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Announcement

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The Journal of Valuation and Property Services is a publication specially intended for property professionals to keep abreast with developments in the property industry as well as the real estate profession.

This journal serves as a platform for the exchange of information and ideas on property issues. It seeks to:

- address areas of major interest and practical relevance to the real estate profession
- create awareness of new theories, techniques and applications as well as related concepts relevant to the real estate profession
- discuss policy issues and regulations and their implications on the property market

We therefore welcome articles with theoretical and practical relevance to the real estate industry and profession, property valuation, property management, property investment and property market.

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BUILD THEN SELL MODELS FOR HOUSING INDUSTRY: A REVIEW

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Abstract

Build Then Sell concept had been extensively discussed and debated by various parties in the Malaysian property development scene. The idea was originally mooted in the 1980s and since then various attempts to implement the system had met with dead ends. Nevertheless, owing to the persistence of the proponents of the concept, the system had recently gained ground by the '10-90' formula proposed by the Government. All the stakeholders in the property development industry are now actively working to chart the next course of actions to make the system a reality.

This paper investigates the Build then Sell models implemented in other countries, and the ones proposed by the respective parties in Malaysia. The rationale of studying the other countries' models is to learn from their time-tested Build Then Sell experience in their respective property development industries. Although some parties in this country claimed that Build Then Sell could lead to price increase, which in turn, could trigger unsustainable business climate in the industry, evidences from the other countries suggested otherwise. The opponents of the Build Then Sell could however, point out that the system in the other countries was applied on a different economic platform, with varying underlying economic fundamentals. Hence, it is important for all the relevant parties to study the Build Then Sell concept from a holistic point of view so that the nation could witness an improvement in the industry in the long run.

Keywords: Housing delivery system, build then sell.

INTRODUCTION

Many developed countries such as Australia, the United Kingdom, United States and Netherlands have adopted Build Then Sell (BTS) approach in their housing delivery systems. Thailand had also followed suit since last decade and have been practicing BTS without problems (Leng, 2005). There are also evidences of countries such as Australia, Singapore, China and Hong Kong adopting a hybrid of BTS and Sell Then Build (STB) in their housing procurement system.

In the past two decades, there had been many aborted attempts to implement BTS in Malaysia. The Malaysian government was, and still interested to introduce BTS in the property development industry. It had received

unflinching supports from the likes of FOMCA and National House Buyers Association, making the case of the BTS implementation stronger than ever. A large number of property developers however, did not welcome the BTS implementation. They argued that BTS cannot exist in the Malaysia economic scenario. Nevertheless, amidst the resistances, the Government had approved the implementation of 10:90 BTS model and STB on June 2006. These systems will co-exist to the residential property development industry.

This article will discuss the concepts of BTS. First, the BTS models proposed in Malaysia will be described, followed by their perceived benefits and then argument against them by the developers. Case studies of BTS

implemented by some Malaysian developers will also be included. Then, the paper will explore BTS models implemented in other countries. The characteristics, strengths and weaknesses of each BTS model will then be identified.

DEFINITION

BTS is the selling of completed property with Certificate of Fitness for Occupation (CFO) (Zulkifli, 2000). It is a system where developers can only sell completed houses to house buyers. It virtually means developers can only sell their houses after they have been completed (Gan, 2005). House Buyers Association (HBA) (2005), basically views the concept of BTS as a system where developers are required to build and complete their housing project first, before selling the completed houses to the house buyers. Chen (2006) pointed out that BTS system essentially means the developer completes the houses before they can start selling them. The financing of the project would be entirely borne by the developer and its banker. The risk is now shared between them. In this instance, the house buyers do not share the risk of project failures.

There are two well-known variants of BTS-the '10:90' and the pure BTS (referred to as 100% BTS here in after). According to HBA (2005), 10:90 is a midway between the present progressive payment (STB) and the completed BTS. Akbal (2006) pointed out that 10:90 model is a scenario whereby 'the purchasers must pay a deposit of 10% when signing the Sale and Purchase Agreement (S&P) with the remaining 90 per cent of the purchase price payable upon completion of their houses together with the issuance of Certificates of Fitness for Occupation. Lee and Tan (2006) added that, 10:90 concept allows house buyers to pay 10% of the sales price upfront to the developer and the remaining balance of 90% would be held back by a lawyer until the handover of the property is done. This indicates that the financing and equity sharing formula for the 10:90 model is very similar to that of BTS where the housing finance are separated from the house buyers (Chen, 2006 and Zainal, 2006).

As a generic definition, BTS is a housing delivery system that requires developers to only sell the

completed houses with CFO issued. It can exist in two forms- the pure BTS and the 10:90 variant.

BUILD THEN SELL: THE MALAYSIAN MODEL

Malaysia has adopted STB as a housing delivery system for over 40 years and it was a norm practiced until today. However, to protect house buyers from the unscrupulous developer under this model, government has amended the Housing Development (Control and Licensing) 1986 to encourage developers to adopt 100% BTS model.

The announcement made by the Deputy Prime Minister on the Government's decision to adopt the 10:90 model for housing delivery alongside the existing Sell Than Build is a new step for housing industry in Malaysia. Some developers especially in Selangor, had practiced the 100% model and 10:90 model of BTS concept. This section will discuss the models of BTS namely the 100% BTS model and 10:90 variant.

100% BTS Model

The BTS system essentially means that the housing developer must complete the housing projects including construction of the houses before they starts selling the unit until the certificate of fitness are issued. In other words, the selling activity would only begin as soon as after the housing units are completed with the strata title and certificate of fitness (CFO) issued. This will give those interested purchasers the chance to look first at what they are paying for before committing themselves to buy the house.

In 100% BTS model, the interested houses purchasers would pay 10% deposit of purchased price on signing of the Sale & Purchase Agreement (SPA). Later, they must complete the balance of the payments after three months from SPA date, with an extension of 1 month to settle it (Tan, 2000). In this case, purchaser can pay the deposit up to 10% if they want, based on their ability to pay, because the balance of the payments will have to be done within one month after signing SPA. Here, most of them will seek the loan from the financial institution to buy the house. Under this model, there is no waiting period for the

completion of the construction. They can move into the house once they have settled the payment for it. To have a better understanding of the characteristics for this model, the whole processes are summarised in Table 1.

In this model, the developer will have to source for their own financing rather than relying on the bridging loan which was offered under the present STB model. In Malaysia, most of the big developers financed their projects by using their own funds and financing facilities from banks such as term loans and bridging loans. In this system, architects and engineers are not required to certify the progressive payments because developers do not use purchasers' funds to finance their project (HBA, 2005).

Therefore, the risk is shared between the banker and developer because financing of the project would be entirely borne by both of them. The amount of financing that would be given to such a development would depend on the criteria set by the individual bank and the bank's risk. There are no clearly spelt-out

guidelines in deciding the level of financing a project gets. Unless banks can come out with a transparent set of guidelines, it is purely guesswork how much financing a project is going to get under the BTS model (Chen, 2006).

The level of bank financing for the project will determine how much equity the developer has to fork out. It could range from a 70:30 to a 30:70 risk sharing formula between the banker and the developer, respectively, depending on the viability of the housing project. For the bank, there is no spread in the risk. Once the financing formula is agreed upon, and if the developer has the balance of equity, the project can be completed with the financing from the bank (ibid).

Syarikat Perumahan Negara Berhad (SPNB) has pioneered this concept in Klebang, Melaka. SPNB claimed that, this model is better than 10:90 because the house buyers do not have to pay 10% deposit before the completion of housing projects. They only charged RM500 for deposit (Kosmo, 2004).

Table 1: Characteristics of 100% BTS Model

		Completed Properties (BTS 100%)
(1)	Developers' Financing	Own funds and/or financing from banks such as term loans
(2)	Purchasers' Financing	Housing loan
(3)	Deposit / Down Payment by purchasers	Pay 10% of Purchase Price on the signing of the Sale & Purchase Agreement (SPA)
(4)	Waiting period for Completion of Construction & Notice of Delivery of Vacant	None
(5)	Purchasers to complete payment/s	Must complete the balance 3 months from SPA Date (in normal situations) with one month extension. (3+1)
(6)	Waiting period for actual occupation with Certificate of Fitness for Occupation (CFO)	None
(7)	Waiting period for transfer of individual/strata titles	Varies on whether titles have been issued at the time of signing of SPA

Sources: HBA Proposal, (2002)

Figure 1 is a graphical representation of the 100% Build then Sell practiced in Malaysia.

The relationship between bridging and end finance loans under 100% BTS Model

One of the main features of BTS system is that the developers are not able to sell the house from their housing projects before they were built. Therefore, they can not use the progress payment by the house buyers to finance their projects just like what they have been using under the present STB system.

Under this 100% BTS concept, the developer has to build the house first before they can start to sell it. In other words, the developers have to seek for other source of financing because the progress payments (end-finance loan) from the house buyers are not available in this concept.

By referring to Figure 2, here, the end finance loan (or better known as housing loan in this concept) from the house buyers will be added to the net cash flow curve as the profit for the developer because it is injected to the developer's account after the project cost has

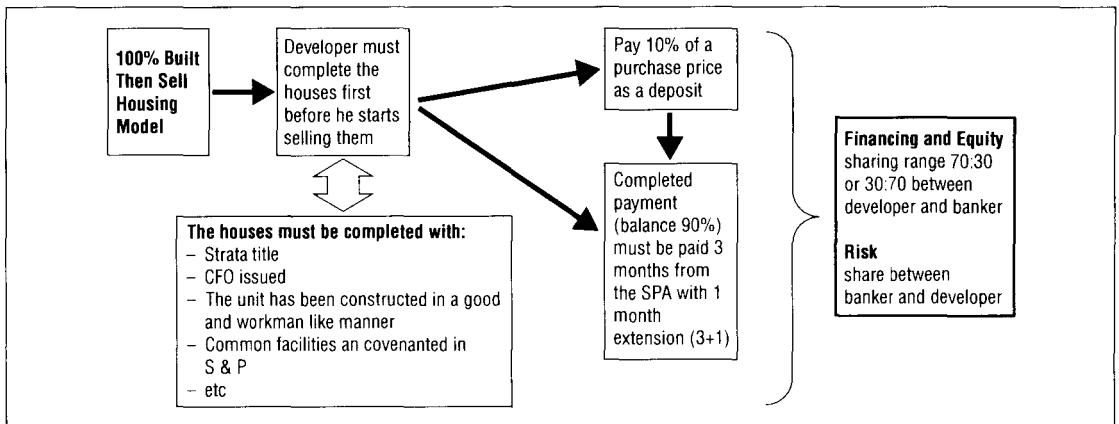


Figure 1: Graphical representation of the 100% Build Then Sell Housing Concept in Malaysia

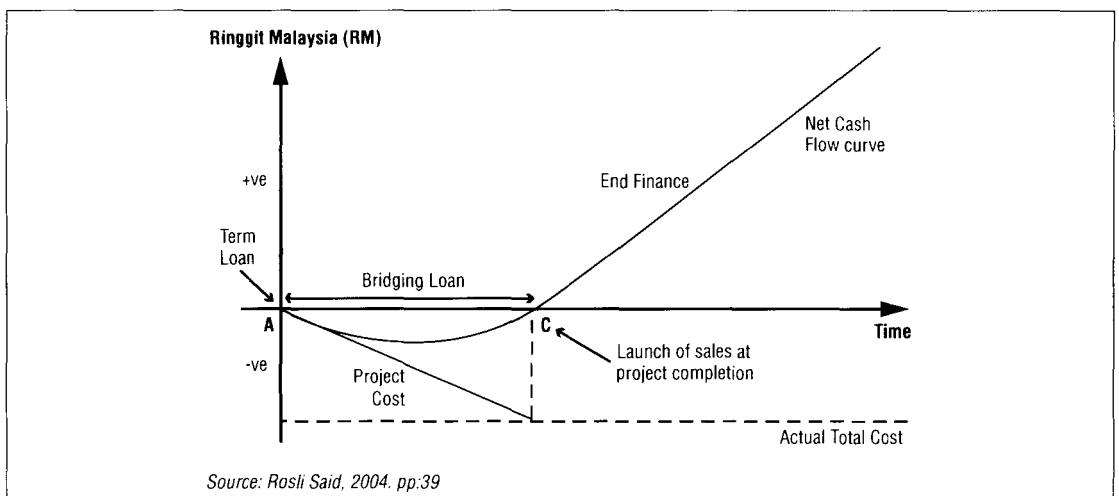


Figure 2: Bridging and End Finance Loans at Different Stages of Development under 100% BTS

stopped. Basically, the interested house buyers will start to make the payment once the completion of the housing project has been issued with Certificate of Fitness for Occupancy (CFO) and/or Certificate of Completion and Compliance (CCC) (which had been announced in April 2007). The difference between this 100% BTS concept and the present STB is, a bigger/larger amount of bridging loan is needed to cover the whole construction cost for the housing project.

Figure 3 illustrates the relationship between the end finance loan and bridging loan in the 100% BTS concept. To make this system works, the financial institutions (especially the banks) will have to re-look into these two loans to help the developers who have insufficient capital when the 100% BTS is implemented.

Ten Ninety Variant (10:90 Variant)

Ten Ninety Variant model is a midway between STB and BTS. It essentially means that the 10% deposit to be deposited into a stakeholder to be released to developer when developers deliver the completed

houses with the certification of fitness issued to the purchasers. In other words, purchaser pay the 10% deposit into a stakeholder and the balance will be paid when the houses are completed with CFO.

In this concept, to lock in the purchasers, they have to pay a down payment or deposit of 10% of the contract price upon signing the Sale and Purchase Agreement. This deposit is then placed in an escrow trust account or fidelity fund. The developer has no access to this money until the plan of subdivision is registered and proper proof is provided that the vendor can give a clear freehold title for the property (Chen, 2006). The money is further protected by way of the Fidelity Fund pursuant to the Legal Practice Act. The remaining amount is only payable within ninety days upon delivery of vacant possession with CFO and Individual Title to the subject property (HBA, 2005). Ideally, the purchaser should not have to complete the payment of the purchase until the property title is issued.

The financing for the cost of construction is the responsibility of the developer and the house buyers will only seek for their financial requirement to buy the completed house when it is ready for occupation.

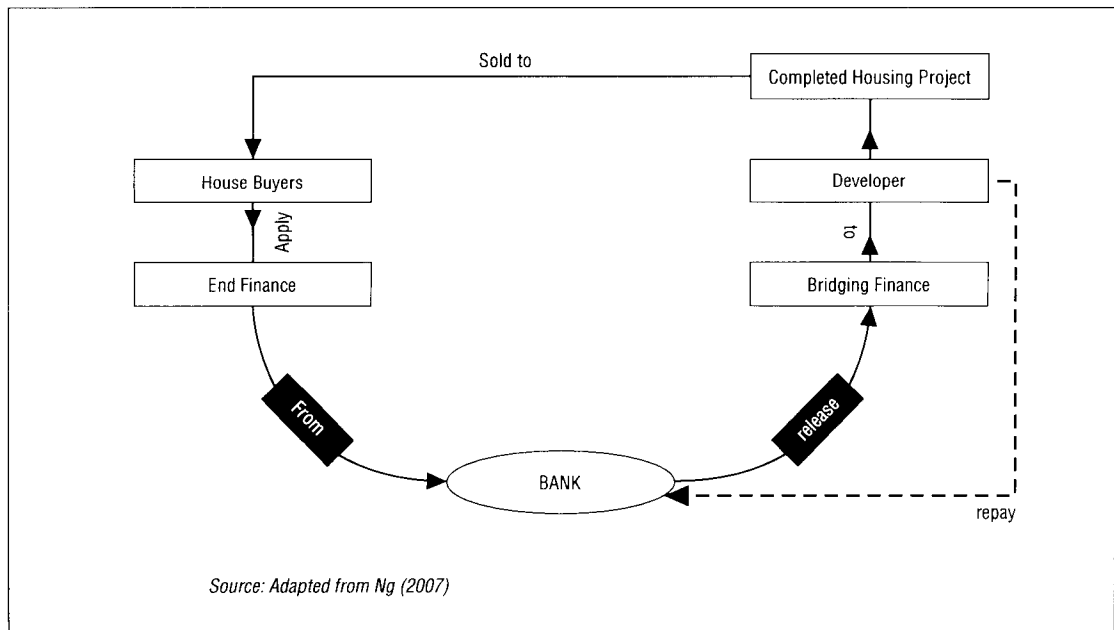


Figure 3: Relationship between end finance loan and bridging loan in 100% BTS concept

The financing and equity sharing formula for the 10:90 model is very similar to that of 100% BTS model. The potential danger of this model is buyers reneging on their agreements during market downturns, thereby creating a domino effect of projects failing in midstream (Chen, 2006). In the event that the developer does not complete the project in accordance with the time frame permitted, the buyer has the right to rescind the contract and have the deposit returned together with any interest that may have accrued. Housing projects that are build and marketed using the complete BTS system need not comply with the statutory standard Sale and Purchase Agreements. It is not difficult to see the vast difference though (Lee and Tan, 2006).

The developer is assured of the committed sale and can concentrate on completing the project on time and with quality assurance. The financial institution will progressively release the bridging finance funds to developer. In this way, they are in a better position to ensure that the developers are paid what they deserve and every ringgit disbursed will go towards the completion of the project (Lee and Tan, 2006). There will be no room for siphoning or diversion of payments from buyers since there are no progress payments. Therefore, as bridging and end finance loans will be affected, the relationship between these two loans under 10:90 BTS Model will be discussed in greater details at section 7.7.2.1. Table 2 shows

the characteristics of the 10:90 Variant Malaysia BTS model.

HBA recommends that a pre-delivery inspection be included in the contract (HBA, 2005). The developer will notify the buyers of the pre-delivery joint inspection (developer and buyer) of the houses, during which time all observable defects are noted. That list may be long or it maybe short, but what it includes are things that are clear to the eye on inspection, and therefore the list will underline the obvious. The developer is to rectify the list before the actual handover and the exchange of the rest of payment is done. Vacant possession should only be given after defects are rectified (ibid). This will go a long way in promoting for a mutual respectable society vis-à-vis the developer and their customers.

Defects liability period remains at 18 months warranty as a safeguard for buyers. Any other defects in workmanship and materials which are identified by the purchaser over the course of a certain number of years say five (5) years of occupancy may be raised directly with the developer. Figure 4 is a graphical representation of the 10:90 Variant Housing Concept in Malaysia.

To prevent such an eventuality, some changes need to be made to existing legislation. This should include a 'lock in' clause in the SPA where buyers cannot renege

Table 2: Characteristics of 10:90 Variant BTS Model

		BTS 10:90 Variant System
(1)	Developers Finance	Own funds and/or financing from banks
(2)	Purchasers Finance	Pay 10% of Purchase Price (as down payment)
(3)	Deposit / Down Payment by purchasers	Within 24 or 36 months or more upon Architect's Certification of Completion
(4)	Waiting period for Completion of Construction & Notice of Delivery of Vacant	90% of Purchase Price at 24 or 36 months from SPA Date depending on the regulated contract of sale
(5)	Purchasers to complete payment/s	Proposed Vacant Possession with CFO
(6)	Waiting period for actual occupation with Certificate of Fitness for Occupation (CFO)	Proposed Vacant Possession with issuance of titles
(7)	Waiting period for transfer of individual / strata titles	Varies on whether titles have been issued at the time of signing of SPA

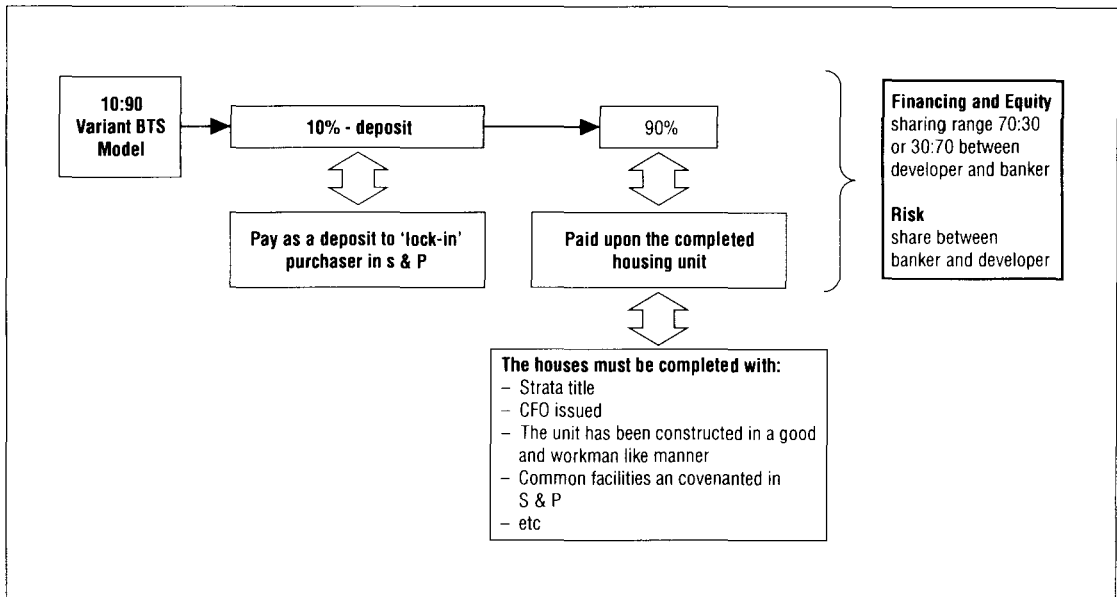


Figure 4: Graphical representation of the 10:90 Variant Housing Concept in Malaysia

on the agreement, and are as equally bound to specific performance clauses as the developer. Sanctity of contract cannot be assumed, as experience has shown that house buyers will find loopholes and the flimsiest of excuses to get out of a down market, even in more mature markets like Australia where a group of buyers successfully reneged on their contracts, citing unacceptable colour tone (Chen, 2006).

The relationship between bridging and end finance loans under 10:90 Variant BTS Model.

Just like the 100% BTS Model, the developers will not either get the progress payment or the deposits from the house buyers to finance the cost for the construction of the housing project. Moreover, they can not depend to the joint venture package between bridging and end finance loans to finance the cost for the construction. Therefore, Figure 5 shows the financial injection of bridging and end finance loans at different stages of development under 10:90 BTS Model.

Under this concept, the developer can sell the housing units before or during the construction but the house buyers are required to pay only 10% of the selling price

for the house that they are interested in. According to HBA (2003), that 10% of the payment will be held by the developer's lawyer who is also a stakeholder. The developer has no access to this money until the plan of subdivision is registered and proper proof is provided that the vendor can give a clear freehold title for the property. The money is further protected by the way of the Fidelity Fund pursuant to the Legal Practice Act (ibid). The house buyers don't have to make any further payment for the remaining 90% because they only have to do so after the completion of construction for the housing project and until the CFO and/or CCC (which was announced in April 2007) have been issued.

The different between this 10:90 concept and the present STB is (just like the 100% BTS concept) a larger amount of bridging loan is needed because the progress payment of end finance is not allowed and the 10% deposit from the house buyers are not accessible by the developers until the completion of the housing projects. Moreover, due to no cash flow before the completion of project (refers to end finance loan), developers have to secure more borrowings including larger and longer term of bridging loan to increase the fund.

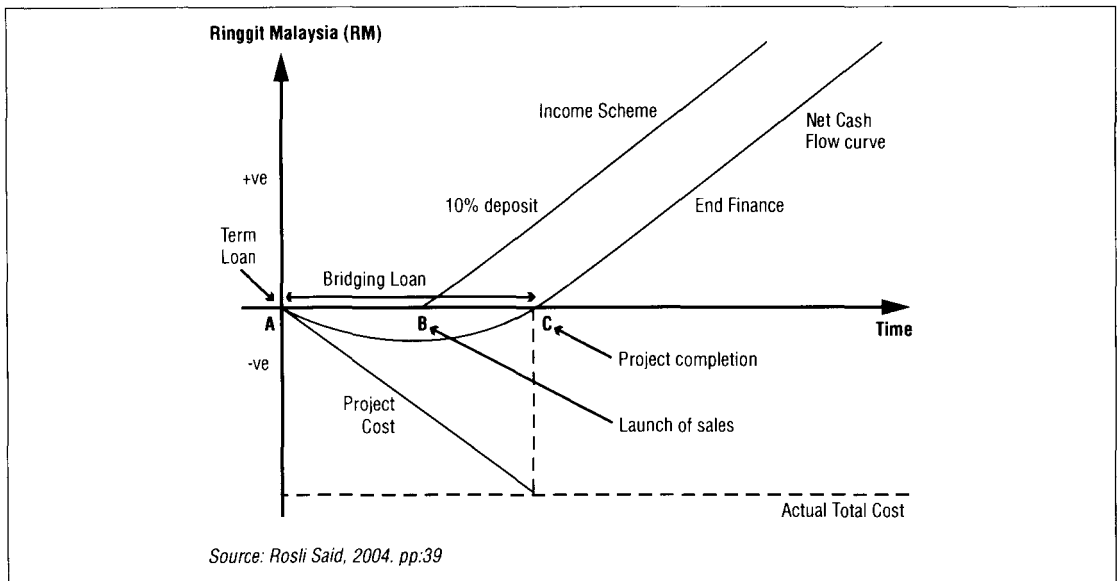


Figure 5: Bridging and End Finance Loans at Different Stages of Development under 10:90 BTS

The summary of the flow for the relations between end finance and bridging loans in 10:90 BTS Model is illustrated in Figure 6.

THE PRACTICE OF BTS IN MALAYSIA

In recent years, a number of Malaysian developers had experimented with the BTS system. Bandar Tasik

Semenyih Group (BTSG) undertook a 16-acre project comprising bungalows, semi-detached units and superlink houses in an enclave called Seri Damai in the burgeoning Kajang township in Selangor (Fadzil, 2004). Undertaken by BTSG subsidiary, Hasrat Angkasa Sdn.Bhd, Seri Damai features 136 residential properties situated on elevated ground with a view of Kajang town a kilometre away. Encouraged by the

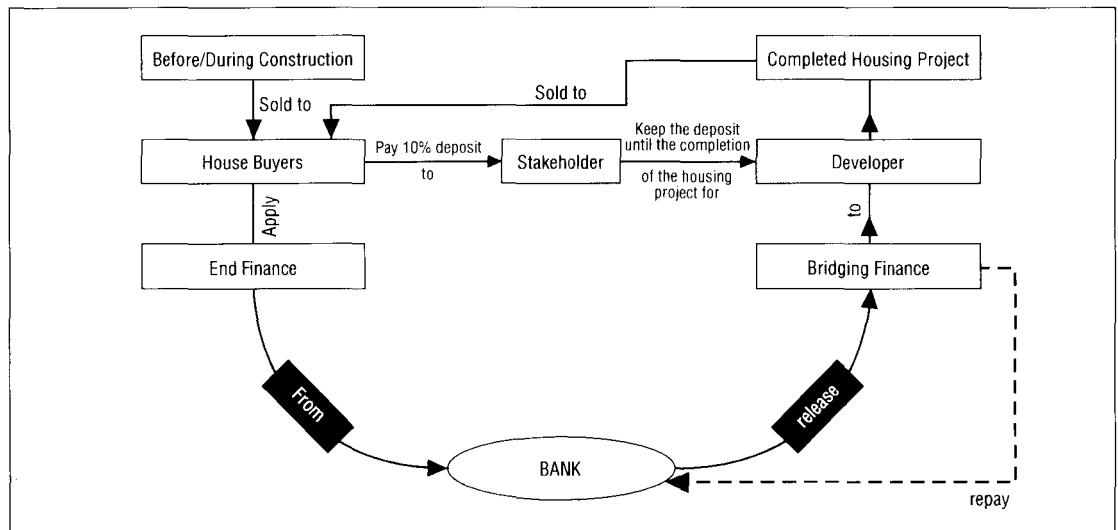


Figure 6: Relationship between End Finance Loan and Bridging Loan in 10:90 BTS concept

success of the first phase, BTSG recently opened phase two, comprising 19 units of double-storey bungalows and another 58 units of double-storey semi-detached. The seven-bedroom bungalows with plot sizes ranging from 3,786sq ft to 7,266sq ft are pegged from RM478,888 to RM642,888. Built-up areas start from 3,230sq ft with standard units having plot dimensions of 50ft by 96 ft.

Worldwide Holdings Berhad partially applied the BTS concept in their housing development in Subang Bestari. One out of every five units in its RM850 million Subang Bestari township were sold under the BTS concept (Business Times, 2004). Syarikat Sentosa Jaya Sdn. Bhd (SJSB), Kelantan's largest bumiputera housing developer, had adopted the concept of build and sell several years back to convince house buyers to buy their properties from them. Annually, the company develops around 600 units of various categories of houses in Kelantan, Selangor, Terengganu, Pahang and Negeri Sembilan (Bernama, 2004).

Mah Sing Group Berhad offered homes complete with CFO in their development in Taman Sri Pulai Perdana, Johor. Guthrie Properties had launched their first BTS development in 2005. With a gross development value (GDV) of RM96 million, the development comprised of 160 units of superlink houses in two design sizes 24' x 90' plot with prices ranging from RM620,000 per unit and 22'x75' sized pegged from RM420,000 per unit.

BTS MODELS IN OTHER COUNTRIES

The literature review conducted reveals seven models which at present are in use in other countries. It can be further classified into three broad groups based on the characteristics of each model. Hundred percent (100%) BTS model will be categorized under group A, Variant BTS model is under group B and Build And Sell (BAS) model will be categorized under Group C.

The Model of 100% Build Then Sell (GROUP A)

One hundred percent BTS model (100%) is categorized under this group. In this concept, developers only sell their products (houses) when it is completed. In

other word, it relates to the properties that are fully finished and issued with certificate of fitness issued before they are put up for sale. It essentially means that the developer must complete the houses with the CFO and title issued before they are offered for sell to the public.

The model categorized under this group characterized as firstly the purchasers buy the house only when the house is completed. Therefore, before completion of the construction of the project, there will be no collection of payment from purchasers. Secondly, developers may seek financing from the financial institutions and/or use their own fund to finance their housing project. Thirdly, the development process involves an element of risk. Many countries use this model, especially in the United Kingdom and Thailand.

The case of UK

In United Kingdom, 'Build then Sell' is the normal practice in the private for sale in market, particularly in the volume housebuilding sector (Courts, 1992). The house building market falls broadly into two main categories; private sector and social housing. The development process involves an element of risk as well as reward.

The traditional approach to development by the private sector in UK is to look for investment opportunities which have a high probability of financial success: success which can be better guaranteed by reducing financial exposure and therefore risk and increasing certainty (Carmona et al., 2003). For this reason, anything that increases costs (and therefore risk) is generally opposed by developers, for example delay in granting permissions, contributions to infrastructure, or bespoke design solutions. Conversely, anything which increases certainty or drives up reward is generally supported, including development that meets clear market preferences, or which is supported in planning policy (ibid). The risk attached to any development opportunity reflects the complexity of the procurement process and the number of uncertainties inherent in that process.

Initially the developer is required to scour the existing environment for development opportunities, a process which requires some prediction of what the property market will be in the future. On identifying an opportunity, a feasibility study is required and some early projection of development costs and cash flows in terms of expenses and incomes over time. Next, short term and long term financing must be obtained (including any grants), plans finalized and all the relevant permissions obtained from the statutory authorities. After contracting arrangements and costs are sorted out, the project then moves onto site and the execution of the development on site has to be managed (op-cit).

Having acquired a piece of land for development and gained the necessary planning approvals to build, the developer will undertake normal site clearance and preparation before the construction of individual houses can take place. This process will include ground engineering works, the provision of infrastructure (roads, sewer, water mains and other services) and the completion of dwelling foundations to "slab" or ground floor level (Courts, 1992). On all but smallest sites, at any one time initial engineering work will normally take place only on sub-divisions or phases of the whole project, involving say 50-100

homes. Engineering work on further phases will be undertaken once a satisfactory level of sales has been achieved on initial phases (ibid).

Finally, the completed scheme is marketed and either sold or let and the ongoing process of adaptation and maintenance begins. At any stage the project is vulnerable to a whole series of external and internal risks, not least the whims and fluctuations of the market and the need to ensure cash flow is secure (Carmona et al, 2003). The way cash flows through the house-building cycle is illustrated in Figure 7.

The figure includes 31 movements of cash in and out of a hypothetical company focused on six key stages of the development process. The stages (represented as ovals) and flows (as arrows) are purely indicative and have to precise relationship with the formal accounting process.

Schematically, development proceeds in a clockwise movement starting with finance at the base (six o'clock). At here, financing for the developer (at Finance stage) comprises four main sources: loans, shares, retained profit and grants. Key financial outgoings are dividends to shareholders, bank interest payments and maintaining the land bank. In practice,

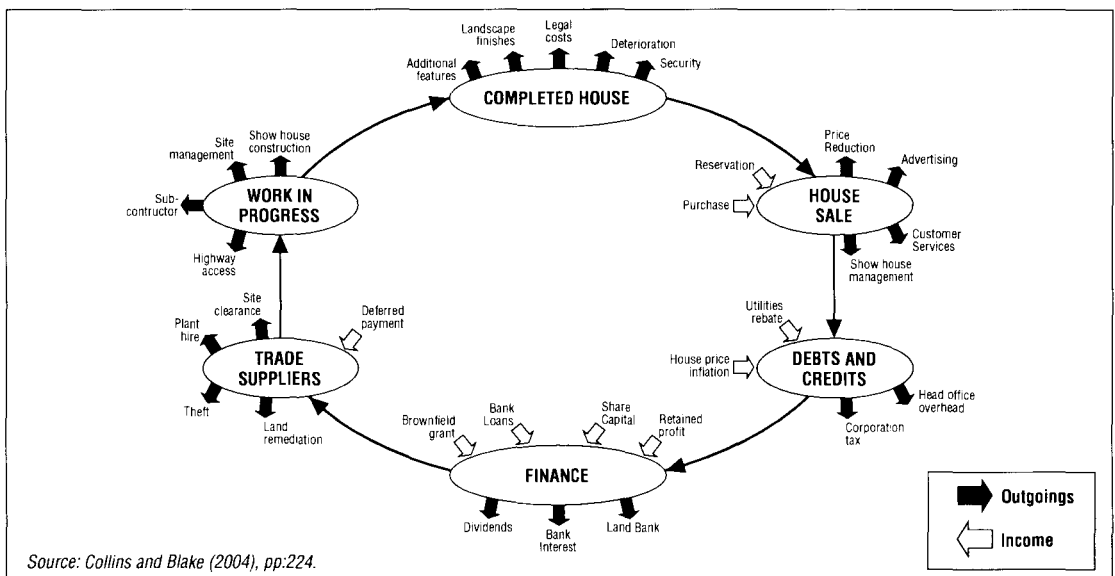


Figure 7: The Developer's Loop – A Schematic Cash Flow for the Housing Development Process

finance raising and repayments occur throughout the cycle. In the early stages of construction the emphasis is strongly on outgoings as sites are prepared, the only income being infrastructure accumulation for which deferred payments are normal. Work in progress (WIP) is entirely an outgoing, although it counts as an asset in the balance sheet because it would be cashed in if the company were taken over (Collins and Blake, 2004).

Once houses are completed, there are still at least five costs relating to enhancement and protection prior to their sale (top of the loop). As sales begin there is a positive cash flow from reservations and purchases which, in a successful scheme, should outweigh the combined costs of land, production, security and publicity. In a sluggish market, price reductions may represent a late outgoing while incentives such as carpets and finishes are offered to retain a competitive edge. In an appreciating market, house price inflation may represent income but this will be partly offset by head office administrative costs and tax responsibilities. When all creditors have been paid and debtors have rendered what they owe, a successful company will retain sufficient profits to feed into further purchases of land, equipment and materials. Certain other types of business operate on a similar 'tread-mill' basis, but house builders are particularly vulnerable to short-term cash flow problems and that compounds the industry's generally brittle image (*ibid*).

The case of Thailand

One of the housing delivery system that have been practiced in **Thailand** is 100% BTS but they changed it over to "build-sell" concept (forced by the exigencies of the 1997 financial crisis) without any problem (Leng, 2005). Some developers have used BTS concept to sell houses and condominium at discount price. Land & Houses (L&H), a major property developer in Thailand, claimed that they become a discount store for houses, by speeding up construction for maximum production (Katharangsiporn, 2004). The discount home retail concept was inspired by L&H subsidiary Home Pro, a superstore for construction materials, tools and home decoration accessories, which was launched in September 1995.

Here, the concept of a discount store is developing a massive volume for sale at the lowest price where they bought materials in bulk to achieve cost savings which boosts their competitiveness. As a result, if there are more houses being build, the developer will have a lower construction material for the costs. When they build more housing projects than their rivals, they will have a cheaper per-unit overhead cost.

Working hand-in-glove with the build then sell strategy, a developer can estimate construction material needs for a whole year and then lock in specifications on huge orders and shop around for the lowest prices. The concept, however, would not work with pre-sold projects, which almost always see some alterations from the original blueprints made by the customers during construction. L&H also revealed that the most important element of the company's strategy was managing supply and controlling inventory.

When their margins of profit start falling, they will clear out stock of unsold units in order to generate a quick return. Other than that, when sales become sluggish, they will not develop any more properties of the same type. Immediately, they will halt construction and sell out all of their leftover stock. This strategy and the management way can be followed by other developers who are interested to practice this concept. Using this concept, the house buyers can purchase a house at a lower price. This will not be the advantages for the house buyers only but, the developers and the government will also gained from it. Figure 8 is a BTS model practiced by Thailand.

Summary of the Group A Model

Generally, the biggest strength in this model aims is to protect house buyers from the unscrupulous developer. For house purchasers, this model gives many advantages to them. For example, there are many choices of housing for purchasers to view before making a purchase in especially in UK and US because this model are the norm practiced in their country (Courts, 1992).

Beside that, purchasers would get to see the actual unit in the actual surroundings, landscaping, the level

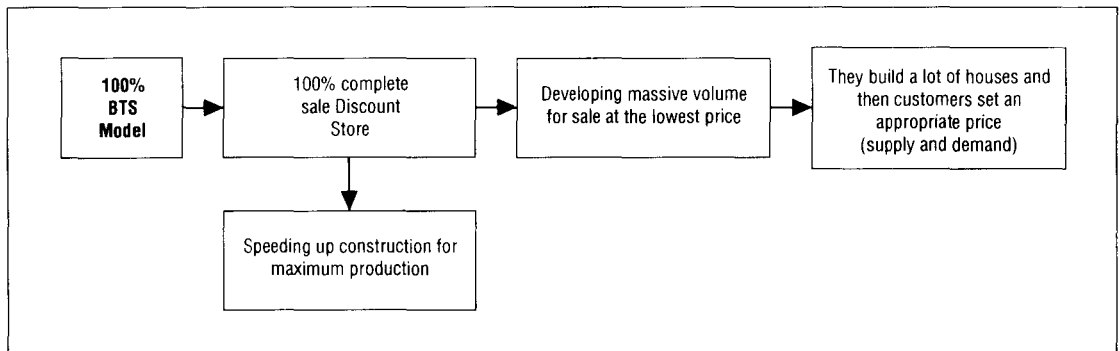


Figure 8: BTS Model practiced by property giant Land & Houses in Thailand

differences between neighbouring lots, the safety conditions for children, the accessibility to facilities, etc, before making decision to purchase. Therefore, purchasers are able to view the physical condition of houses in term of quality. For the sale and purchase of housing unit, purchasers would only pay current market prices at the time of delivery and this model will provide the house buyers a brand new house (Eric, 2006). There is no waiting time to get the actual unit and it will be more secure for purchaser's fund.

In the case of developer in UK, they will conduct feasibility study to ensure buyers' potential in buying the house in order to minimize the risk (Courts, 1992). In terms of construction stages, the process will take a shorter time. Because of that, this model has more flexibility to implement and the administration of the projects should be easier. The successful developer will minimise risk by gaining a thorough understanding of the housing market in which he operates, by researching individual house building opportunities or projects and carefully planning the programme of construction and sales in accordance with anticipated market demand. In addition, the quality control of the project could be better. In Thailand, developers buy material in bulk using the discount store concept to achieve cost saving which boosts their competitiveness. That's mean the construction cost should be lower and the house buyers will get a fair price for the houses they are buying.

As developers in Thailand sell their product (housing unit) with lower prices (because they build the units

at the lower construction material cost), this will affect the housing demand. The increase in the housing demand will then pull along the housing supply into positive growth. Indirectly, this activity of housing supply and demand will contribute to the economic development in Thailand. Moreover, the implementation of this model will reduce the risk of project abandonment and lessen the number of complaints from disappointed purchasers. In addition, it could help the government from bearing the cost of rehabilitating abandoned housing projects.

The weaknesses of this model firstly, for developer under this concept, the margin per unit for the houses that they built may be lower. Financial risks are so high because developers financed their project with their own funds or other financing schemes from the financial institutions. In addition to this, for small developers, it's more difficult for them to get any financing facilities. It is because the bank will look at the strength of company and the viable of their projects before they approve the application. This may cause the small developers to be out of business if they cannot secure any financing for their projects.

This is not the case in the UK. Dowdeswell (2004) explained that the UK property developers use the service of specialist property finance brokers to source for their project fundings. Once the lender has issued a formal offer to the developer, the broker must explain any conditions of the offer that are unclear to the developer. In practice, many small developers are quite familiar with typical conditions such as valuation, insurance, construction cost verification

etc. Following acceptance of the offer, the broker will continue to liaise between the client and the lender and perhaps the valuer and solicitor to ensure that the loan completes in time for the land acquisition or refinance to take place.

Build Then Sell Variant Concept by Other Countries (GROUP B)

This group is classified as the BTS Variant concept which was practiced by other countries. This concept essentially means that the purchasers must pay money deposits upon signing the Sale & Purchase Agreement before the construction work started and the balance will be paid after the houses are completed with title and CFO is issued.

In this model, the purchaser must pay a deposit or down payment before the construction works start. The deposit ranges from 10% to 40%. Hence, the BTS could exist in different permutations such 10:90 model, 15:85 model, 20:80 model, 30:70 model and 40:60 model. The deposit money paid to the developer is used to lock in the purchasers at the beginning of the development process while the remaining amount will be paid after the houses are completed.

If the purchasers are not satisfied with the quality of the houses, they can terminate the agreement and ask for their deposit money back. In this model, as the bridging financing cannot apply, the developers financed their project using their own fund and/or other financing from the financial institutions or even from the purchaser's deposit that are paid to them. This concept is practiced in many countries such as Australia, Singapore, Taiwan, United Kingdom, US and Thailand.

The case of Australia and Singapore

The 10:90 model is used extensively in Australia and Singapore. The Australian model is regulated by the Sale of Land Act 1962 of the State of Victoria. S9AA of the Sale of Land Act 1962 of the State of Victoria.

In Australia and Singapore, the concept requires buyers to pay 10 percent of the property price as down payment into an escrow account held by a

stakeholder, with the balance payable only when the house is completed and delivered with Certificate of Fitness issued. The duration of time required for such approval is about three to six months in Australia.

Obviously the house buyers have zero risk and the total risk factor will be borne by the developer. In Australia and Singapore, from the very beginning, the developer will have to use his own or borrowed funds to finance the housing project. He does not even have the luxury of using the buyer's 10% deposit (Teo, 2005). Architects and Engineers have no role in this model and are not required to certify progress payments because developers do not use purchasers' fund to finance their projects. According to Boyd (1992), the buyers in Australia can pay deposit ranging from 10% to 20%.

As for the case in Thailand, developers financed project development by use of purchasers' down payments of 10 to 40 percent of sales prices (Chaitrakunchai, 1995). Down payments of 10% to 40% of the sales prices, paid to the developer, are occasionally accepted in installment, most commonly over seventeen to twenty-two months on adjustable rate term (Sharkawy and Chotipanich, 1998).

The case of Thailand

By the late 1980s in Thailand, the economy was growing so fast that urban land prices skyrocketed. Terraced houses and town houses became unaffordable and private developers switched to low-cost condominiums. A study in 1986–1987 found that the private sector had gone “downmarket” by building smaller, cheaper, simpler houses (mainly row houses and townhouses), using more efficient construction methods and more sophisticated marketing methods (Yap, 2002). They built apartments of 30–40 m² for sale, but many of the condominiums were in rather remote locations. An inexperienced developer would have some difficulties obtaining project loans from a commercial bank, but the bank would happily refer the client to its own subsidiary finance companies.

A major shortcoming of projects by inexperienced developers was a lack of market research. The main source of information on demand and supply were

visual surveys and the mass media. Equity would come from the sale of family assets or from the profits of another of the family's companies. There was often no clear separation between companies owned by the same family. Informal transfers of funds between companies were common practice, even if one of the companies was listed on the stock exchange. It was not uncommon to use public-company money to launch private companies.

In 1992, the government established the Bangkok International Banking Facility (BIBF) to attract International capital to Bangkok. Some of the capital that entered the country through BIBF went into real estate including housing. With all the liquidity in the money and capital market, it became easy for real estate developers to borrow funds to finance real estate projects and for homebuyers to obtain housing loans. The government fixed the exchange rate and this facilitated the repayment of US-dollar loans. The government initially also controlled the interest rates for Baht loans. As the loan volume multiplied, the Bank of Thailand urged the banks to be more prudent with their lending.

However, many government ministers were close to the commercial banks and the real estate sector, since both supported the political parties financially. Moreover, professional staff moved freely between the Bank of Thailand (the regulator) and the commercial banks (the regulated) and this did not help to maintain a strict control over the banking sector.

As the commercial banks lend to developers for housing development, it was critical for them to ensure that the housing units were actually sold. So, banks and real estate developers agreed on a package deal whereby the bank would provide mortgage loans at lower interest rates to buyers of housing that the bank had financed to develop. Some banks had their own real estate companies and this allowed them to control the entire process.

However, by early 1999, the Government Housing Bank initially alone, later in competition with the commercial banks, extended loans to private-sector developers and homebuyers to support the demand for housing finance (Richupan, 1999 and Yap, 2002).

Because the higher income housing sector was saturated, the private sector focused its attention on the lower-middle income groups which for the first time, they could afford to buy a house.

The case of UK and USA

United Kingdom and United States also practice the variant. In United Kingdom, buyers can pay deposit money of up to 30 percent (30:70). In order to assist potential purchasers with their decision to buy, the developer will build a sample dwelling for each of the housing types that will be contained in the housing development project. A typical development will have between 3 and 6 different housing types, and will usually have models of the most common ones. Along with the show house block, a developer will build a number of properties for occupation, but he is likely to keep his construction programmed very much in line with his achievement of sales (Courts, 1992).

Although a house must be built and ready for occupation before final payment by the client is made, a developer in the UK will not often start to construct a particular house until he has at least have a verbal commitment from the potential buyers that they will proceed with their purchase. In some cases the initial commitment from the clients to the developer may need to be a financial one. For example, the house buyers may have to pay the deposit of up to 10% from the final purchase price for the house that they are interested in. Thus, this will indirectly fix the price at the date of paying the down payment regardless of subsequent general price movements in the market.

Sometimes, for developer is building a block of apartment or terrace, he has to settle all the dwellings that are needed to be substantially completed before any new dwelling can be occupied. Here, the developer may choose to wait until a number of the block has been "reserved" before construction will commence (ibid).

Dowdeswell (2004) added that, the smaller developer can source his finance through a number of different routes. His first port of call is likely to be his high street bank and he may also have an existing relationship

with a specialist lender. Alternatively, he will seek out his own finance, perhaps through the property media, his accountant, his solicitor, his financial adviser or by talking to fellow developers. Often, a better option for the developer is to use a specialist property finance broker to source the funding he needs.

The advantage of using a reputable broker is that he has the market knowledge that will help the property developer especially for the developer who was unable to obtain the facility he needs from his usual sources. The broker will approach reputable funders. He will respect the confidentiality of information supplied by the client (developer) and will charge a fee that is commensurate with the service provided. He knows which banks are lending in which sector and where they operate geographically. He also knows what their lending terms and security requirements are and how quickly they can consider and sanction loans because time is often of the essence to the developer who is competing to buy land with others (ibid).

There are a few accurate statistics on the number of lenders involved in the financing of residential property development. Out of the 600 or so banks that are registered in the UK, a fair estimate is that there are no more than 50 that are actively seeking residential development funding. This excludes short-term bridging funders and private equity suppliers. These active lenders/banks come from all sectors of the banking and funding industry.

- There are the major commercial banks seen in the high street as well as the Irish and Scottish banks.
- There are also the quoted and unquoted specialist property lenders who have great expertise in assessing development projects, some of whom have been lending through all economic conditions for over 40 years.
- Additionally, there are some small private lenders using their own funds for projects.
- There are some private individuals who specialize in providing mezzanine funding for development projects where the small residential developer

has insufficient equity to meet the lending bank's requirements.

- Some of the property banks will also add a mezzanine layer to their lending for the right deal.
- Lastly, there are the 100% funders who will provide all the funds needed for the scheme in exchange for a significant share of the profits. These funders are sometimes house builders themselves, or they may be a special unit of a major bank. (ibid)

The strength in these models also protects the house buyers from the victim of unscrupulous developers. Generally, the purchaser gets to view the completed housing unit before paying the balanced. In addition, they also get to examine the property and its workmanship and quality before they make a payment for the balanced. Purchasers are given the opportunity to inspect the house. In case default by developer, the purchasers can break the agreement and get the deposit back. So, this concept promotes the building of better quality houses if the developer wants its completed products to sell.

The case of Singapore

In Singapore, according to Ong (1997), developers have less incentive to provide quality workmanship if their properties are sold before completion. The larger the portion of the project that is sold during the development or construction stage, the lower the effort level that the developer will exert, since buyers are already committed to purchase.

In this concept, the purchaser is insulated from any risk of the completion of the project being abandoned or delayed, hence having to pay unnecessary amount of interest to his financier. The purchaser only pays when the property is ready for occupation because the developer is solely and singly responsible for financing the construction towards the completion of the housing project.

Under this concept, the developer gets to be paid a lump sum of the full purchase price and the risk of a purchaser defaulting in the payment will not arise. The housing development project can have a better

control because the developers will minimize the risk in construction. To sell after construction, it will lead to a better technology being introduced for efficiency and the standardization of components in housing industry where the chances of abandoned housing project can be reduced.

One of the weaknesses for this model is purchasers are exposed to higher price offered by developers under this model because the high interests for financing the cost of construction and the risks are borne by developers and bank. Moreover, it is difficult for developers to secure bank loans to finance housing projects because it involves a bigger sum of financing and a greater risk.

On the other side, the purchasers will have lesser choice of housing types as developers will tend to build those types of houses which are popular with the purchasers. Hence, this will discourage genuine innovative products to be made available to the public. Projects carried out by developers may also be on a smaller scale as developers will try to avoid their projects being abandoned due to poor sales.

Overall, there will be a fewer number of developers who will have the financial capacity to carry out their housing projects. If this happen, then the industry will be monopolized by only big developers who will dictate the cost and pricing of properties. The costs of funding will surely increase and this will be passed on to the purchasers and resulting in a higher selling prices. Developers will undertake housing development in more affluent locations and they will unlikely embark on any major housing development in remote areas.

This will deprive lower income groups of owning properties even if it is a low-cost or medium-cost housing unit. Under this concept, it will require huge shareholders' funds and capital commitment of the company if the developer is unable to secure any bank's borrowings where the banks are reluctant to

finance his project under the BTS concept due to the nature of the risks involved.

It has been a trend that small developers will stand little chance of securing any project financing. As we know, there are not many companies out there with huge market capitalisation which can adopt the BTS concept and implement it in every of their housing projects. For the bank to provide financing to them on case basis, this will have to depend on many factors especially from the developers' track record, the viability of the housing projects and the financial credibility of the developers' company.

Build And Sell (BAS) Variant Concept by Other Countries (Group C)

This group is classified as the build and sell model. In this method, the developers will partly build the houses before proceeding to sell the houses at certain time during the construction phase. The main characteristic of this model is, the selling activity of the housing unit will start at certain time during the construction phases.

There is an evidence of a small-sized developer who practiced 'Build and Sell' in the UK. In this instance, the purchasers can make a request to change or modification their house during the construction period (Abdul, 2005). Besides that, in England, this model of BTS concept has very limited choices of housing and it is suitable for high income earners. For housing properties in China, it can be offered for sale prior to the completion, but only after two-thirds of the structural work has been completed. However, a study conducted by RAM (2003) pointed out that there is no regulation pertaining to the purchasers, where payment is vis a vis for the pre completion sales.

In Hong Kong, developers are allowed to commence sales 20 months from the date of expected completion (based on the architect certification of the estimated completion date) (ibid). Similarly in China, there is also no ordinance that governs the use of such

sale proceeds prior to handing over the properties. Nonetheless, the report also noted that the financing from the banks would normally impose restrictions on the use of those proceeds. Both the above arrangements would probably reduce the completion risk borne by purchasers to some degree.

The strength of this model is that, as evidenced in China and Hong Kong, many citizens especially in low-income families and single person household are protected from unscrupulous developers. The purchasers are given the opportunity to inspect the house first before they purchase the house. In addition to this, the risk of having abandoned project can be reduced.

One of the weaknesses of this model is that, there is limited choice for housing under this model and it is difficult to meet all the necessary requirements. In addition, as the prices will be considerably high, the middle and lower income family must secure financing first if they want to purchase the houses. Thus, in order to own a house, people in Hong Kong must spend a lot from their saving on residential housing. Table 3 summarises the characteristics of each discussed group.

SYNTHESIS OF THE BUILD THEN SELL MODELS

After the lengthy discussions on the proposed Malaysian BTS models and the other international BTS models, it is apparent that the Malaysian models can be improved considerably even before its full implementation. The first two years of the BTS operation should be regarded more as a trial run where plenty of rooms are provided to fine-tune the newly installed system. Only when all the stakeholders are willing to allow a degree of changes to the system, can it be given a proper chance to survive and then ultimately, to prosper.

It could be said that, the two Malaysian BTS models are heavily influenced by the Australian, UK and Singapore BTS housing delivery systems. By leaning itself towards the more established systems practised in these three countries, it is clear that the Malaysian government wants to minimise the upheaval the new system might cause to the Malaysian property development industry. This safe strategy can actually work, but it should be noted that, all the parties involved must not be lulled by the false sense of stability in the newly implemented BTS system. The system must be allowed to evolve and grow within the unique Malaysian economic realms. Some elements

Table 3: Groups of BTS Models by Other Countries and their Characteristics

Group	Model	Country	Characteristics
A	100% BTS	UK, USA, Thailand, Netherlands	• Purchasers buy the house only when the house is fully completed. • There will be no collection of payment from purchasers and house buyers before completion of the housing project. • Developers seek financing from banks and/or use their own fund to finance their project. • The development process involves an element of risk which is borne by the developers and banks.
B	BTS Variant (10:90, 15:85, 20:80, 30:70 and 40:60)	Thailand, Singapore, Australia, Taiwan, Netherlands, UK, US	• The purchasers pay deposits ranging from 10% to 40%. • The deposit aims to lock in the purchaser at the beginning of the development for housing process. • The balance will be paid after the houses are completed. • Developers finance their project with their own fund and/or financing from the banks besides using the purchaser's deposit.
C	Build and Sell	China, Hong Kong, England (UK)	• Developers build the house first and in the certain required time, they can start selling the houses.

of the originally proposed models might need to be dropped along the 2-year bedding-in period, so that the system can succeed and accepted by all parties.

The Malaysian BTS models do not actually deliberate on the incremental value of properties from its construction until completion. This issue had been the bone of contention for some property developers who opposed the implementation of BTS. It is a normal practice for property developers to actually raise the price of their property development within weeks or months from the initial soft launch. If they get an overwhelming response to their proposed projects, they will increase the price accordingly. This is more so when the project is nearing completion and people can already see how the development is going to look like after its full completion. Hence, if the price of one double-storey terraced house is RM200,000 at the initial launch of the project, it could be sold off by the same developer to the subsequent buyers at RM220,000 in later stage of the successful project. By sticking to this practice, the property developers will not lose out on the capital appreciation during the course of their projects. The UK experience on this matter as discussed earlier under the Group A BTS model is that, the developers should be given the opportunity to profit from the capital appreciation even before the project completion. Initially, it worked pretty well in the UK's free economy system where everything that is put on sale is subject to the demand and supply mechanism. But lately, amidst the property boom in the UK, the issue came to head when there are so many incidences of 'gazumping' – a situation whereby a late buyer got their offer of a better price accepted by the developer and consequently left the original buyer without a house unless he is willing to match the prevailing market price. This vicious offer and counter-offer practice between buyers and developers even before the project is completed can lead to a overheated property market, especially during the property boom time. To tackle this case even before it happens in the Malaysian BTS system, the government needs to draw a line on the time any property deal must be locked in. A mechanism to allow the property developers to profit from capital appreciation must also be put in place so that they will not suffer from economic injustice.

Another interesting point that had been discovered in the literature review is the use of market research in the UK and Australia. The property developers in these two countries are adept in using market research techniques, enabling them to predict the house buyers' response to their product offering. For them, the prediction of customer behaviours has almost become a science. Gone are the days when they could just base their property development decisions on just 'hunches'. Because of the sophisticated use of these market research techniques, property overhang is not as widespread as in Malaysia. This is a massive achievement since many of their property developments are delivered by BTS system. It is clear that, the Malaysian property developers should take a leaf out of their counterparts' books so that they could target their market with intelligence and planned actions. The arrival of the BTS system could inadvertently, encourage the Malaysian property developers to utilise market research techniques in their project planning.

BTS AND STB COMPARED

Both BTS and STB have their own unique characteristics that could appeal to the house buyers, developers, and financiers. It is not true to claim that all house buyers would prefer BTS over STB. From the discussions earlier in this paper, the BTS housing delivery might come at a premium because of the higher cost of financing to the developers. This could be passed onto the buyers. Because of this, a significant number of house buyers might prefer to buy properties through STB system from reputable companies. The following table summarises the main differences between BTS and STB.

CONCLUSIONS

This article focused on BTS models that were proposed in Malaysia and all the other models used in other countries. Two variants of the proposed models, i.e. 100% BTS and 10:90 BTS were described. The paper then explored BTS models implemented in other countries. The models were classified into three groups based on the similarity of their characteristics. Group A is 100% BTS Model, Group B is Variant BTS Model while Group C refers to Build and Sell (BAS) model. Discussions were then centred on the strengths of the BTS models applied in other

Table 4: Comparing BTS with STB

Factor	BTS	STB
Price to the house buyers	Likely higher price because of higher lending costs to the developers	Likely lower price
Tangibility of product before purchase	The buyers can view the house in situ	Only model houses can be viewed during S&P
Quality of workmanship	Likely higher quality because developers want the buyers to complete their purchases	Likely lower quality
Waiting period	Shorter time period, could be less than 3 months	Longer, up to 2 years
Financial security (buyers)	Higher	Lower
Financial risk (developers)	Higher	Lower
Freedom of choices to the buyers	Theoretically, buyers can 'shop' around for better houses	Less choices because everything is shown as perfect in sells brochures
Capital appreciation during construction	No, everything is locked in at purchase time	Yes

countries. These strong elements of the foreign BTS can be harnessed into the Malaysian BTS to make it more acceptable to all the property development stakeholders.

In Malaysia, a few developers has adopted the 100% BTS model. Those are Mah Sing Properties, Hasrat Angkasa Sdn.Bhd, Bandar Tasik Semenyih Group, Worldwide Holdings Berhad and a few others. It is important for other developers to learn from the experience of these pioneers.

The 100% BTS and 10:90 variant models proposed by HBA were finally approved by the government to co-exist with the current STB concept. The BTS itself will be subjected to a two-year review after the government recently gave an "approval in principal" for it to co-exist with the STB concept. However, these BTS pioneer projects are relatively small in terms of the total number of housing units to be built in the near future.

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MODELLING INTERACTION OF LOCATION INFLUENCE WITH RENTAL VALUE ON COMMERCIAL PROPERTIES USING SPATIAL STATISTIC TECHNIQUES

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Abstract

The Multiple Regression Analysis (MRA) approach has been widely used to identify the location factor and perform value prediction of the property. However, this approach is subjective, choosing which measures to include in the model or in defining the measures itself. A possible alternative to this approach is to integrate the MRA with spatial statistic techniques to produce a better result. In this paper, the spatial relationship between the rental value of the commercial properties which is the shop house and location influence is explored using geographically weighted regression (GWR). GWR attempts to capture spatial variation by calibrating a multiple regression model fitted at each shop house in localities, weighting the location factors from the subject shop house which needs to be determined. GWR produces a set of parameter estimates and model statistics for the shop houses in the study area of Johor Bahru, Malaysia. It is evident that the GWR model provides useful information on rental value caused by surrounding factors. The GWR model was also compared with the traditional model, which is the ordinary least squares (OLS) model, to show the differences of the two models. The parameter estimates and model statistics of the GWR and OLS model were then mapped using visualisation tools, such as Geographic Information system (GIS). Consequently, the influence of site location, bank facilities, shopping complexes and others can be evaluated, tested, modelled, and readily visualised. In this study, the result shows that the bank provides a higher significant spatial variation towards the rental value of the shop house than the other influence factors. GWR is a useful tool that provides much more information on spatial relationships to assist in model development and further our understanding of spatial processes.

Keywords : *Geographical Weighted Regression (GWR), Ordinary Least Squares (OLS), Geographic Information System (GIS), location, rental value, shop house.*

1.0 Introduction

Mostly, ordinary least squares regression (OLS) has been used to estimate the value of the property based on the location influence factor (Scott, 1988; Wyatt, 1997; So et al., 1997). Although some researchers have improved the regression models, these still lack explanatory power particularly on why property value in certain location is over-valued or under-valued based on neighbourhood factor (Gallimore et al., 1996; Theriault et al., 2003).

In this paper, we introduce the GWR to determine the rental value of the commercial property within Johor Bahru. We applied this local modelling technique to a relatively simple linear regression model of shop houses. The improvement of GWR over OLS in model fitting is tested and compared. Then, the location influence, which gives the most significant effect on spatial variation, is illustrated using ArcGIS and WinSurfers software.

2.0 Influence of Location Factor on the Shop House Value

Location is an important factor in determining the values of properties. The influence of location may be in terms of accessibility to shopping complex, parks, petrol station, public facilities and work place; road traffic, noise and business; neighbourhood amenities; safety issues such as level of crime and security; to mention a few (Kahn, 1963; Gallimore et al., 1996; Rozana, 2004).

However, for commercial property, the location factors may be different to that of residential. This is illustrated by Wyatt et al. (2003), location factor that influence commercial property are accessibility to the market place, proximity to suppliers of raw materials and important nodes such as railway stations, car parks and open spaces. These results show that easy access to parks significantly influences residential property but not commercial property. Meanwhile, parking spaces greatly influence the value of commercial property but rarely for residential property.

Providing variety types of location factors will improve greatly the model to estimate property value (be it price or rental), rather than just putting it as only one factor in the property valuation model. This however, is not easy, as modelling locational factors has proved difficult because of the wide range of spatially defined attributes, which may affect value and maybe at only a particular time and location. This has been discussed by many researchers to determine the best locational factors, including their measurements, and how they influence property values.

Some argued that house prices are determined not only by accessibility but also by the neighbourhood quality or the environmental attributes of the location (Stegman, 1969; Pollakowski, 1982; and McCluskey et al., 2000). There are also researchers who employ measurements in measuring location such as using the type of transport, time taken per trip, and transportation cost such as Theriault et al. (2003). Moreover, Gallimore et al. (1996) had stated out that locational influences on the property value may arise from any number of sources and with this, the authors believe that different types of relevant location factors is necessary to be examined if an accurate property valuation model need to be produced.

3.0 GWR and Regression Analysis

Geographical Weighted Regression (GWR) is a modelling technique for local spatial analysis. This technique was originally proposed by Brunsdon et al., (1996; 1998).

This technique allows local, as opposed to global spatial models to be calibrated and interesting variations in relationships to be measured and mapped. Stewart Fotheringham, Martin Charlton and Chris Brunsdon of the Spatial Analysis Research Group and Department of Geography at the University of Newcastle, UK are the pioneers in this field.

In this study, we chose the normal linear regression model (i.e. ordinary least squares

(OLS)) to explore spatial relationship between rental values with location factor. The formula can be stated as follows:

$$RV = B_0 + B_1X_1 + B_2X_2 \dots B_nX_n$$

Where, RV is the estimated rental value for each shop house which is calculated as the sum of B_0 (constant) and location influence variables ($B_1X_1 \dots B_nX_n$).

However, in GWR, the inclusion of the data coordinate, which is the longitude and latitude, has rewritten the original model as follows:

$$RV = B_0(u_i, v_i) + B_1(u_i, v_i) X_1 + B_2(u_i, v_i) X_2 \dots B_n(u_i, v_i) X_n$$

where (u_i, v_i) denotes the coordinate of the i th point in space and $B_n(u_i, v_i)$ is a realization of the continuous function $B_n(u, v)$ at point i .

The (u, v) s are typically the locations at which data are collected. This allows a separate estimate of the parameters to be made at each data point. The resulting parameter estimates can then be mapped. Various diagnostic measures are also available such as the local standard errors, local measures of influence, and a local goodness of fit. If the (u, v) s are at the mesh points of a regular grid, then the spatial variation in the parameter estimates can be examined as a pseudo-surface. The parameters may be tested for 'significant' spatial variation. The outputs from the software provide a convenient linkage to mapping software which is ArcGIS (National Centre for Geocomputation (NCG), 2006).

Based on Fotheringham et. al., (2002), the GWR weighting is actually based on geographically weighted mean which is the starting point for thinking about geographically weighted statistics. The formula for arithmetic mean is:

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

This is simply the sum of the values making up a batch of numbers divided by the size of

the batch. More generally, we can consider a weighted mean:

$$\bar{x} = \frac{\sum_{i=1}^n w_i x_i}{\sum_{i=1}^n w_i}$$

where the w_i s are the weights. Here we multiply each value by its weight, and divide by the sum of the weights. In the case that each observation has a weight of unity, then this formula and the one above are equivalent.

In many cases the weights are integers, but they may also be non-integer numbers. In this case, we can use weights generated from the same geographical weighting scheme that we have used for geographically weighted regression. Rather than being a whole-map statistic, a geographically weighted mean is available at a particular location, say, u . Thus the formula for a geographically weighted mean at location u is:

$$\bar{x}(u) = \frac{\sum_{i=1}^n w(u)_i x_i}{\sum_{i=1}^n w(u)_i}$$

$W(u)_i$ is the geographical weight of the i th observation relative to the location u . The weights may be generated using a fixed radius or an adaptive kernel.

By analogy the local geographically weighted variance is

$$s^2(u) = \frac{\sum_{i=1}^n w(u)_i (x_i - \bar{x}(u))^2}{\sum_{i=1}^n w(u)_i}$$

and the locally weighted standard deviation is the square root of this. Notice that the mean here is the geographical mean around point u and NOT the global mean of the data.

The GWR software currently supplied (GWR3.0) allows the user to compute geographically weighted means, variances, and standard deviations for a set of input data, and for either a fixed or an adaptive kernel.

4.0 Methodology and Data

Ninety observations of ground floor shop house rental values for the year 2004 through 2005 were collected from 29 localities within the Johor Bahru area as shown in Figure 1. Meanwhile, seventeen location factors such as site location, road type, road direction, car park, school, university, central business district, industrial area, construction site, shopping centre, sport centre, recreation centre, office area, bank, bus or taxi station and view of surrounding were collected for each of the 90 observations. Correlation analysis was carried out to identify the multicollinearity between the 17 independent variables of location factors. The result indicates that the factors can be considered independent.

The attribute data for the location factors is coded using "Dummy" or variable's indicator (e.g. 1 or 0) that depicts the impact of location

on the properties. For example, the code "1" represents the property that receives the impact of the location factor, otherwise, code "0" will be given. So, the more the locational factors near the shop house, the more the influence it will receive. This means that no measurement tools such as buffer or network analysis available in GIS was used to construct the spatial variables involved in this study.

The tests used in this study are such as F test to measure the overall goodness of fit of the model, the spatial autocorrelation test to determine the spatial variation of the model and finally, Monte Carlo test was conducted to find out the significance of the spatial variation in each local parameter estimate from the model.

5.0 Results and Discussion

Table 1 compares the results from the OLS and the GWR. The estimation is been done using a computer software program which is SPSS 14.0 for OLS analysis and GWR 3.0 for GWR analysis. Detail information on both of this software is available at the website www.spss.com and www.ncl.ac.uk/geography/GWR.

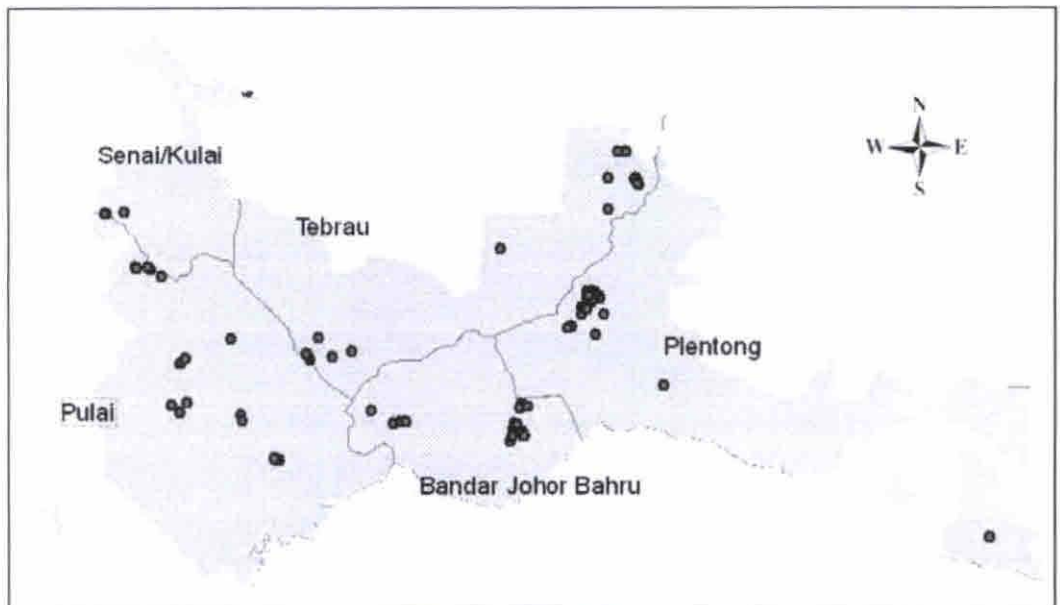


Figure 1. Area of Johor Bahru with the location of the 90 observations data

Table 1. Comparison of the statistics of OLS and GWR models

	OLS	GWR
Residual sum of squares (RSS)	18740127.350	13910118.641
Coefficient of Determination (R ²)	0.596	0.700
Adjusted r-square	0.494	0.564

Based on the above results, it can be said that the GWR is better than the OLS model, in which the coefficient (R²) has increased from 0.596 to 0.700 and the RSS has decreased from 18740127.350 to 13910118.641. The R² value can be considered high and acceptable based on Tang (1997) and Carl, D. et. al. (1994) who suggest R² of 0.600 and above is acceptable.

Table 2 shows the results of an ANOVA in which the OLS model is compared with the GWR model. The ANOVA tests the null hypothesis that the GWR model represents no improvement over a global model.

The F test was conducted to measure the contribution of each independent variable, measuring the overall goodness of fit or

correctness of the model when all the variables are considered simultaneously. The rule is that the higher the value of computed F value, the better the model will be (Gujarati, 1995). The test reveals that the value of computed F (2.22) is higher than the value of theoretical or critical F (1.75) based on the F statistical table. The F test suggests that the GWR model is a significant improvement on the global model for the Johor Bahru data.

Moran's I test indicates that positive spatial autocorrelation occurs if residuals of the same sign cluster together while negative spatial autocorrelation occurs if residuals of different signs cluster together (Lee and Wong, 2001). Figure 2 shows how the spatial variation patterns are formed.

Table 2. ANOVA of the GWR and OLS model

Source	SS	DF	F
OLS Residuals	18740127.4	18	
GWR Improvement	4830008.5	9.74	
GWR Residuals	13910118.6	62.26	2.2183

*SS = Residual Sum of Squares (RSS)
DF = Degree of Freedom

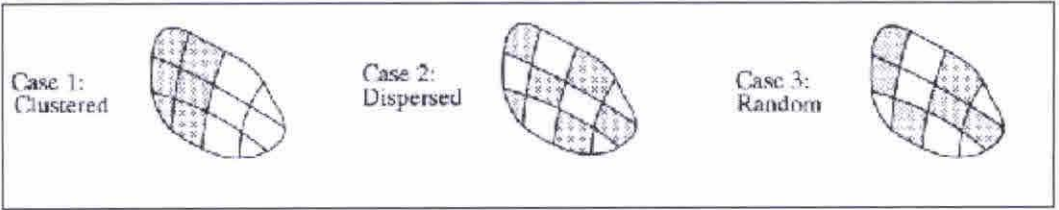


Figure 2. Spatial variation form (clustered, random or dispersed)

By using the Moran's I test in ArcGIS 9.2 software, we identified the spatial autocorrelation based on the residual from both of the model. The result is shows in Table 3.

Table 3. Moran's I spatial autocorrelation for OLS and GWR

	OLS	GWR
Moran's Index	-0.04	-0.07

Note: The Moran's I spatial autocorrelation is based on the Inverse Distance spatial relationship with Euclidean Distance method and spatial weights are standardized by row.

Based on the above results, the OLS model shows that the spatial distribution is not evident as there are no obvious patterns, clustered or dispersed, to the residuals which appear random across the study area. This means, there is no significant spatial autocorrelation from the OLS model. The GWR model however, shows that the pattern is somewhat dispersed, which could be

due to random chance. This finding is actually taken from the analysis output's script in ArcGIS 9.2.

The differences of spatial variation between GWR and OLS can be seen if we compare maps of the residuals from the two models. Figure 3 and 4 show the GIS visualisation of the residuals for OLS and GWR in 3D presentation using WinSurfers software.

From the maps, the green coloured pattern shows the minimal residual between -100 to 100, which can be acceptable as the differences are not high. The high negative (yellow) and high positive (orange) residuals however, show that the rental value is under predicted and over predicted respectively. The spatial variation from GWR illustrates a much more dispersed pattern and this may be caused by the variety of location factor.

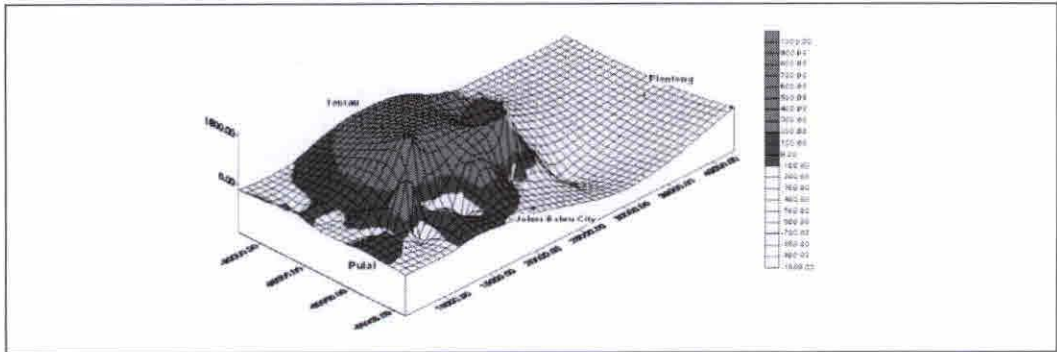


Figure 3. 3D residuals visualisation from the OLS model

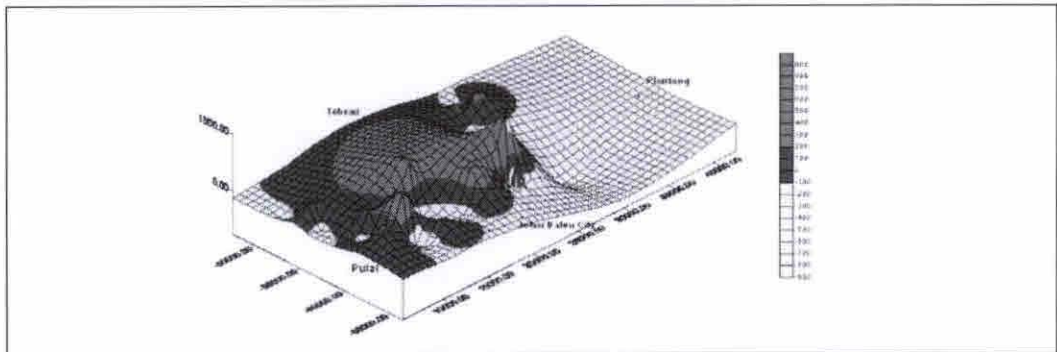


Figure 4. 3D residuals visualisation from the GWR model

Finally, a Monte Carlo test is conducted to determine the significance of the spatial variation in each of the local estimates from the model. The result of Monte Carlo test obtained by using the GWR software is as in Table 4.

parameter estimates using GIS interpolation for 3D visualisation purposes.

The GIS visualisation above shows that the value is high in the west side (Pulai) of the study area

Table 4. Test for spatial variability of the GWR parameters

Parameter	P-Value	Significant
Bank	0.00000	Significant at .1% level
Site Location	0.05000	Significant at 5% level
Intercept	0.33000	Not Significant
Road Type	0.38000	
Road Direction	0.89000	
Car Park	0.15000	
School	0.85000	
University	0.95000	
Centre Business District	0.38000	
Industry	0.29000	
Construction	0.71000	
Shopping Centre	0.56000	
Sport Centre	0.52000	
Recreation Centre	0.72000	
Office	0.98000	
Post Office	0.67000	
Bus/Taxi Station	0.27000	
Surrounding View	0.13000	

Note: Test based on the Monte Carlo significance test procedure due to hope (1968)

The results of a Monte Carlo test on the local estimates indicate that the GWR model fits significantly ($\alpha = 0.01$) for Bank. This means that there is significant spatial variation in the local parameter estimates for the variable Bank. The spatial variation for the other variables is either of no or low significance and in each case there is a reasonably high probability that the variation has occurred by chance. Based on this test, we can concentrate on the variable Bank for which the local estimates exhibit significant spatial non-stationarity. It is interesting to note that these results reinforce the conclusions reached above with the informal examination of local parameter variation for the variable Bank. Figure 5 demonstrates the results of the local

in which the influence of the bank is high. This is probably due to the bank's high influence on the community centre as the number of banks over there is still average which is 22 banks, while, in the CBD (Johor Bahru City and Tebrau) and industrial (Plentong) area, there is less influence of the bank as the number of banks in that area is already high which is about 32 and 31 banks respectively.

6.0 Conclusion

In summary, this study has shown that GWR can produce a set of local estimates for the model coefficients at each point in the defined

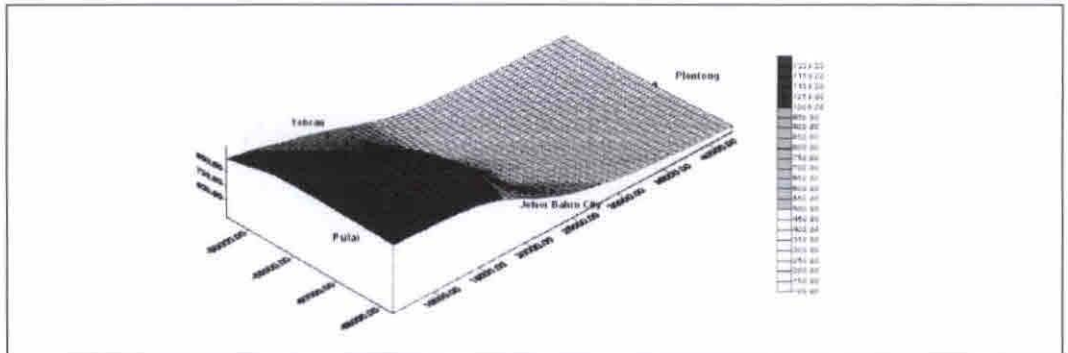


Figure 5. 3D visualisation of local estimates of the bank parameter

geographic area. These model coefficients can be visualized using tools such as GIS, which can highlight the sub-areas within the localities where rental value is higher or lower than in other sub-areas. This indicates that GIS enables researchers to use GWR to explore the spatial variation of the relationships between variables under investigation. Research can subsequently incorporate the identified geographic patterns into a formal modeling procedure.

This study however, was applied without using any measurement tools of GIS analysis such

as buffer or network analysis to determine the location influence of the shop houses. Other than that, the weight of the location factor also needs to be determined as we believe that its incorporation can improve the model. Furthermore, the ninety observations data may seem too little and may affect the result especially for the non-significant parameters estimated in Monte Carlo test. Hence, the observations data should be increased in future study to produce a much more accurate result.

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REAL ESTATE EDUCATION IN MALAYSIA: STUDENTS PERCEPTIONS AND INDUSTRY REQUIREMENTS

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Abstract

During recent years, the issue of appropriacy and methods of real estate education has received an unprecedented level of attention, especially from academics and professionals. Universities are being challenged to rethink their course and programme offerings to bring them in line with the changing demands of the industry and globalization and the emergence of real estate market. It is imperative to bring about the assessments by students and industry to assist the academic in improving the current curriculum development and overall programme. The objectives of this study are threefold; firstly, to study the perceptions of the real estate professions and preferred future employment of the final year undergraduate students of Estate Management Programme at University of Malaya; secondly, to seek the graduates' perceptions on whether the programme has prepared them for a career in the real estate industry; and thirdly, to determine the extent to which University of Malaya's estate management graduates matched industry expectation. The main research method employed is by gathering quantitative data by separate literature-based questionnaire surveys on final year students, graduates and employers. The research found that majority of students preferred to enter into property management or facilities management despite being primed for careers in valuation. Graduates rated finance and building technology as most lacking in syllabus content and relevance respectively. The industry was of the opinion that graduates of the Estate Management course suffer from low leadership skills, skills to carry out tasks and inability to work with minimum supervision.

Keywords: Real Estate Education, Perception, Graduate Skills, Estate Management

Introduction

Real estate courses are undergoing a radical change from which multidisciplinary aspects form the professional demands of the built environment industry. No longer may an individual surveyor be able to display a distinct skill in a particular area as each member of the built environment professional is supposed to display the knowledge and skills demanded by the globalised environment and industry. (Yasmin & Haniza, 2004).

The term "Real Estate Programme" as used in this paper refers to programme aimed at providing education and training in valuation and property management offered at tertiary level. Formal education in real

estate has been established in Malaysia since 1967 with Universiti Teknologi Mara's diploma programme in real estate (Mohd Ali & Alias, 2006). At present, four Malaysian universities are offering degree in real estate programme, namely University of Malaya (UM), Universiti Teknologi Malaysia (UTM), Universiti Teknologi Mara (UiTM) and University of Tun Hussein Onn Malaysia (UTHM).

During recent years, the issue of appropriacy and methods of real estate education has received an unprecedented level of attention, especially from academics and professionals. Debates have been raised within the academics and the professional

in different occasions. Who best to evaluate the quality of the real estate education curriculum and teaching, other than the clients themselves, i.e. the students, graduates and prospective employers? It is imperative to bring about the assessments by students and industry to assist the academic in improving the current curriculum development and overall programme.

As such, this study surveys the perceptions of undergraduates of Estate Management Programme at University of Malaya with regards their future employment and career preparation. The study is also to seek the graduates' perceptions of the quality, sufficiency and relevance of the course curriculum/syllabus as well as the skills and competencies acquired throughout their degree courses and whether the degree has prepared them for a career in the real estate industry. In addition, this paper is also to determine whether estate management graduates from University of Malaya were meeting the expectation of the industry.

Literature Review

Trend in University Education

Searching for better performance in public sector, fashionable terms such as "excellence", "increasing competitiveness", "efficiency", "accountability", and "devolution" have been introduced and different strategies such as internal audit, quality assurance, performance pledges, management-by-objectives have been adopted to try to improve the efficiency and the effectiveness of public services (Sankey, 1995; Pollit, 1986; Aucoin, 1990). Education being one of the key public services, is not immune from the tidal force of "managerialism" and the prominence of "economic rationalism" (Mok, 1999).

Being affected by the strong tide of managerialism, there has arisen now a different use of language in the educational sphere. Students are no longer students but rather are clients or customers; their admission is about access instead of selection. The curriculum design encompasses cores and options from which students as customers can choose, rather than a fixed set of subjects. On the management front, a shift from collegial to managerial forms of university

governance has been widely recognized as a "global" trend (Altbach, 1994; Goedegebunne et al., 1994).

Seeing students as consumers, faculty members try to satisfy their expectations. Several business professors stated that, "a faculty member can forget the idea of [acquiring] tenure if he does not please the students who evaluate him". Faculty share the view that students are increasingly seeing university education as a path to job procurement rather than as an occasion to deepen their knowledge of the surrounding world (Stromquist, 2007, pp 89).

"Internationalisation" and "globalisation" became key themes in the 1990s, both in the higher education policy debates and in research on higher education (Enders, 2004, pp 361). As technological innovations relentlessly compress the world in space and time and our economies become rapidly impelled into the highly competitive environment of global market, educational institutions are being challenged to follow suit. At the university level, globalisation is manifested by what is termed by insiders as "internationalisation", a subtle response that not only affects academic programs, faculty, and students, but also creates new administrative structures and privileges (Stromquist, 2007, pp 81). In practice, internationalisation covers a wide range of services, from study abroad and greater recruitment of international students, to distance education and combinations of partnership abroad, internationalized curriculum, research and scholarly collaboration, and extracurricular programs to include an international and intercultural dimension (Albatch, 1998; Biddle, 2002; de Wit, 2002).

Internationalisation is certainly reflected in the higher education policy of Malaysia, the most recent evidence being the *National Higher Education Strategic Plan* launched in August 2007. One of its seven thrusts include "intensifying internationalisation" Critical implementation mechanisms and schedules are spelt out in another policy document, the *National Higher Education Action Plan 2007-2010*, the first in a series of shorter-term plans for each of the four phases of the transformation – laying the foundation; strengthening and enhancement; excellence; glory and sustainability.

Parsa (2000) in his research funded by RICS, revealed that both real estate academics and professionals

agreed that there is a need for enhanced education and knowledge to be prepared for the new challenges of globalisation. Butler et al (1998) highlighted two prominent issues concerning real estate curriculum. The first issue concerns the *knowledge and skills should be taught* to the student whilst the second concerns *how the curriculum should be taught*.

Fraser et al. (1994) considered the 'market needs' in term of professional practice, personal and managerial skills and on the other hand the "intellectual requirements" including economics, law, financial mathematics, investment, valuation, planning, building and others.

Hutcheson (1993) in his research concluded that in the USA real estate is taught in school of business and these schools prefer to concentrate on finance, management, operations, marketing and accounting. These business schools are ignorant of design, site analysis and city planning. However, he added that in other countries, real estate schools within the faculties of building and architecture are viewed as slow in absorbing new finance and quantitative business techniques.

Evolution of the Real Estate Education in Malaysia

The real estate profession in Malaysia originated with the establishment of the valuation division of Ministry of Finance which mainly dealt with statutory valuation, now grown into the full-fledged Valuation and Property Services Department (VPSD). Universiti Teknologi Mara (UiTM) commenced its diploma in real estate in 1967 whilst the Universiti Teknologi Malaysia started the real estate degree in 1973. More recently, University of Malaya's real estate degree programme began in 1996 whilst Universiti Tun Hussein Onn Malaysia started its Bachelor in Real Estate Management in 2001. These four are the main institutions of higher learnings offering real estate programmes in Malaysia.

From the emphasis on providing professionals for VPSD, the real estate education in Malaysia has evolved to reflect increasing corporate participation in the real estate industry (Mohd Ali & Alias, 2006). Realising the need to establish a forum where common goals and objectives in real estate education may be discussed, a small group of academics

from UTM, UiTM and UM met in 2004. As a result Real Estate Educators and Researchers (REER) of Malaysia was formed and become a regular forum and meeting among institutions including UTM, UiTM, UM, INSPEN, UTHM, USM and National Land Institute (INSTUN) (Mohd Ali & Alias, 2006). This meeting of academics is hoped to enhance the real estate education and profession.

The University measures the quality of the teaching, while the quality of the curriculum is measured by the industry. The professional bodies associated with property industry in Malaysia are the Board of Valuers, Appraisers and Estate Agents Malaysia (BOVAEA) and the Institutions of Surveyors Malaysia (ISM). These two bodies are the major stakeholders in the University property course.

In Malaysia, a person intending to practice valuation, estate agency or property management must become a registered valuer or estate agent with the BOVAEA. In order to become a registered person, he must hold the appropriate University qualification, which the Bachelor of Estate Management from University of Malaya satisfies, and pass the Test of Professional Competence (TPC) set by the BOVAEA.

It is one of the requirements of the University Malaya's Quality Management System to conduct course evaluation before end of each semester. The feedback is used to improve the quality of teaching of the lecturer/lecturers concerned. Students are also encouraged to express their views using *MS ISO9001:2000* format on any issues or problems pertaining to the running of the Faculty/Department. This particular evaluation is based on three (3) main criteria which comprise students evaluations on course conducted, teaching and course delivery and facilities provided.

The Bachelor of Estate Management degree, University of Malaya

Ever since its conception in 1996, the Bachelor of Estate Management course at the University of Malaya has been designed to meet the requirements of BOVAEA and the industry. The programme has been designed with the incorporation of ideas and contributions from ISM and in accordance to the general structure recognized by the Royal Institution of Chartered

Surveyor (RICS). The quality of the course content is under regular scrutiny by these organisations. This is also to ensure that the content is kept up-to-date with any changes in the industry. The programme is a 3-year full time course, comprising 32 faculty courses and 9 university courses (Appendix I – List of Faculty Subjects). Graduates can proceed into a number of different property-related fields such as valuation, property management, estate agency, property development, research and consultancy.

The main objective of the estate management programme is to develop students' knowledge in valuation, investment and property management as well as employability skills such as communication skill, critical thinking, ethics and professionalism.

New student entry is via four paths that is Higher School Certificate (equivalent to UK's A'Levels), diploma, university foundation, and the Ministry of Higher Education matriculation. University of Malaya has reintroduced the pre-Built Environment Foundation programme recently after calling to halt the programme a few years back. This earlier streaming is seen to further enhance students' career direction as they will be exposed to the field earlier.

Programme planning and curriculum review are carried out every five (5) years. The curriculum review takes into account responses from various institutions and bodies. The Estate Management programme has gone through several review of its structure to suit the requirement of the Board of Valuers as well as the University of Malaya subjects. Currently the programme is undergoing its second curriculum review and the findings from this study will be considered as part of the improvement efforts.

Research Methodology

The survey of the current students (N=40) was undertaken during lecture times with 100% response rate. Questionnaire survey was distributed during lecture to final year Bachelor in Estate Management students who have spent almost three years at the University. The questionnaire consisted of three sections and took approximately 10 minutes to complete.

The graduate survey was carried out on randomly chosen graduates of years 2004 to 2007 (N=26). Access to respondents was assisted by the Faculty of the Built Environment's graduate database. Questionnaires were posted directly to graduates' employment offices.

The industry survey was sent to randomly selected employers of Bachelor in Estate Management graduates from University Malaya. Access to respondents (N=30) were assisted by the Faculty of the Built Environment's graduate database. The quality of the real estate curriculum can be measured by the industry. In order to produce graduates who are better prepared when entering the current working environment revising and changing real estate curriculum is vital. Butler et al (1998) implied that input sought from leading practitioners can assist in defining knowledge and skill goals. This can be done through survey of the industry and that by examining the current needs for the trained professionals (Butler et al, 1998; Black, 1996).

The questionnaires were formulated from the literature review and previous survey questionnaires.

The questionnaire for current students consisted of three sections. Section I captured the background of students including gender, reasons for pursuing the degree and their preferred area of postgraduate study. Section II mainly dealt with their career preference and the reason for choosing their preferred career. Section III explored why they did not choose the other professions. Preference and disinclination were measured based on ranking system of "1 to 3" or "1 to 4" (where "1" is Most Likely and "3" or "4" is Least Likely reason).

The graduates' questionnaire was divided into three sections. Section I surveyed the details of the ex-student's occupation including time taken to obtain employment and scope of work done. Section II listed all subjects in the syllabus and asked ex-students to rank their sufficiency (knowledge and skills learnt) and relevance (knowledge and skills used). Ranking is based on scales of "1 to 3" and "1 to 4" (where "1" is Not Relevant/Sufficient and "3" or "4" is Very Relevant/Sufficient). In Section III, graduates

were asked to rate how the study programme has contributed to their personal development by outlining those intrinsic or extrinsic skills that could be linked to the estate management course. The last section also contained an open-ended question where students were asked how the department may improve the current syllabus to meet the needs of the working environment.

In the employers' questionnaire, some background questions on the graduate and evaluator were asked to establish their relationship. The next section asked the evaluator to rate the graduates in terms of skills, character, knowledge and performance by using a "1 to 4" rating scale (where "1" is Poor and "4" is Excellent). The last section contained two open-ended questions whereby employers may comment on the quality of graduates and how the department may improve the current syllabus to meet the needs of the working environment.

FINDINGS AND DISCUSSION

Responses From Present Students

The survey found that nearly half (45%) of students preferred to pursue a career in the property or facilities management after graduating compared to

only 27.5% in valuation, 20% in real estate agency and 7.5% in academics.

Students were asked to rank the reasons for their career choice (Figure 1). Valuation was chosen mainly as a stepping stone before moving in another field. Most students perceived property or facilities management as an interesting career whilst academia was perceived as being a relaxed and stressless career. Students who chose estate agency were mainly attracted by what is envisaged as a well-paid career.

The reasons for not choosing valuation, property/facilities management, academia and estate agency were also surveyed (Figure 2). Unsurprisingly, valuation was seen as a dying career with poor pay whilst property or facilities management was not chosen mainly due to students' perception that they lack the skills required. Lack of knowledge and skills was also high on the most likely reason why students were reluctant to join academia. Predictably, most students felt deterred to join estate agency for being risky as payment is by commission.

Responses From Graduates

Majority of the graduates joined the private sector upon graduation with 69% in local companies and 19% in international companies. Their work

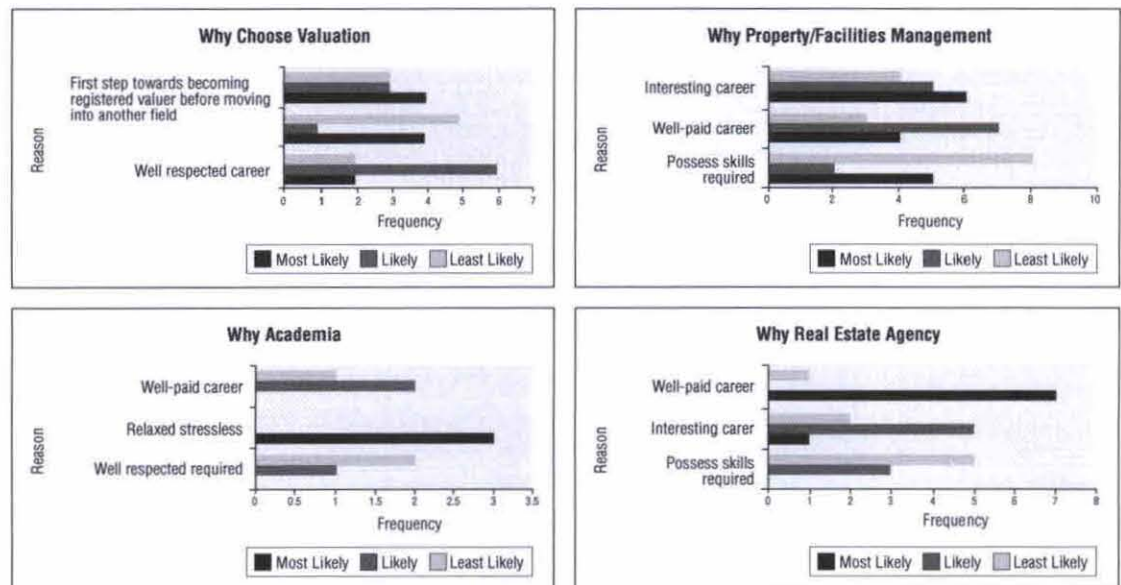


Figure 1. Reasons behind career preference

predominantly involves valuation (51%), followed by marketing (18%), with smaller percentages in other (research, agency, etc.) 16%, management (11%), and Rating/Law (4%).

Graduates were asked to rate the sufficiency and relevance of the syllabus and the response was summarised in Table 1. The graphic representation of the result is given by Figure 3. "High" and "Very High" scores were collapsed to represent sufficiency and relevance whilst "Not Sufficient" and "Low Sufficiency" displayed insufficiency and irrelevance of the syllabus. Graduates affirmed that all subjects were above average in sufficiency as mean score on High to Very High Sufficiency was 18.9 (73% of respondents). The subject that attained lowest sufficiency rating (combined Not Sufficient to Low Sufficiency) was Building Technology at 35%. As for relevance, the syllabus was found to be relevant with mean score of 19.6 (75% of respondents). Compared to sufficiency, graduates were more critical of the syllabus' relevance as more subjects were rated high on Not Relevant to Low Relevance. Subjects that were rated as having lesser degree of syllabus relevance in relation to job environment include Finance (38%), Land Economics (31%), Building Technology (27%) and Planning (23%).

Amongst comments in connection to the above matter are:

- More concentration should be given on legal matters pertaining to land acquisition i.e. actual cases on special property and local town planning.
- To widen syllabus on common area/maintenance of property i.e. M&E matters.

Graduates were asked which character building aspects that the programme had contributed to them (Figure 4). Most of them put High and Very High contribution for qualities such as self-confidence, oral communication skills, professional interpersonal relationship, teamworking, continuous learning, research skills and thinking skills. Mean score on Medium to High contribution was 19.78 (76% of respondents). Even though none rated Low contribution by the programme on any of the skills surveyed, a few obtained Medium-Low contribution by the programme. 35% respondents felt that there was only Medium Low contribution by the programme towards their leadership qualities. Likewise, 31% opined that there was only Medium Low contribution towards their oral communication and professional interpersonal relationship skills.

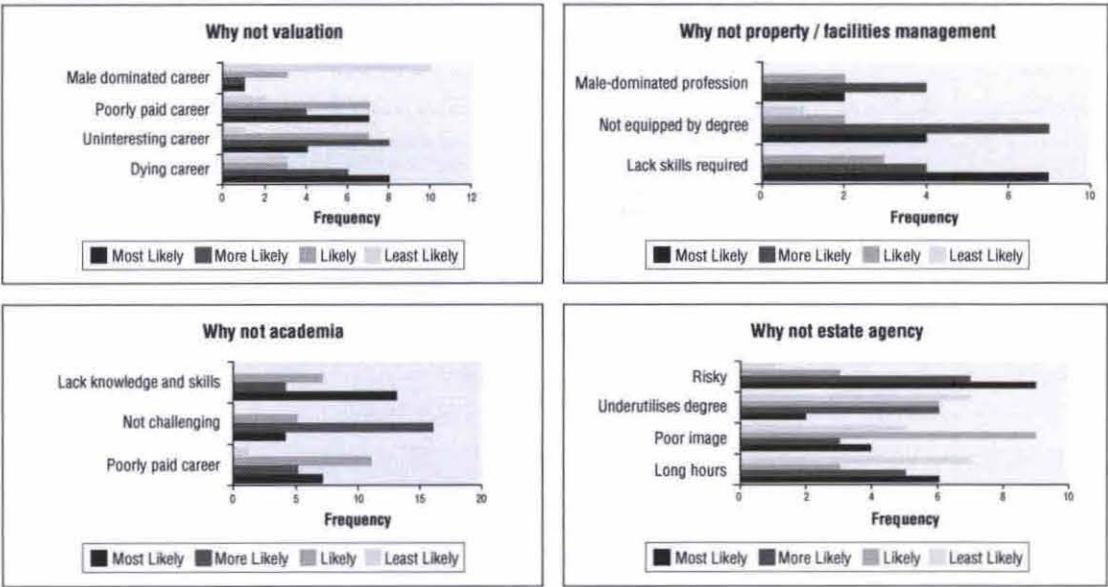


Figure 2. Reasons for not choosing career

Table 1: Sufficiency and Relevance of Syllabus

Sufficiency					
	Didn't Answer	Not	Low	High	Very
Valuation	4	0	0	11	11
Prop Law	3	0	1	13	9
Land Eco.	3	0	4	15	4
Finance	3	0	4	17	2
Planning	4	0	2	12	8
Bldg Tech.	4	1	8	11	2
Prop Mgmt	4	0	3	14	5
Prof Fields	5	0	4	14	3
Projects	5	1	2	14	4
Overall Educational Experience	4	0	2	16	4

Relevance					
	Didn't Answer	Not	Low	High	Very
Valuation	2	0	1	13	10
Prop Law	3	0	3	13	7
Land Eco.	4	0	8	11	3
Finance	4	0	10	11	1
Planning	2	0	6	11	7
Bldg Tech.	3	1	6	9	7
Prop Mgmt	2	2	1	13	8
Prof Fields	4	0	5	12	5
Projects	4	0	5	12	5
Overall Educational Experience	3	0	2	17	4

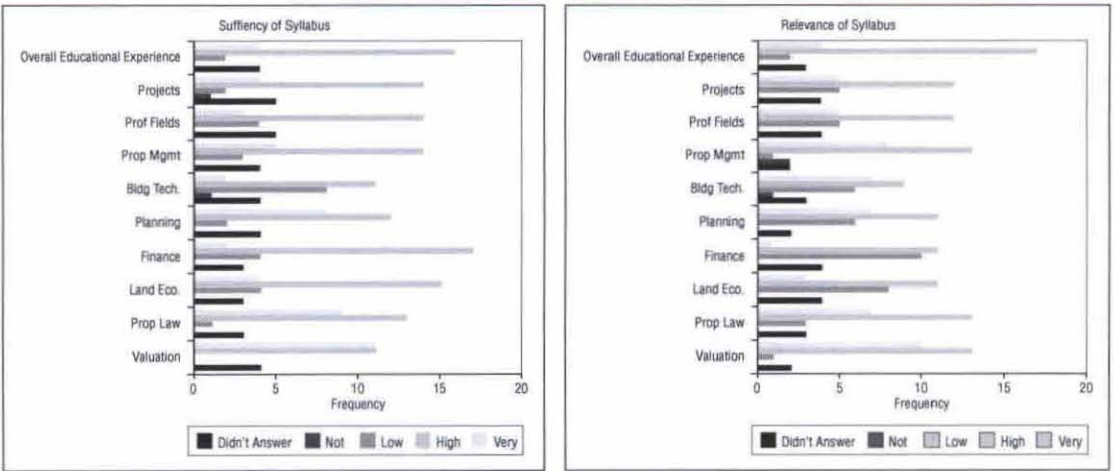


Figure 3. Sufficiency and Relevance of Syllabus

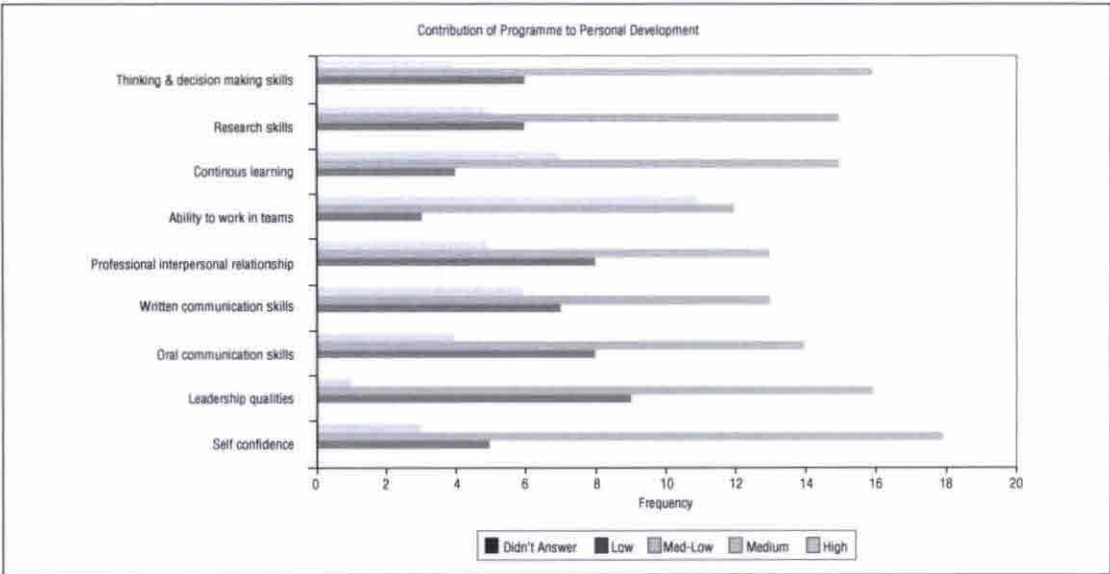


Figure 4. Contribution of Programme to Personal Development

Finally, almost all of the surveyed graduates would select this programme again if given the opportunity (96%) and would recommend this course to other potential students (92%). Comments on how to improve the programme reflect students' concern on their perceived lack of interface between theory and practice (see Table 2 : Graduates' Open Opinion).

Responses From Industry

In some areas, UM graduates had high Excellent performance ratings, particularly in showing enthusiasm towards completing tasks; being responsible in carrying out duties; possessing positive attitude and values and having good teamwork. In all sixteen areas of soft and hard skills, the Good performance mean score was 19, indicating

that graduates who were surveyed were rated above average by their employers. The detailed assessments of employers on the graduates for both hard and soft skills are available in Figure 5.

More importantly, the industry indicated three areas of concern, based on their relatively high rating of "Poor" to "Average" performance as leadership skills, skills to carry out tasks and working with minimum supervision (Table 3). These areas fetched high scores in Poor to Average compared to fifteen other areas surveyed.

Industry Comments

The industry was asked to propose on how the Department of Estate Management, Faculty of the

Table 2: Graduates' Open Opinion

"Need more experienced people from the field"
"Employ more experienced lecturer"
"From time to time, communicate with the private sector"
"Maybe can ask (sic) some experienced professionals to give talk or have discussion with the students, give them an idea of the real working environment"
"Invite more outside lecturer or relevant professional to give extra talk/lecture for the students"
"Need good relations with industry/company"
"More practical work (assignment) to expose the student in reality world (sic)"
"Having practical training in all the three year (sic)"

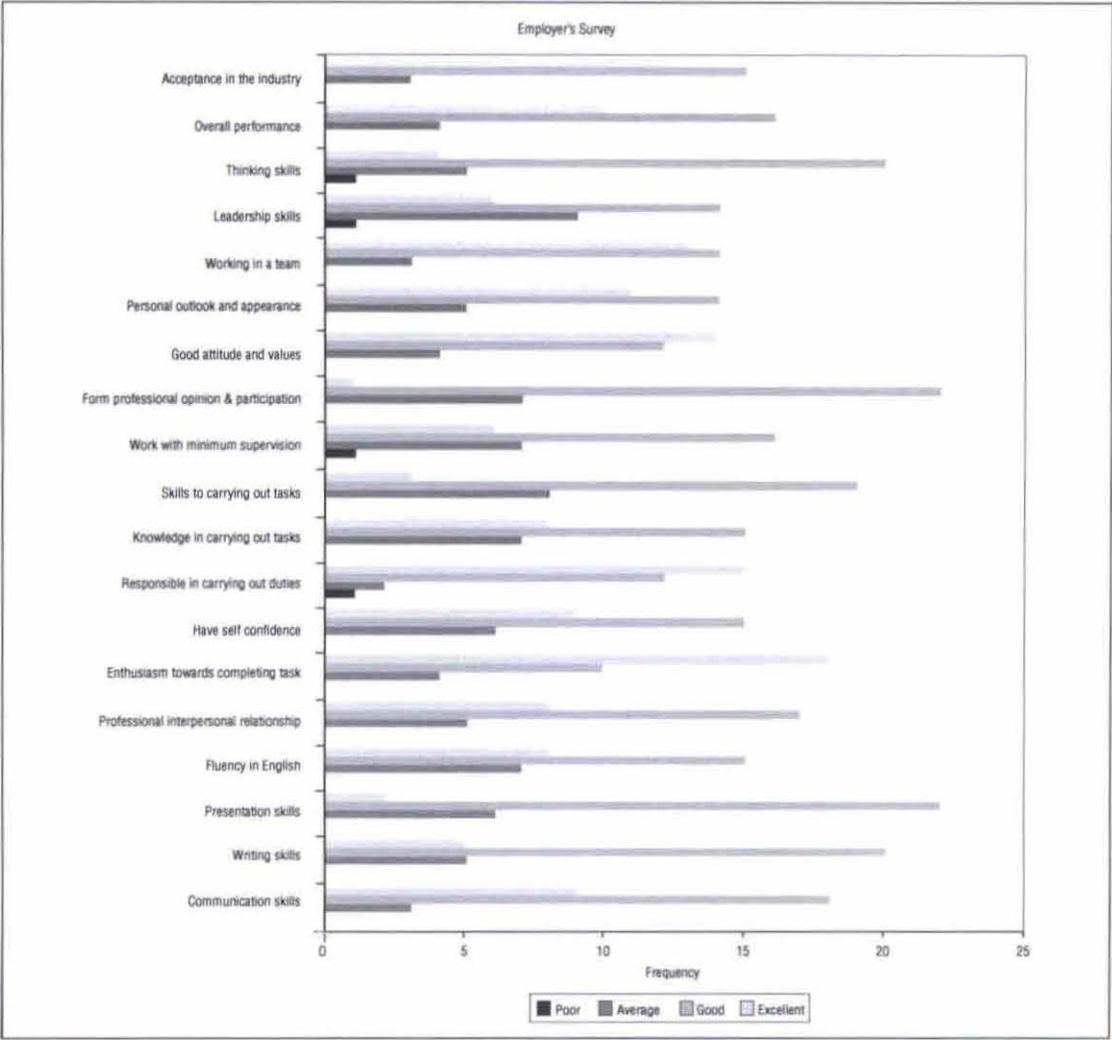


Figure 5. Employers' Assessment on Graduates

Table 3: Areas rated highly as having Poor to Average in performance

Item	% graduates
Leadership skills	33
Skills to carry out tasks	27
Work with minimum supervision	27

Built Environment can improve the current syllabus to meet its current needs. Summary of proposals (Table 4) was divided into hard skills, soft skills and other. For improvement of hard skills, it was suggested by the industry for longer industrial training period, wider ICT base and strengthening valuation techniques. Soft skills may be improved by concentrating on students' presentation and communication skills. To keep the teaching abreast with actual development in the field of real estate, it was proposed for the department to build networking with government-based research institution and update on current news relating to property development, trends and issues particularly in prime locations. Some samples of industry's comments are tabulated in Table 5.

management instead of valuation and their preference is supported by current occupation trend. The economic principle of scarcity of resources demands efficiency in its distribution so as to avoid wastage. It is imperative, however, that the persistence of this trend is ascertained.

Building Technology was found as a subject being unsatisfactory in syllabus content sufficiency whereas Finance, Land Economics, Building Technology and Planning were indicated as lacking in relevance to the profession. The above findings suggested that focus should be given to fortify Building Technology for two reasons. Firstly, present students showed preference to enter into property management or facilities management

Table 4: Industry Suggestions to Enhance Degree Programme

Hard skills	• Period of industrial training to be extended from 3 months to 6 months so that students are able to learn more. • Knowledge of ICT will be very useful in this changing world environment. • To strengthen Mass Valuation Techniques, Valuation of Shopping Centres and Office Complexes and Business Operation/Management subject.
Soft skills	• Strengthen students' skills in presentation. • Improve students' mastery of the English language communication skill.
Other	• Build networking with government-based research institution. • Update on current news relating to property development, trends and issues particularly in prime locations.

Table 5: Industry's Open Opinion

On industrial training:
"Longer industrial training"
"Practical training as recommended is good as it gives the required exposure for the graduate...a longer term maybe better e.g. 6 months"
 On quality of students:
"Good quality"
"Capable of providing knowledge (sic) students to fuel future needs in the relevant industries"
"Above average graduates – will do well in the industry and has potential to be groomed into a professional"
"It meets the market requirement in producing student"

Discussion

Students were generally disinclined to embark into a career in valuation and instead preferred property or facilities management. Currently, the syllabus from Year 1 to 3 of the programme focuses on valuation as the core subject and other subjects, especially building, playing complementary roles. This finding presents a question on the adequacy of the syllabus if indeed students prefer to enter into property/facilities

which require high technical and cutting-edge knowledge of buildings and secondly, graduates of the programme indicated that the current syllabus concerning Building Technology is deficient. The five-yearly syllabus review should seriously consider this to enhance the efficacy of the programme.

Graduates also opined that the course had little interface with the industry, somewhat a gratuitous statement since it has been the practice of the

department to maintain contact with the real estate industry. For instance, the external examiner comes from the industry and the syllabus review every five years never failed to obtain industry's input.

From the survey, the industry believed that graduates of the Bachelor of Estate Management are competent even though the programme is just 10 years old. They were of the opinion that the graduates are outstanding in theory and are quick learners but a little lacking in practicality. The Soft Skills Assessment which has been newly introduced by the Ministry of Higher Education could be used to filter those students who are not up to standard. The continuous assessment involves seven areas including leadership, critical thinking, communication and entrepreneurship whereby a minimum standard is to be fulfilled by students before they are allowed to graduate. Should the minimum standards remain unfulfilled by the end of their study, students shall have to attend a 'finishing school' for a period of time where they will be taught the necessary skills.

The university also offered elective skill-enhancing courses such as Report Writing for Business which should be able to improve students' mastery of the English language. As for suggestion for longer training period, the packed three-year degree programme renders any extension to training time impossible. In addressing the concern of bridging theory with practice, the department has adopted an unofficial policy of employing lecturers with practical background since 2004. This is hoped to fill the lacuna between academia and industry as subjects will be taught with reference to the "outside world".

Summary and conclusions

Real estate education has a unique professional focus and thus needs a multidisciplinary approach in designing the curriculum. Overall, the survey questionnaire on students found that there is a mismatch between career preference and syllabus. Undergraduates prefer career in property management or facilities management as it is an 'interesting career' whilst seeing valuation as a "dying career". On the other hand, graduates signalled that the syllabus of some subjects need reinforcements for them to effectively carry out their tasks. The subject found lacking in both content and relevance is Building

Technology, which invited debate on whether to consider this in the department's next syllabus review exercise. Results from the industry, whilst being overall satisfied with the performance of Bachelor of Estate Management graduates from UM, showed that there were some soft skills that they found the graduates to be lacking such as leadership. Further research is proposed to investigate if the pre-Built Environment foundation programme succeeds in preparing future Estate Management students in their career direction.

A more scientific approach could be adopted for the future study. This is based on Cloete (2002), who suggested assessing the needs of the real estate industry on a more scientific basis rather than soliciting the opinions of experts in the various field. Nonetheless, the usefulness of qualitative research such as focus group discussion should not be underestimated. Focus group interviews are essential in the evaluation process: as part of a needs assessment, during a programme, at the end of the programme, or some period after the completion of the programme to gather perceptions on the outcome of that programme (Patton, 1990 in Lewis, 2000). Future study involving focus group allowing in-depth perceptions of this programme is therefore proposed.

Appendix 1

Faculty Compulsory Courses for the Bachelor of Estate management, University of Malaya

Major	Courses
Property Valuation	Introduction to Valuation, Applied Valuation, Investment Valuation, Valuation of Special Properties, Statutory Valuation, Advanced Valuation Techniques
Property Law	Legal Studies I, Legal Studies II, Introduction to Land Law, Development Law, Law of Taxation and Property Acquisition, Building Law
Land Economics	Principles of Economics, Urban Land Economics, Urban Management Economics, Development Economics
Finance	Accounting and Financial Management, Property Finance, Property Investment Analysis
Town Planning	Principle of Town Planning, Town Planning Practice
Building Technology	Building Technology, Building Services and Maintenance
Property Management	Property Management & Tenancy, Facilities Management
Professional Field	Computer Application, Property Marketing & Research, Professional Practice in Real Estate Management
Project	Academic Project (Dissertation), Estate Management Industrial Training, Integrated Project

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A CASE FOR PASSIVE ARCHITECTURE AS A GAIN IN FACILITIES MANAGEMENT

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Abstract

The objective of this paper is to demonstrate that Passive Architecture gives significant Energy Savings Benefit that is advantage to Facility Management (FM). Passive Architecture is an assertion for energy conservation where building elements are passively designed and strategised for comfortable indoor conditions. Consequently, the building operation becomes less dependent from commercially supplied energy and offers Energy Savings Benefit. This idea was demonstrated using a computer simulation by comparing energy use in a living/dining area of a house with consideration of Passive Architecture (PA Case) and a version that disregards Passive Architecture design strategies (non-PA Case). The features of these cases were based on two actual houses with opposite characters in Bangi, Malaysia. The resultant indoor comfortable conditions in the two cases were compared against the standards. Whenever the PA Case did not need to use artificial lighting or mechanical cooling, it therefore, claimed Energy Savings Benefit. It was found that the living/dining area in the PA Case had effect for substantial monetary value of Energy Savings Benefit for one year, making Passive Architecture a significant cause. Passive Architecture is a fundamental action before using Energy Efficient equipment or applying Renewable Energy system whereby the latter is relatively expensive and the payback period takes a long time to materialise. By understanding the significance of Passive Architecture, FM professionals could further explore the idea in a wider context and be more effective in the building industry.

Keywords: Passive Architecture, Facilities Management and Energy Savings Benefit.

Malaysia's energy demand

A study for the Economic Planning Unit to support policy decisions for the 9th Malaysia Plan predicted a steady rise in energy demand in Malaysia from present to year 2020 (NIRAS, 2005) (Fig. 1).

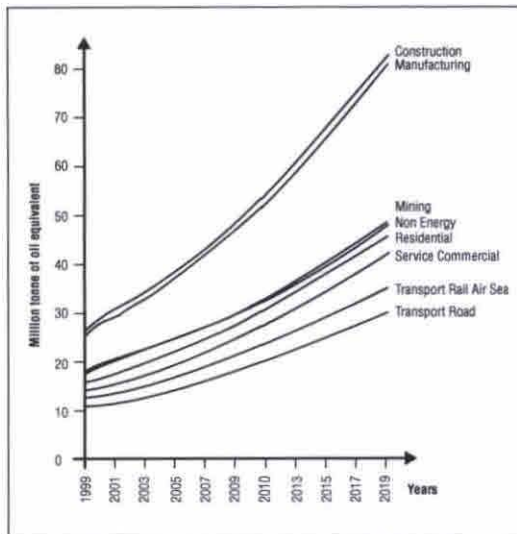


Figure 1: Proposed final energy demand from 1999 to 2020 (extracted from NIRAS, 2005).

This claim of increased energy demand is supported by a report from the Energy Commission (2008) that showed the electricity sales of the main energy company in Malaysia, Tenaga Nasional Berhad (TNB) had been increasing for the last 5 years (Fig. 2). Parallel to that is the rising fuel subsidies recorded at RM4.8 billion, RM6.6 billion and RM7.6 billion in years 2004, 2005 and 2006, respectively (Ismail, 2007).

There are three major issues resulting from the continual increment in energy demand and subsidies. Firstly, subsidies cannot be sustained by the government for a long time because it is a fiscal burden as well as an opportunity cost (NIRAS, 2007). Subsidies will inevitably reduce or come to an end and the actual cost of energy will have to be passed down to the consumer, perhaps in the form of tariff hike. Secondly, the bulk of energy source

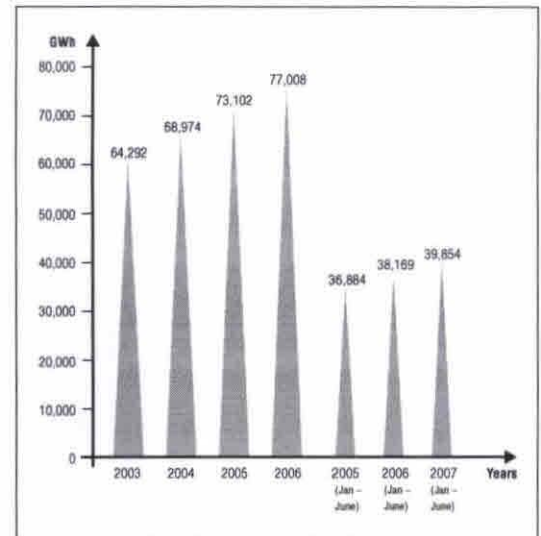


Figure 2: Total sales of electricity by TNB from 2003 to mid 2007. (Extracted from Energy Commission, 2008)

comes from fossil fuel and it is depleting (Smith, 2005). Thirdly, the main by-product of energy production is carbon dioxide (CO₂) which is found to be the main contributor to the global warming phenomena (Szokolay, 2006). Some studies claimed that the excessive increment in CO₂ will speed up the process of planet Earth self-destruction (Smith, 2005). In conclusion, the increasing demand in the commercially supplied energy is not good news.

Facilities Management (FM) and energy

A study in the industrialised countries claimed that the building industry emits 50% of the total CO₂ in the course of its construction and throughout its lifetime (Smith, 2005). In hot and humid tropical climate, building needs Operational Energy (OE) mainly to cool the living space besides providing artificial lighting so that occupants feel comfortable. FM has a direct connection to this aspect of building via its core competency of Operation and Maintenance (O&M). It has been an ongoing effort in FM to reduce OE in building by applying Renewable Energy (RE) or Energy Efficient (EE) equipment (Ismail, 2007). However, such initiatives have limited takers because the issue from stakeholders' points of view are not

adequately addressed. For instance, the payback time for RE is too long and the return on investment is hardly recouped by the building's first owner (Smith, 2005).

Presently, FM has gained gradual recognition of its role in the building industry and it is identified as one of the key organisation that could effect for the reduction in energy consumption (Lim, 2007). Furthermore, FM encompasses multiple disciplines and its circle of influence in the built environment includes various people, such as client, consultant, contractor, occupants, authorities, etc., as well as process and technology (Gilleard, 2007). Nonetheless, to be effective in this quest, FM must demonstrate the economic benefits of low energy building to stakeholders way ahead of the O&M stage, i.e., at the design phase. This paper demonstrates the benefits of Passive Architecture whereby building is sensibly designed to avoid dependency on commercially supplied energy and become an advantage in championing effective FM.

Passive Architecture

Passive Architecture is a climate responsive building that provides comfortable indoor conditions, without relying on mechanical cooling or artificial lighting (Szokolay, 2006). In hot and humid tropics, this means avoiding solar radiation, promoting ventilation from the prevailing wind reducing humidity level and ensuring daylight into the building. The maximum impact can be achieved by strategising the building elements such as orientation, form, opening and sun shading devices to achieve the said goals (Olgyay, 1963; Hyde, 2000). Passive Architecture is not a new idea. Traditional houses in the tropics had exemplified Passive Architecture by means of raised floor, low thermal mass envelope and raised/jacked roof to facilitate ventilation (Fig. 3).

Generous openings like windows, doors and ventilation outlets are deliberately positioned to encourage natural ventilation (Olgyay, 1963; Hyde, 2000). Shallow rooms elongated from east to west and faced north performs better in achieving comfortable indoor conditions (Hyde, 2000). It was also found that natural ventilation is more successful in slender room since prevailing wind in the tropics does not have high velocity (Olgyay, 1963). Traditional

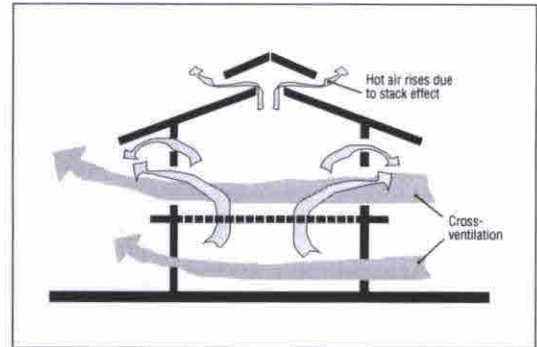


Figure 3:

Cross-section of a traditional house showing the ventilation concept with arrows depicting the flow of air.

house also put emphasis in encouraging daylight as much as possible into its rooms via openings that are well shaded to reduce heat gain. Generally, Passive Architecture is elementary as it asserts Energy Conservation (EC) at the design stage to reduce OE in building (Fig. 4).

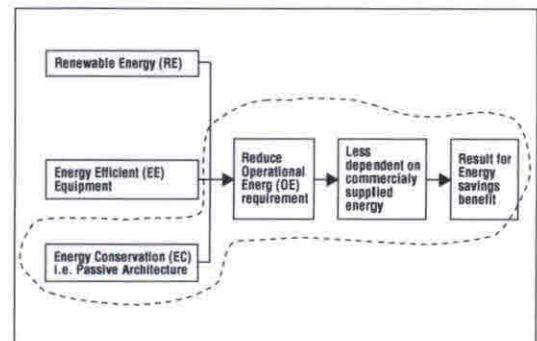


Figure 4: Passive Architecture asserts Energy Conservation that reduces Operational Energy in building.

Thermal comfort and visual comfort

A building can be made independent from mechanical cooling when the occupants feel thermally comfortable. There are two components of variables that influence thermal comfort, namely microclimate and occupant's personal adaptation (Auliciems & Szokolay, 1997). Meanwhile, to be independent from artificial lighting, occupants must sense visual comfort. Good amount

of daylight enables occupants to carry out their activity in the house without resorting to artificial lighting (Majoros, 1998).

Comfort variables affect the indoor conditions differently at various times and these factors do not work in isolation. For example, alleviating heat gain using external sun shading devices can affect the amount of daylight entering a room. Therefore, it is important to present the potential of Passive Architecture with reference to the combined effects of both thermal and visual comforts.

Energy Savings Benefit (ESB)

The intended effect of Passive Architecture is the "savings" in the operational energy, termed as Energy Savings Benefit. This could be made tangible by comparing the energy consumption in buildings of similar type. In this study, building is being represented by a detached house. Theoretically, a house that is designed for maximum daylight will need less commercially supplied energy when compared to another that has no consideration for daylighting (Baker & Steemers, 2000). In this instance, the Energy Savings Benefit claimed by the former occurs when it does not need to use artificial lighting (Fig. 5).

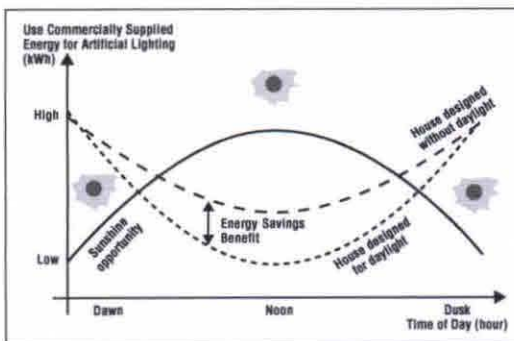


Figure 5: Theoretical use of commercially supplied energy for artificial lighting.

Similarly, a house with good natural ventilation will require less mechanical cooling compared to the one with poor ventilation; hence, claiming Energy Savings Benefit from mechanical cooling. Nonetheless, such comparison is only valid when it is made on a levelled

platform, whereby the two houses must be of the same locality and size. In addition, the behaviour of the occupants in both houses has to be the same.

Methodology

A simulation study of two cases was carried out to demonstrate the Energy Savings Benefits from Passive Architecture. The key design features of two detached houses in Bangi, Malaysia of opposite qualities were used as basis of the simulation where the resultant comfortable conditions of the two cases can be compared.

The first case was designed to imitate key design features of a Passive Architecture precedent currently under construction (Fig. 6).



Figure 6: A detached house (under construction) in the Bangi, Malaysia endeavours to achieve Passive Architecture goals via wide openings facing north.

This case is termed as 'PA Case' and has the following design strategies (Fig. 7):

North orientation;

- Slender form elongated east-west;
- Large openings on the north facade; and
- Recessed floor plan on the north and south sides.

Another case is simulated based on the key features of a typical house in the vicinity that lacks of Passive Architecture considerations (Fig. 8). Generally, many houses in Malaysia have little consideration on orientation, form, opening and shading devices. For example, the orientation of the typical house selected does not respond to climate conditions. Like many others, it responds to the main access road. As a result, frequently used spaces such as living/dining

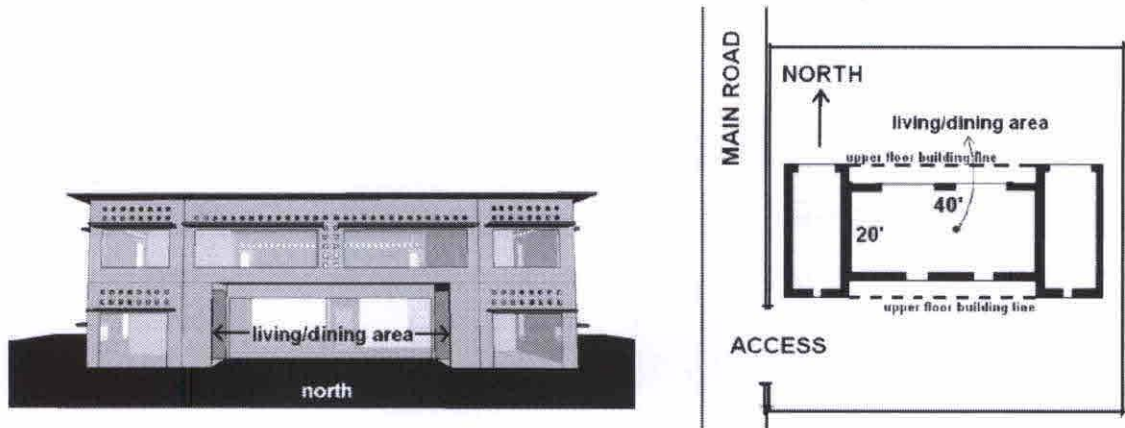


Figure 7: Simulated elevation and site plan of PA Case showing elongated form.

areas faced west and get the most of heat gain. In addition, the form of such house is normally square reflecting the squarish lot area. Consequently, it results for concentric space arrangement with less natural cross ventilation. Furthermore, the openings are placed according to aesthetics rather than to facilitate natural ventilation and shading devices are normally underprovided.

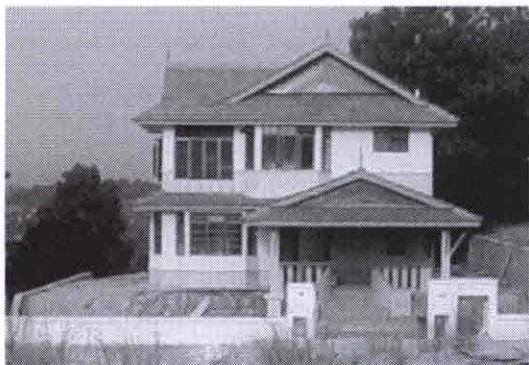


Figure 8: An example of a typical detached house (under construction) in the Bangi, Malaysia that lacks of Passive Architecture design considerations.

Based on the above, a 'non-PA Case' was simulated with the following features (Fig. 9):

- West orientation;
- Square form with concentric rooms arrangement;

- Medium-sized openings on all facades with undersized shading devices; and
- Porch at the front, not for climatic reasons but for vehicle parking.

Both PA and non-PA cases have the same floor area, volume and method of construction but the total cause of orientation, form, openings and sun shading devices, or the lack of it, was treated as one effect for one definite value of indoor comfortable conditions (Table 1). The value of Energy Savings Benefit in the PA Case was determined by comparing it against the energy use in the non-PA Case. For this paper, the study was limited to the living/dining area only.

Scale of measurement

The study assumed that occupants, microclimate, and material were constants. The simulation readings in the two houses were taken on every 15th day of the month for a year. Based on Auliciem's equation, $T_n = 17.6 + 0.31T_m$, where T_n is Thermal Neutrality and T_m is the mean temperature for the locality of the case, i.e., 27.4°C for Klang Valley area; T_n works out as 26.1°C (Sh. Ahmad, 2004). It was assumed that when the building offers comfort zone in the region of 2.5K from T_n (for 90% acceptability), the occupants would not require the aid of mechanical cooling.

The illuminance (lux) readings for visual comfort were compared with recommendation by the International CIBSE (Chartered Institution of Building Services Engineers) Standard; for living/dining area is 300 lux

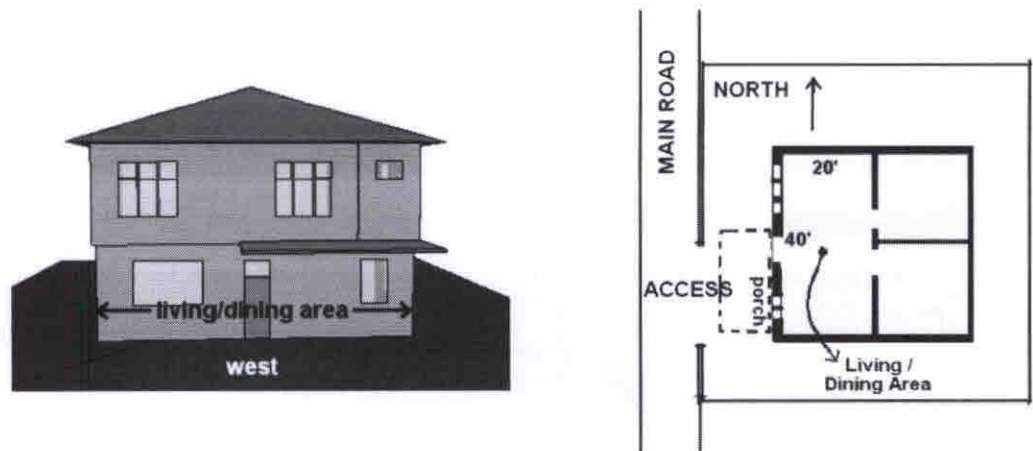


Figure 9: Simulated elevation and site plan of non-PA Case showing square form.

Table 1: Cause and effect of PA and non-PA Cases.

SAMPLE	CAUSE	EFFECT
PA Case incorporation Passive Architecture design strategies  PA Case	Building elements (orientation, form, openings and sun shading devices) were designed to achieve Passive Architecture goals	=> long period of comfort => need less mechanical cooling / artificial lighting => low operational energy => need less commercially supplied energy => claims Energy Savings Benefit
Non-PA Case disregards Passive Architecture design strategies  Non-PA Case	Building elements were merely construction elements	=> short period of comfort => rely on mechanical cooling / artificial lighting => high operation energy => need more commercially supplied energy

(CIBSE, 1994). It was assumed that when the space gave such illuminance reading, it would not require artificial lighting and that personal adaptation would not involve any operational energy (Majoros, 1998).

Results of visual comfort analysis

The illuminance reading measured daylight opportunity under standard overcast sky as defined by the CIE (Commission Internationale d'Eclairage). The duration was approximately 12 hours from 7:00 a.m. to 7:00 p.m. every day, except during winter solstice. The daylight analysis was carried out onto an imaginary working plane of 0.85 metre-high in the living/dining area to reflect the operational level.

Generally, it was found that the illuminance readings in the space were not consistent. For example, on 15th June, area closer to the window had high illuminance reading compared to the centre of the space. In this instance, even when one-third of the space read 300 lux, it was assumed that the occupant would still need artificial lightings in order to compensate for the insufficient luminaire at the other part of the space. When this happened, the area was generalised as having inadequate daylight.

The fluctuation in the luminance reading on the 15th June can be translated into the need for artificial lighting in the living/dining area (Fig. 10).

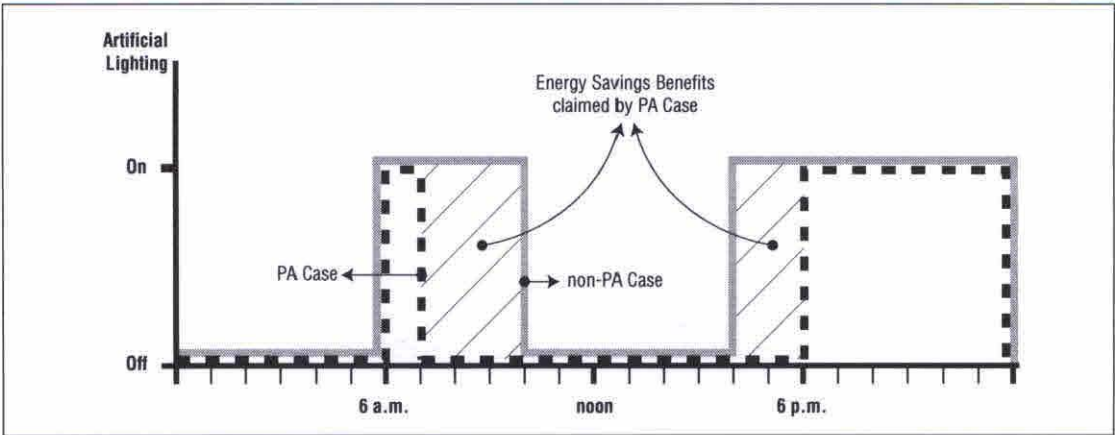


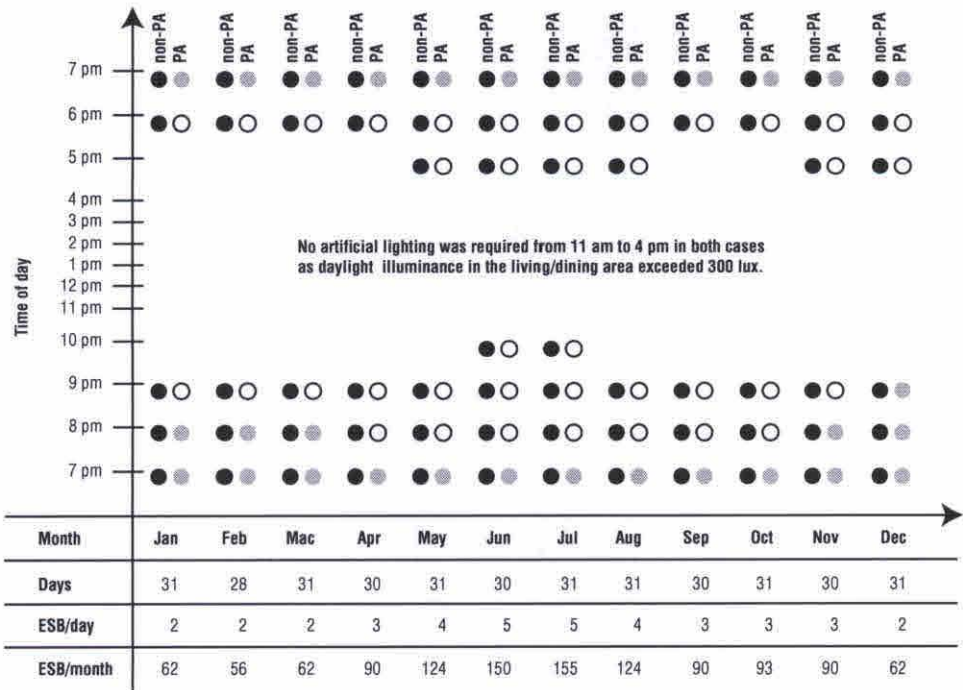
Figure 10: Use of artificial lighting by PA and non-PA cases on 15th June.

On this particular day, both the PA and non-PA Cases required artificial lighting at night time. However, during daytime non-PA Case needed artificial lighting several hours longer in the morning and late afternoon when compared to the PA Case. Assuming that in both cases the living/dining area was unused

after midnight till 6 a.m., the Energy Savings Benefit claimed by the PA Case occurred when it did not require artificial lighting for five hours as compared to the non-PA Case.

When simulated for every 15th day of the month, non-PA Case had insufficient daylight and had to rely on

Table 2: Time and hours when the living/dining area of non-PA Case and PA Case had to rely on artificial lightings on every 15th day of the month and the resultant Energy Savings Benefit (ESB) [marked as 'o'].



artificial lighting for at least five hours per day (Table 2). PA Case had inadequate daylight for a maximum of three hours per day but it had maintained to be above the minimum luminance requirement during most part of the day. Assuming readings on every 15th day represented a typical day of the month; PA Case could claim Energy Savings Benefit up to 155 hours per month or 1158 hours per year which averaged at 96.5 hours per month.

Monetary value of Energy Savings Benefit from artificial lighting

The monetary value of the Energy Savings Benefit was derived with reference to the same lighting provision in the living/dining area in both the PA and non-PA cases. It was assumed that the light fittings can be either of the following types:

- Two 36 watt Energy Efficient (EE) 4-foot long fluorescent lights, equally spaced at the living/dining area; or
- Three sets of two 100 watt incandescent light bulbs equally spaced in the area.

Commercially supplied energy was provided by the main electricity company, the National Electricity Board or Tenaga Nasional Berhad (TNB) and the domestic tariff for the first 200kW was 21.80 sen/kWh but increased to 28.90 sen/kWh for the next 800 kWh (TNB, 2008). Based on the above, the monetary value of one-year Energy Savings Benefit

from artificial lighting in PA Case was deduced to be (Ringgit Malaysia) RM151.44 if used incandescent lights and RM17.52 if applied EE fluorescent lights (Table 3).

Results of thermal comfort analysis

The reading on 15th June showed that the minimum indoor air temperature in the non-PA Case was 28.9°C and this had exceeded the thermal comfort range of 2.5K from Thermal Neutrality, T_n of 26.1°C. Meanwhile, the indoor air temperature of the PA Case was in the range of thermal comfort in the morning. During post-meridiem the indoor air temperature of PA Case only slightly exceeded the thermal comfort zone and the occupants may or may not require mechanical cooling at this time. However, the study assumed that whenever the thermal reading exceeds comfort zone, occupants would opt for mechanical cooling.

Based on the above and assuming no one uses the living/dining area between midnight and 6:00a.m., the Energy Savings Benefit claimed by the PA Case on 15th June happened when it did not need mechanical cooling for 6 hours compared to the non-PA Case (Fig. 11).

Simulations on every 15th day of the month showed that the non-PA Case would require 18 hours mechanical cooling to bring the room temperature down into the comfort zone. On the other hand, the PA Case appeared to need only 12 hours of mechanical cooling because the space fell into the

Table 3: Calculation of monetary value of Energy Savings Benefit (ESB) from artificial lighting (incandescent, EE fluorescent) claimed by living/dining area in PA Case.

Item	Calculation Description	Three sets of two 100-watt incandescent lights	Two EE 36-watt, 4-foot long fluorescent lights
	Note: RM is Ringgit Malaysia TNB is National Electricity Board		
(A)	Energy required by artificial lighting	0.6 kWh	0.072 kWh
(B)	Average ESB per month = (A) x 96.5 hours / month	57.9 kWh	6.95 kWh
(C)	TNB Domestic Tariff for first 200kW @ 21.80 sen / kWh / month	RM 12.62	RM 1.46
(D)	One-year value of ESB from artificial lighting = (C) x 12 months	RM 151.44	RM 17.52

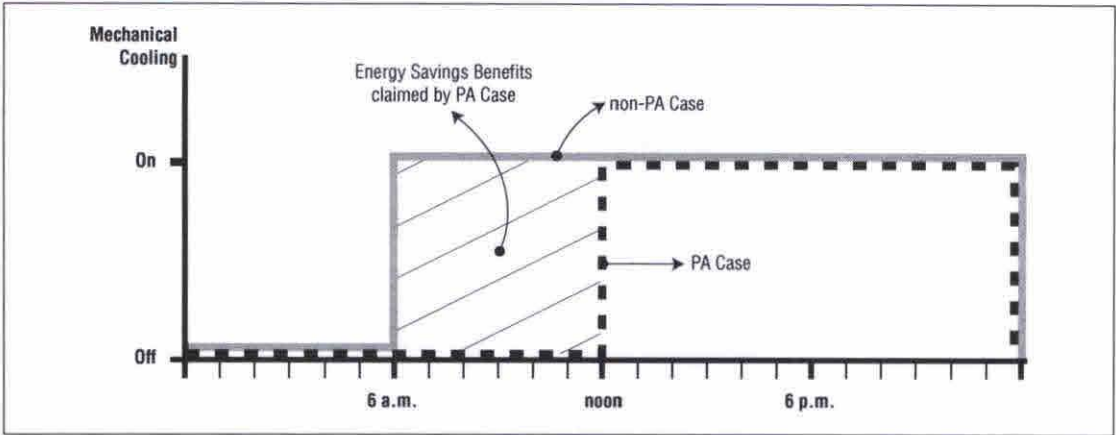
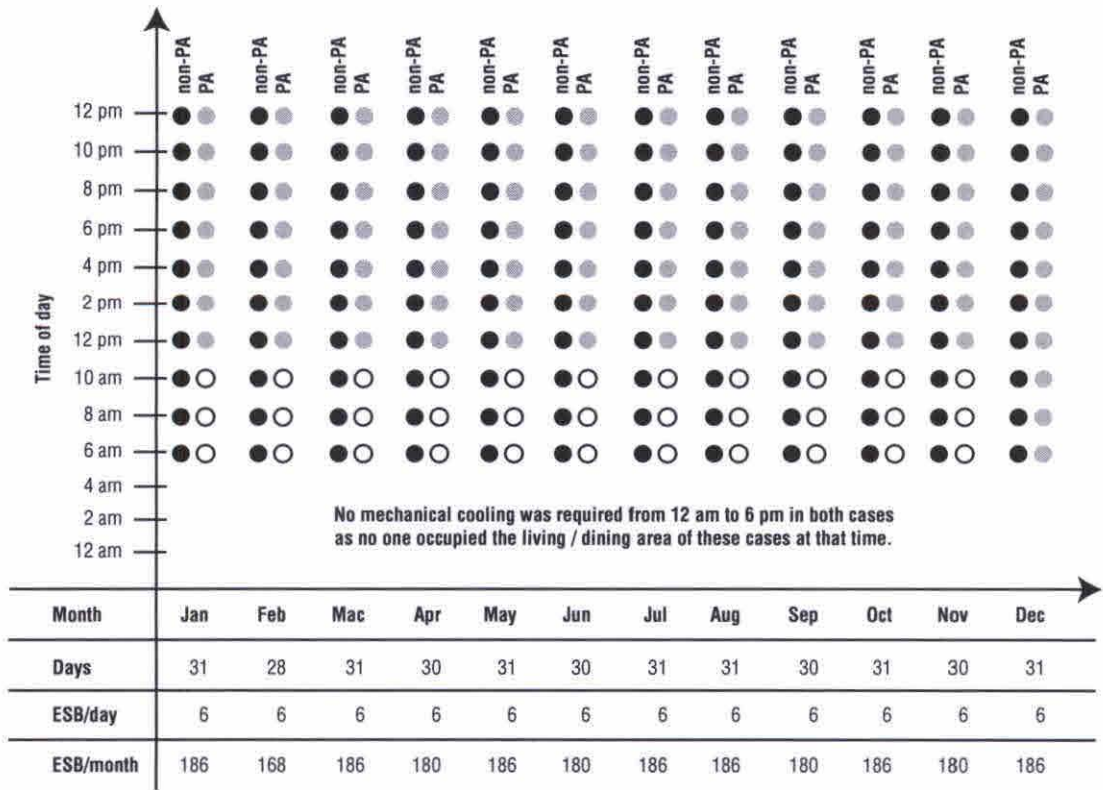


Figure 11: Use of mechanical cooling by PA and non-PA cases on 15th June.

thermal comfort zone during ante-meridiem (Table 4). It was also found that the indoor air temperature appears to be fairly consistent everyday because of

the little climate change in the tropics. As a result, the daily Energy Savings Benefit from mechanical cooling claimed by the PA Case was consistently six hours

Table 4: Time and hours when the living/dining area of non-PA Case and PA Case had to rely on mechanical cooling on every 15th day of the month and the resultant Energy Savings Benefit (ESB) [marked as 'o'].



and that added up to 186 hours per month (i.e., 6 hours x 31 days) or 2190 hours (i.e., 6 hours x 365 days) per year.

Monetary value of Energy Savings Benefit from mechanical cooling

There are two typical methods adopted to bring down the indoor air temperature in the living/dining area into the comfort zone, i.e., using ceiling fan and air conditioning system. A typical ceiling fan has variable rheostat to control the rate of fan blade rotation. However, this has no bearing on the actual amount of energy use because when the fan speed is slow the excess energy is simply converted into heat (Mc Comas, 2008). Hence, the energy use by ceiling fan is either 'on' or 'off' and typical power requirement of a ceiling fan is 0.3kWh.

Typical domestic air conditioning unit of 1 horsepower uses 1.5 kWh of energy. 1K temperature difference in a room matters as far as indoor comfortable conditions is concerned because it affects the energy requirement for the air compressor. However this study did not differentiate the additional energy requirement for every 1K drop in temperature difference so as to generalise the findings. It was also assumed that a typical living/dining area of such size would need two mechanical cooling equipments serving each half of the space, i.e., either two ceiling fans or two air conditioning units. When using air

conditioning units, the set point temperature remained at 28.6°C, being the upper limit of thermal comfort zone assumed in this study. Based on the above, the monetary value of one-year Energy Savings Benefit from mechanical cooling in PA Case was deduced to be RM 286.44 if used ceiling fan and RM1,728.36 if applied air conditioning system (Table 5).

Conclusion

The study showed that one-year Energy Savings Benefit from mechanical cooling and artificial lighting in PA Case could be up to 2190 hours and 1158 hours, respectively. When deduced into monetary value, one-year Energy Savings Benefit was recorded to be RM151.44 from incandescent lights and RM17.52 for EE fluorescent lights. Meanwhile, the monetary value of Energy Savings Benefit from mechanical cooling was found to be RM286.44 from ceiling fan and RM1,728.36 from air conditioning system. Therefore, it can be deduced that the maximum one-year Energy Savings Benefit claimed by the PA Case could be RM1,879.44, when compared to non-PA Case that used incandescent lights and air conditioning units. The study also found that substantial gain was due to the form and orientation of the PA Case and this was achieved without incurring any additional construction cost.

Although the demonstration was only for a living/dining area of a house as an example of a building,

Table 5: Calculation of monetary value of Energy Savings Benefit (ESB) from mechanical cooling (ceiling fan and air conditioning unit) claimed by living/dining area in PA Case.

Item	Calculation Description Note: RM is Ringgit Malaysia TNB is National Electricity Board	2 units of Ceiling Fan	2 units of Air Conditioning Equipment
(A)	Energy required by mechanical cooling equipment	0.6 kWh	3.0 kWh
(B)	ESB per day = (A) x 6 hours	3.6 kWh	18 kWh
(C)	Average ESB per month = (B) x 365 days /12 months	109.50 kWh	547.5 kWh
(D)	TNB Domestic Tariff first 200kW @ 21.80sen/kWh/month	RM 23.87	RM 43.60
(E)	TNB Domestic Tariff next 800kW @ 28.90 sen/kWh/month	Not applicable	RM 100.43
(F)	Monthly value of ESB from mechanical cooling (D + E)	RM 23.87	RM 144.03
(G)	One-year value of ESB from mechanical cooling = (F) x 12 months	RM 286.44	RM 1,728.36

it could be generalised that when a property applies Passive Architecture design strategies it will indeed become less dependent on commercially supplied energy and consequently offered Energy Savings Benefit. In this case, the sample is in hot and humid tropics where buildings rely heavily on mechanical cooling. Together with the data recorded from the O&M experience, perhaps FM professionals could extend the idea of Passive Architecture into a wider context such as commercial and office buildings, etc. The research on Energy Savings Benefit could

be extended to show favourable long term effect of Passive Architecture buildings, such as less mechanical and electrical installations to operate and maintain; and additional benefits to EE and RE installations – more so in the case of 'in-house' sourcing where building owner is also doing FM.

Acknowledgement

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IMPACT OF MACRO-ECONOMIC FACTORS ON HOUSE PRICES PERFORMANCE

(Merit Research paper Award -2nd WAVO Congress & Valuation Forum, 2007, Beijing, PRC)

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Abstract

This paper examines the impact of macro economic factors on house price. To capture the effect of house price movement and to examine the impact of macro economic factors on house prices, the researcher has identified six macro economic factors. The factors are Per Capita Income, Gross Domestic Product, Consumer Price Index, Base Lending Rate, Population Growth Rate, and Unemployment Rate. The findings showed that only two factors have strong impact on Malaysia house price performance which ie. Per Capita Income and Base Lending Rate.

Keywords: House prices index, macro economic factors, predictive model of house price performance

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IMPACT OF MACRO ECONOMIC FACTORS ON HOUSE PRICES PERFORMANCE

1.0 INTRODUCTION

In the property sector, housing is considered as an integral part of a national output. There is a possibility that expansion of housing activity is preceded by an increase in economic output, with the initial effect felt largely within the housing sector and only subsequently on the aggregate economy. If markets are interdependent, disturbance in one market will be transmitted to other markets. Therefore any changes in the economic factors or other market factors would eventually affects demand and pricing of a house.

2.0 OBJECTIVE OF THIS STUDY

The objective of this study is to examine the impact of macro economic factor on house prices.

3.0 LITERATURE REVIEW

Previous studies using data in United State (US), New Zealand (NZ), Australia, Hong Kong and Malaysia have identified the macro economic factors which influence house prices.

In US, Jacob and Higgins (1999) reviewed several literatures and found that previous researches have mainly focused on linking property performance to a variety of measured

economic factors. Arbitrage Pricing Theory has been the general framework which was initiated by Chen, Roll and Ross (1983). Their research suggested that underlying economic forces can primarily influence the US stock market. Using similar framework, Maginn and Tuttle (1990) analysed systematic risk and returns in the US property market and other asset classes with risk inherent in various economic scenarios. Other studies on real estate returns as well as studies on residential house prices variation have identified specific variable as representative of change in macro-economic conditions over time.

The behaviour of house prices varies from market to market. Key findings in USA as noted by Malpezzi et. al. (1998) are that house prices levels relate to physical constraints, population, income and demographic variables. The modelling of UK house price however identified real interest rates and income expectations (Muellbauer et al 1997) as the main factors.

Hoag (1980) build regional and national economic concomitants into value indices for industrial property by considering the microeconomic and macroeconomic variables (such as location, property type, size and age), economic and demographic variable (such as business inventories, construction costs, transportation access and population, transaction prices and cash flows) which affect property value. Subsequently Chan et.al., 1990 and Dokko et al., 1991 have identified a number of key economic factors that influenced US property performance such as inflation, interest rate term structures, 90-day bills and 10-year bonds. Jones Lang Wootton (1992) identified inflation, 10-year bonds, interest rate differentials and stock market dividend yields as key economic factors for Australian office property yields.

Studies undertaken in Australia indicate that house price are linked to several inter-related variables with those relating to demand exerting greater influence upon housing prices than supply (Waxman and Lenard, 1997).

Jacob and Higgins (1999), found that there is a positive relationship between aggregated House Prices in Australian Capital Cities (ACC) with Household Net Income (NI) and to a lesser extent Employment level (EP). The study implies that financial market rates affects household net income and both these variables may determine house price in capital cities. It therefore highlights the importance of financial markets as determinants of house prices across Australia.

In New Zealand, Mitchell (1993) studied the price of residential property and found that there is a strong relationship between the prices of residential property and at least six economic indicators, ie. population size, consumer price index, number of building permits, business confidence, M3 money supply and capital appreciation. These are the main variables with a strong relationship to New Zealand price of residential property between March 1970 and June 1991.

Field (1994) found that the Hong Kong's residential property demand was highly correlated to the increase in the household income.

Aminah (2004) quoted that, L.B Smith (1974) developed an explanatory model of house price on a function of permanent income house hold, price of goods and services, the stock occupied homes per house hold, the stock of vacant homes per household, the cost of home mortgage credit relative to other credit and a measure of consumer inflationary expectations.

In the local context, Aminah (2004) noted that the determination of house prices especially regionally has been debated in economic research for quite sometime. A number of works have addressed and analysed house price variations as influenced or explained by market-wide macro factors. Demand factors such as degree of employment, disposable income and demographic characteristics as well as supply factor such as housing stock have been used widely in the analysis. Her findings showed that income and GDP for macro factors and physical,

locational and neighbourhood attributes for micro factors, significantly affects house price in Malaysia. In line with that, Rahah (1998) noted the local real estate commentators suggest that the growing population and the increasing disposable income coupled with easy access to finance have led to a high demand for housing. This in turn will give impacts to the house price movements.

The above discussed are some of the typical example of macro price determinants.

Based on the above literature, six macro economic indicators identified will be analysed and tested for the significance in affecting house price in Malaysia for the period from 1990 to 2006. These are Per Capita Income, Gross Domestic Product, Consumer Prices Index, Base Lending Rate, Population Growth Rate, and Unemployment Rate.

4.0 METHODOLOGY

This paper examines the impact of macro economic factors on house price. In order to capture price variation and to examine the impact, a hedonic function derived from MRA (multiple regression analysis) will be used to enable the estimation of changes in house price from one period to another. The output of the regression will provide information on how much a change in a macro factors would affect the price of a property and, estimate the predictive capability of pricing model incorporated in these factors.

4.1 Data Collection

Six macro economic indicators identified from the literature review will be examined. The economic factors are Per Capita Income, Gross Domestic Product, Consumer Price Index, Base Lending Rate, Population Growth Rate, and Unemployment Rate. The period of the analysis is on a yearly basis from 1990 to 2006.

4.1.1 Dependent Variables

For the purpose of this research, the dependent variable is the overall Malaysian residential house prices, which is represented by the Malaysia House Price Index (MHPI), published by the National Property Information Centre. MHPI are derived from the property transactions receive by JPPH for Stamp Duty valuations. More than 10,000 sales data for each year/period were collected from the branches in the whole country for the computation of indices.²

4.1.2 Independent Variable

Six independent variables used to examine the impact of economic factors on house price are:

i. Per Capita Income

Per capita income refers to the amount each individual receives, in monetary terms yearly, generated in the country through productive activities. It measure the average income of an individual household in a country. The income level and purchasing power will affect individual household decision in buying house. Per capita income is believed to have a positive correlation with the house price.

ii. Gross Domestic Product (GDP)

GDP is defined as the market value of all final goods and services produced within a nation's borders during a fixed period of time. The gross domestic product (GDP) is the most important economic indicator. It represents a broad measure of economic activity and signals the direction of overall aggregate economic activity (Bureau of Economic Analysis).

² Source – *The Malaysian House Price Index, (Jan – Jun 1997); Valuation & Property Services Department*

iii. Consumer Price Index (CPI)

CPI is a price index calculated as the current cost of a fixed basket of consumer goods divided by the cost of the basket in the base period. Malaysian Overall Consumer Prices Index or the inflation rate is calculated from the prices of a basket of goods and services, which include essential daily food and goods as well as non-durable goods. In this study, CPI is used to calculate real value of nominal per capita income.

there is not enough labour force in the market and would drive up wage to a level not proportionate to the productivity.

If unemployment rate is high, it indicates that a greater amount of people are not able to generate stable income to purchase houses or service housing loans. Therefore, house price would have a negative correlation with the unemployment rate.

iv. Population Growth Rate (POP)

Population growth rate (POP) is the increase in a country's population during a period of time, usually one year, expressed as a percentage of the population at the start of that period. It reflects the number of births and deaths during a period and the number of people migrating to and from a country.

vi. Base Lending Rate (BLR)

Base Lending Rate (BLR) is the minimum rate of loan. Which is set by Bank Negara for lending to other banks. Usually for a house mortgage loan, a premium of 2.5% to 4% will be added on top of the BLR by the commercial banks and financial institutions.

Population growth is normally associated with the demand pressure for properties especially residential, commercial and industrial sector. Growth, in turn, is related to size. As population size increases, demand for properties also increases (Hamid, 1998).

v. Unemployment Rate (UNEMP)

Unemployment is the number of people who are available and actively seeking for work but unable to secure jobs. The unemployment rate represents the fraction of the labour force that is unemployed. It increases or falls following a change in economy activity. A high unemployment rate or very low unemployment rate (less than 4%) is not unhealthy for economy. High unemployment rate indicates low purchasing power, while very low unemployment rate shows that

4.2 Source of Data

Secondary data from various sources would be used in this research. Data on Per Capita Income, Gross Domestic Product and Consumer Price Index are sourced from Bank Negara Bulletin. Population Growth Rate and Unemployment Rate are sourced from Statistical Bulletin Malaysia. Base Lending Rate are sourced from Malaysia Economic Report. Malaysia House Price Index (MHPI) are sourced from Malaysia House Price Index and Property Market Report.

4.3 Timeframe

A period timeframe from 1990 to 2006 was selected as it includes various phases of the economic cycle in Malaysia thus ensuring that all economic scenarios can be assessed. 1990 is taken as the base year for data analysis.

4.4 Statistical Test**4.4.1 Correlation Analysis**

From previous property-related studies, we know that many of the economics as

well as financial indicators have leading and lagging effect on the property market. In order to understand the direction and relationship of the co-movements of the dependent and independent variables, correlation analysis will be carried out. It should be noted that correlation between two variables may not be a causal relationship. The result of correlation analysis, r -value, indicates the direction and strength of co-movement of the two variables.

If the correlation coefficient is positive, the increase in independent variable value will result in an increase in the dependent variable value. If the correlation coefficient is negative, the co-movement of the two variables will be in opposite direction. The magnitude of co-movement is measured by the value of correlation coefficient. If the number is 1.00, then we can conclude that perfect relationship exists between the two variables. When the result is 0, there is no correlation between the dependent and independent variable.

By shifting the time reference of the independent factors forward (lead) and backward (lag) against the dependent variable, and examine the correlation coefficient of independent variables (the highest of each variable) on a yearly basis, the result would indicate which variable is a lead or lag indicator and the lead or lag period.

4.4.2 Multiple Regression Analysis

MRA has been widely used as a tool for mass appraisal of residential properties since the 1970's.

In this research paper, the objective is to examine the impact of macro economic factors on house prices performance. Hence, the dependent variable (y) is Malaysian House Price Index and the independent variables ($x_1, \dots, x_6$) are the macro economic factors.

Multiple Regression Analysis (MRA) is an extension of a linear regression to more than one independent variable. Multiple regression analysis is used to measure the relationship between one interval dependent variable (y) and several independent (or predictor) variables in (x). By using more than one independent variable, we could better explain the variation in y and hence provide more accurate predictions.

The MRA will incorporate the results from the correlation analysis and the effect of lead will be built into the model. The mathematical expression of the relationship between the dependent variable and the independent variable is as follows:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \epsilon$$

where

y = Malaysian House Price Index

x_1 = Per Capita Income

x_2 = Gross Domestic Product

x_3 = Consumer Price Index

x_4 = Base Lending Rate

x_5 = Population Growth rate

x_6 = Unemployment Rate

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 = coefficient of each independent predictors respectively

ϵ = Error term

Assumptions of the multiple linear regression model:

- i. The random errors term ϵ has an expected value of zero and a constant variance. That is $E(\epsilon) = 0$ and $\sigma_\epsilon^2 = \sigma^2$ for each recorded value of the dependent variable y .
- ii. The error components are uncorrelated with one another.
- iii. The regression coefficients, $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 are parameters.

iv. The independent variables x_1, x_2, x_3, x_4, x_5 and x_6 are known constants.

v. The inferential procedures given in this text require that the random errors ϵ be normally distributed.

4.4.3 T-test

The t-test of the individual coefficients allow us to determine whether the regression coefficients $\beta \neq 0$ (for $i = 1, 2, 3, 4, 5$ and 6), which tells us whether a linear relationship exist between (x_1, x_2, x_3, x_4, x_5 and x_6) and y . A t-test will be carried out for each independent variable. If the t-value is more than 2.042, at 95% confident level (two tailed for more than 30 observations), we can conclude that there is a significant linear relationship between the dependent and independent variables.

4.4.4 F-test

The F-test in the analysis of variance combines this t-test into a single test. That is, we test all the β at one time to determine if at least one of them is not equal to zero. The F-test is performed only once which can reduce the erroneous conclusion when multiple t-tests are likely to show significant level when even there is no linear relationship between each of the independent variables and dependent variables.

4.4.5 Multicollinearity

Multicollinearity is an undesirable situation where the correlations among the independent variables are strong.

In some cases, multiple regression results may seem paradoxical. For instance, the model may fit the data well (high F-Test), even though none of the X variables has a statistically significant impact on explaining Y. How is this possible? When two X variables are highly correlated, they both convey essentially the same information. When this happens, the X variables

are *collinear* and the results show *multicollinearity*.

Multicollinearity increases the standard errors of the coefficients. Increased standard errors in turn means that coefficients for some independent variables may be found not to be significantly different from 0, whereas without multicollinearity and with lower standard errors, these same coefficients might have been found to be significant and the researcher may not have come to null findings in the first place. In other words, multicollinearity misleadingly inflates the standard errors. Thus, it makes some variables statistically insignificant while they should be otherwise significant.

4.4.6 Variance Inflation Factors (VIF)

Variance Inflation Factors (VIF) are measures that can be used to detect multicollinearity among the X's in a regression model on the precision of estimation. Understanding multicollinearity should go hand in hand with understanding variation inflation. Variation inflation is the consequence of multi-collinearity. We may say multi-collinearity is the symptom while variance inflation is the disease. In a regression model we expect a high variance explained (R-square). The higher the variance explained is, the better the model is. However, if collinearity exists, probably the variance, standard error, parameter estimates are all inflated. In other words, the high variance is not a result of good independent predictors, but a mis-specified model that carries mutually dependent and thus redundant predictors. So Variance Inflation Factor (VIF) is common way for detecting multicollinearity.

General rule, if $VIF > 10$ (or equivalently tolerance < 0.10) for predictor it's an indication of potential multicollinearity problems (Neter, Wasserman and Kutner, 1990).

5.0 DATA ANALYSIS

Dependent and independent variables data are as tabulated below.

Table 1: Dependent and Independent variable by year (1990 – 2006)

YEAR	Dependant Variable	Independent Variables					
	MHPI Annual Change (%)	Per capita Income (RM/year) Annual Change (%)	GDP Annual Change (%)	CPI Annual Change (%)	BLR Annual Change (%)	POPULATION (million) Annual Change (%)	UNEMPLOYMENT Annual Change (%)
1990	4.10	12.76	11.36	3.0	7.14	2.8	-29.11
1991	25.50	9.80	-11.22	4.4	20.00	3.9	-3.57
1992	12.20	11.18	-10.34	3.9	5.56	2.7	-27.78
1993	4.90	10.76	6.41	3.6	-10.53	3.2	-23.08
1994	8.00	7.52	10.84	3.7	-17.06	2.6	-10.00
1995	18.40	12.14	1.09	3.4	16.31	3.0	3.70
1996	12.90	11.63	-9.68	3.6	11.95	2.4	-10.71
1997	1.90	7.68	-10.71	2.7	12.53	2.4	0.00
1998	-9.40	0.27	-200.00	5.2	-22.17	2.3	36.00
1999	-2.30	1.40	-181.33	2.8	-15.55	2.3	-11.76
2000	6.00	4.78	36.07	1.6	0.00	2.6	3.33
2001	1.10	4.45	-95.18	1.4	-5.89	3.0	16.13
2002	2.50	1.89	925.00	1.8	0.00	3.3	-2.78
2003	4.00	8.37	26.83	1.1	-6.10	2.4	-8.57
2004	4.80	11.74	36.54	1.4	-0.33	0.7	9.38
2005	2.40	8.57	-29.58	3.0	3.68	2.2	0.00
2006	1.90	9.56	18.00	3.6	8.39	1.8	0.00

Source: The Malaysia House Price Index/Economic Reports/Property Market Report

5.1 Sample Characteristics

Below are graphs of dependent variable and independent variable used in this study:

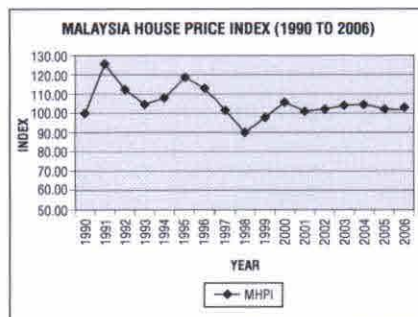


Figure 1: Malaysia House Price Index from 1990 to 2006

Figure 1 shows the trend of annually MHPI movement from 1990 to 2006. The MHPI trend was moving upward indicating the

Malaysia house price has increased with strong performance from 1990 to 1991. After 1991 the property market dropped from 1991 to 1993 than picked up towards 1995 but decreased again for the period of 1995 until 1998 when the country was affected by economic turmoil. The property market fared better from 1999

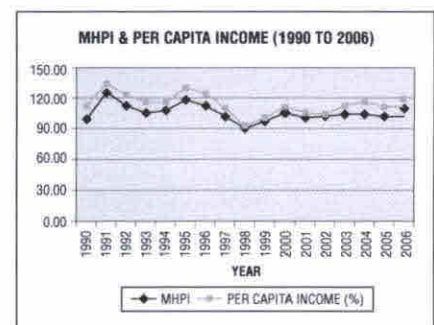


Figure 2: MHPI & Per Capita Income From 1990 to 2006

to 2000 with a slight decrease in 2001 but moved on quite stable growth up to 2006.

The graph shown in Figure 2 showed that the statistics of per capita income has grown up from 1990 to 1991. This increasing and decreasing trends are in tandem with house price movement from 1990 to 2006. House price performance is quite stable from 2000 until 2006 but per capita income was slightly on the increase during this period.

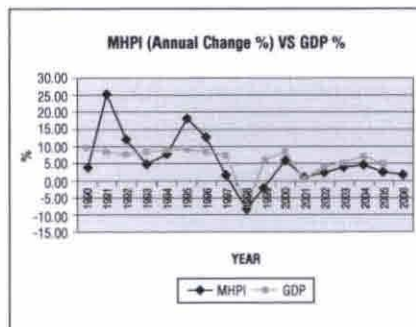


Figure 3: MHPI (Annual Change % VS. Gross Domestic Product (GDP) From 1990 to 2006

Figure 3 shows that from 1997 to 1998, GDP and MHPI have decreased to -ve 7.50% and -ve 10% respectively. This scenario happened during the economic downturn. After 2001, MHPI and GDP were moving in tandem and moving up until 2004 during which our national

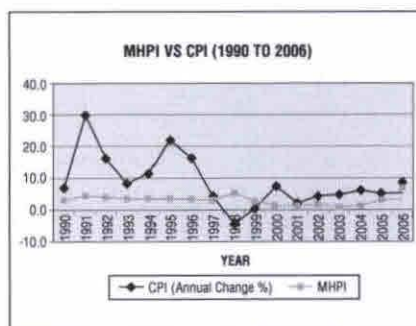


Figure 4: Consumer Price Index (CPI) From 1990 to 2006

economic have already recovered from the recession.

Figure 4 shows the trend line of CPI is stable in range of 1.0% to 5.2%. In year 1997 to 1999 the property market performance was decreased but the CPI was going up to 5.2%.

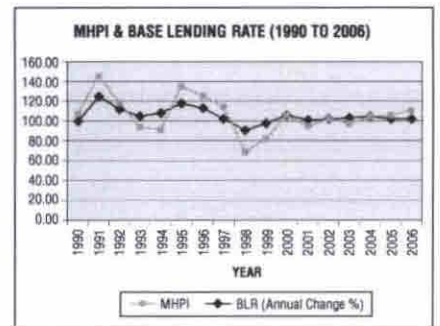


Figure 5: Average Base Lending Rate From 1990 to 2006

Figure 5, the average Base Lending Rate fluctuates within narrow range from 6% to 10% over a period of the year 1990 to 2006. This shows the interest rate is stable over the period, which is important to economic growth. The trend of base lending rate matches the MHPI trend, indicating that both are moving closely with each other.

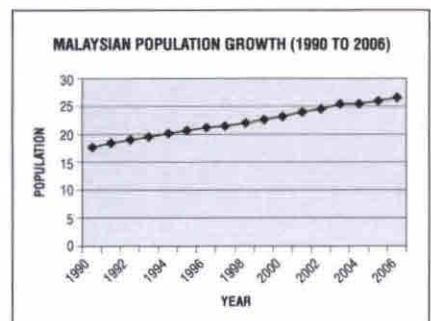


Figure 6: Population Growth From 1990 to 2006

The population growth increase progressively 1990 to 2006. For year 1990, our total population was 17.8

millions and 26.6 million for year 2006. It has increased to about 49% in 17 years. The larger the population size, the larger is the market coverage and the greater, say the house price. This will give some impact to demand of property in the market.

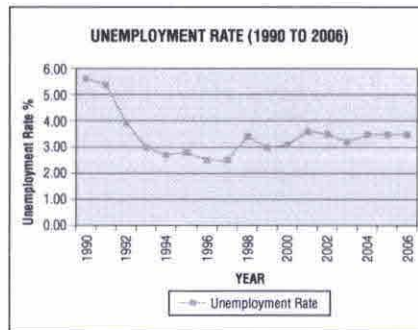


Figure 7: Unemployment Rate From 1990 to 2006

We can see from Figure 7, the unemployment rate has decreased from 1990 to 1997. From 1993 onwards, the unemployment rate was below the 4%. This implies that during that period, Malaysia is actually having a labour shortage problem, which is a problem to get a labour to work in this sector. So this situation will increase labour costs.

5.2 Correlation Analysis

To examine the impact of macro economic factors on house price, it is necessary to assess the rate at which this economic information is impounded or assimilated into house price performance. This can be determined by examining the correlation between MHPI and the percentage changes in each of the economic factors from 1990 to 2006. These resulting correlations give the magnitude of the positive or negative co-movements between these economic factors and the house price market.

Statistical test have been carried out using the dependent variable and six independent predictors. The results of each test are shown below. All statistical tests are performed using SPSS.

Table 2: Summary Output Of Correlation Analysis

Economic Factor (Annual Change)	Period of Lead (Year)			
	Same Year	One Year	Two Year	Three Year
Per Capita Income	.623(**)	.629(**)	.171	-.077
Gross Domestic Product	.050	-.059	-.024	-.339
Consumer Price Index	.181	.294	.557*	.656*
Base Lending Rate	.704(**)	.401	-.133	-.380
Population Growth Rate	.446	.120	.189	-.046
Unemployment Rate	-.363	-.413	-.195	-.023

Notation: 1. largest correlation for each economic factor is given in **bold**.

2. ** =significant at 5% level

5.3 Analysis Findings

Table 2 presents the correlation coefficient of the six leading economic factors and Malaysia House Price Index for a period up to three years.

From the correlation, it is clear that economic factors will lead the property market at different degrees, reflecting both short-term (up to 1 year) and longer term impact. The Base Lending Rate and Population Growth Rate have a correlation with MHPI within in the same year. Per Capita Income, Gross Domestic Product and Unemployment Rate are leading factor of MHPI by 1 year. While Consumer Price Index took 3 years to give an impact to MHPI.

As indicated above, three factors are highly correlated with MHPI. The factors are Base Lending Rate ($r = 0.704$), Per Capita Income ($r = 0.629$) and Consumer Price Index ($r = 0.656$) these three indicators will be further tested using MRA.

The maximum Base Lending Rate (BLR) correlation ($r = 0.704$) was achieved within the same year indicating a short-term impact, with these correlation being significantly less at the other lead periods in excess of a year. It shows that the BLR will give a strong impact to house price performance.

The maximum correlation for Per Capita Income ($r = 0.629$) was achieved at a lead of 1 year to indicate a short-term impact. This indicates that house price index and per capita income have a strong co-movement about 62.9%.

The maximum correlation for Consumer Price Index ($r = 0.656$) was achieved at a lead of 3 year to indicate a long-term impact. This indicates that house price index and Consumer Price Index have a strong co-movement about 65.6%.

From the above we can see that income is a very important determinant of house demand which in turn affect house price. When people receive higher income, their purchasing power increases which include purchase of houses. However, the analysis also indicates that the have price change lagged by one year. As for Gross Domestic Product, the negative effect is shown at ($r = -0.59$) which explain that the price decrease after one year.

Unemployment Rate has a negative coefficient correlation of -0.413 at lead one year. Unemployment Rate is the inverse measurement of stable income generation power, which will indirectly affect the purchasing power. The high negative r-value reveals that the lower the unemployment rate, the higher the house price index. This is understandable. When the unemployment rate was very low (less than 4%) it shows that people can find jobs with a secured income and have purchasing power. One of their options is to buy a house. This will increase the demand and house price will increase.

From 1993 onwards, the unemployment rate was below the 4.0%. This implies that during the period, Malaysia is facing has a labour shortage, which is a problem in getting workforce in this sector. So this situation will increase labour costs and indirectly will increase the house price in the long term. MHPI is correlated with

Consumer Price Index with moderate r-value (0.656) which was achieved at a lead of 3 years indicating a long-term impact.

The r-value of Population Growth is 0.446 with lead in the same year indicating a moderate positive co-movement between the MHPI and population growth rate. From the property market investment perspective, when the population increases, demand for property especially housing increases as well (positive relationship).

5.4 Multiple Regression Analysis

Summary output of multiple regression analysis for the six independent variables

Table 3: Multiple Regression Analysis

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-1.399	3.402		-4.11	.689
Per Capita Income	1.007	.342	.480	2.941	.013
Base Lending Rate	.414	.101	.623	4.095	.002
Consumer Price Index	.102	1.259	.014	.081	.937

a. Dependent Variable: Malaysia House Price Index

From the above results, a preliminary multiple regression model is established as below.

MHPI = -1.399 + 1.007 Per Capita Income (lead 1year) + 0.414 Base Lending Rate (same year) + 0.102 Consumer Price Index (lead 3 year)

$R^2 = 0.796$

The multiple 'R' again indicates size of the correlation between the observed outcome variable and the predicted outcome variable (based on the regression equation). R^2 or the coefficient of determination again indicates the amount of variation in

the dependent scores attributable to all independent variables combined. The R-square value is an indicator of how well the model fits the data (*e.g.*, an *R-square* close to 1.0 indicates that we have accounted for almost all of the variability with the variables specified in the model).

From the above analysis, the coefficient of determination $R^2 = 0.796$ indicates that about 79.6% of the MHPI variation is explained by the multiple regression model. The remaining 20.4% is unexplained. Negative coefficient indicates decrease in MPHI and while positive coefficient in the predictors will increase the MHPI. Correlation-coefficient indicates change in MHPI when the independent variable changes by one unit.

Test of significance of the independent variable are carried out in the analysis and the results are shown in the above summary output. From the t-test two independent variables which are Per Capita Income (*t-test* = 2.941) and Base Lending Rate (*t-test* = 4.095) are significant.

5.5 Predictive model of house price performance.

Previous studies attempted to model the relation between economic factors and commercial property performance (Newell and David, 1996) with a range of leading economic indicators on Australian commercial property performance. The study indicated that the performance of Australia commercial property are seen to be closely linked to economic activity, both domestic and international. Most economic factors achieved their maximum impact within one year.

Table 3 present the summary output of multiple regression analysis for the economic factor to develop a model to predict house price performance. The

equation below, present the a model to predict house price performance

$$\text{MHPI} = -1.399 + 1.007 x_1 + 0.414 x_2$$

x_1 = Per Capita Income (lead 1year)

x_2 = Base Lending Rate (same year)

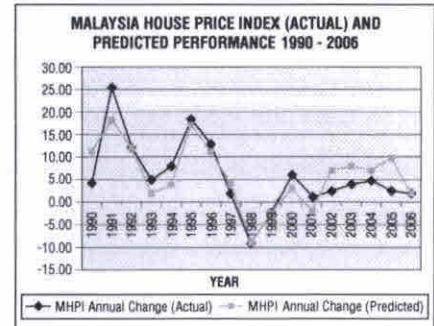


Figure 8: Malaysia House Price Index Actual And Predicted Performance: 1990 - 2006

Figure 8 shows actual and predicted of Malaysia House Price Index, demonstrate the good fit that is evident in these predictive models. The impact of different economic factors at various leads is clearly evident in these predictive models.

6.0 CONCLUSION

The performance of Malaysia house price is closely linked to the economic activity. This paper has clearly demonstrated the timing of the impact of these economic factors on Malaysia house price performance. From the correlation two economic factors which are Base Lending Rate and Population Growth rate achieved their maximum impact within a same year. Three economic indicators which are Per Capita Income, Gross Domestic Product and Unemployment Rate achieved their maximum impact within one year. Finally Consumer Prices Index gives an impact after three year.

From the MRA, there is sufficient evidence to conclude that, not all factors are significantly related to house price, but from all of six

economic indicators, two factors have a strong impact on Malaysia house price performance which are Per Capita Income and Base Lending Rate.

Predictive models of house prices performance can be developed by incorporating these economic factors at identified leads.

Insights concerning the impact of these economic factors and the use of these predictive models should enable this economic information to be used to forecast property market performance.

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