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- address areas of major interest and practical relevance to the real estate profession
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REFEREE PANEL

IMPACT OF SINGLE-TIER TAXATION SYSTEM ON DIVIDEND RETURNS OF INDIRECT PROPERTY INVESTMENTS IN MALAYSIA

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Abstract

The Budget 2008 has proposed to replace the existing dividend imputation system with a single-tier dividend tax system as part of the tax reform process to achieve efficiency and simplicity. The adoption of single-tier system has important implications for both companies and investors receiving dividends from their share investments.

The new single-tier dividend system is compared with the former two-tier dividend imputation system to examine the tax effects on dividends declared by listed companies of the property, hotel and plantation sectors of Bursa Malaysia.

The after-tax dividend income under the single-tier system is also compared with the holding tax imposed on REIT income to examine the relative attractiveness of different indirect property investment options i.e. shares in the property, hotel and plantation sectors versus REITs.

Keywords: single-tier dividend system, indirect property investment, REITs

Introduction

In general, there is a growing international trend to integrate corporate and personal tax so that double taxation is avoided. The Budget 2008 announced that as of 1st January 2008, the tax treatment of corporate dividends will be changed from the dividend imputation system to single-tier system. The single-tier or one-tier system is a move to reform the current imputation corporate tax system towards the direction of simplifying the Malaysian tax system.

The changed in the taxation on dividends will have implications on individual investors, institutional investors and companies that received dividends from listed companies and for companies that make dividend payments.

The dividend imputation system

Under the imputation system, a company pays tax on its annual chargeable income. The tax paid is credited into its imputation account (i.e. Section 108 account). The company can then franks dividend out of the imputation credit. The company can only pay franked dividends based on the credit it has accumulated. A shareholder who receives the dividend will need to include the dividend as part of his income in computing his taxable income. The tax paid by the company is given as a credit

to the shareholder. In another words, the shareholders are taxed on gross dividend with tax credit given. For shareholder who is not liable to income tax e.g. pensioners and retirees, the full credit would be refunded to him.

The system is costly as it involves significant costs of administration to ensure tax compliance to keep track of taxes paid. Another disadvantage of this system is that non-resident investors do not benefit from the tax credits enjoyed by the resident investors.

The dividend imputation system is currently still applicable until 31st December 2013 on all other listed companies apart from REITs in Bursa Malaysia.

New single-tier dividend system

Under the single-tier system, tax is only levied on the profits of the company and is then free to distribute the after-tax profits whenever it wishes without having to link the dividends to the corporate tax that the company has paid. The dividends received by the shareholders are exempted from income tax. For implementation, the single-tier system is under a six-year transitional period (1st January 2008 to 31st December 2013) to allow companies to use their existing tax credits to declare dividends. Companies that wish to pay single-tier dividends are required to exercise a one-time option in writing which is irrevocable. Table 1 shows the characteristics of the single-tier system and the imputation system. Table 2 shows the after tax dividend income under the two systems.

Advantages of the single-tier system

This system is administratively easier to monitor. Shareholders do not need to report such corporate dividends and claim corresponding tax credits. The system achieves simplicity resulting in efficiency savings for both businesses and the tax authority. It plugs up tax leakages since no tax refunds are made.

The significant feature of the single-tier system is that there is no restriction on the flow of dividends to shareholders and capital profits can be flowed out to shareholders without any hindrance. This feature would appeal to regional and multi-national companies seeking a holding company location in Malaysia.

Disadvantages of the single-tier system

The disadvantage of this system is that for taxpayers, whose marginal tax is lower than the corporate tax rate will no longer receive a refund of the differential taxes paid. For example, individuals on a top marginal personal tax rate of 28% as against a 25% corporate tax rate in 2009, the individual investors would suffer from a 3% tax differential. These individuals are disadvantaged as they will not be able to get refunds of the corporate tax on the dividends.

Under the single-tier system, all investors will pay tax at the highest corporate tax rate i.e. 26% in 2008 and 25% in 2009. In particular, this new system is disadvantageous to certain groups of investors identified below:

(a) for investors whose marginal tax is lower than the corporate tax rate.

(b) charities, pension funds and other tax-exempt bodies that do not pay any taxes.

(c) investors who borrow to finance the purchase of their share investment will not be entitled to any tax relief for the funding costs e.g. interest expense.

Table 1: Characteristics of the dividend imputation system and single-tier system.

Features	Imputation system	Single-tier system
(a) Dividends	Dividends are taxable on the recipients.	Dividends are exempt from income tax.
(b) Tax credits	Yes	No
(c) Section 108 franking credit	Section 108 franking credits is accumulated from the tax paid by the company.	The company distributing the dividends is free to distribute profits to shareholders as it no longer requires Section 108 franking credits in order to distribute dividends.
(d) Distribution of capital gains as dividends	Dividends cannot be distributed from capital gains received by the company, without suffering tax.	Allows the distribution of capital gains as dividends.
(e) Tax administration	Incur higher compliance and administration costs.	Easier to administer.

Table 2: After tax dividend income under dividend imputation system and single-tier system.

	Dividend imputation system		Single-tier system	
Shareholder	**Corporate (RM)**	**Individual[2] (RM)**	**Corporate (RM)**	**Individual[2] (RM)**
Shareholder's dividend income[1]	100	100	100	100
Company tax (26%)	26	26	26	26
Dividend received by shareholder	74	74	74	74
Tax	26	28	0	0
Imputation credit	26	26	Not applicable	Not applicable
Net shareholder tax	0	2	0	0

Note

1 Assuming a dividend of RM100.
2 Assuming the individual has a personal income tax rate of 28%.

(d) all unit trust investors who receive distributions which contained dividends will now suffer tax at the corporate rate.

Effect of single-tier system on dividends from indirect property investments

Under the single-tier system, there would be different net tax effects for different individual investors on the dividend income received depending on the individuals marginal rate of tax:

(a) where an individual investor's marginal rate of tax is less than 26% (for year 2008), the investor will not be entitled to a tax refund;

(b) where an individual investor's marginal rate of tax is at 26%, the investor may find share investments to be less attractive compared to other investment instruments e.g. bank deposits and certain bonds which attract zero percentage tax.

The single-tier system applies equally on indirect property investments in the form of listed companies in the property sector (i.e. listed property development companies and property investment companies), hotel sector and plantation sectors. These listed companies generally have a dividend payout policy and is expected to pay franked dividends under the transitional period. Another reason is that often the

level of a company's dividend payments would correlate with its profitability and the need to retain earnings for future business expansion and for making acquisitions. Under this scenario, it would have accumulated a large tax credit balance which will enable it to continue to pay franked dividends. In addition, a company paying a 10% franked dividend will pay out less cash than it paid a single-tier dividend at the same rate. This is a further reason for these listed companies for not switching to the single-tier system during the transitional period until the due date.

REIT and dividend income

Following the announcement of the Malaysian 2007 Budget on 1st September 2006, unitholders who receive distribution from REIT after 1st January 2007 are subject to their respective tax rates as follows:

(a) non-corporate investors and local institutional investors are subject to a final withholding tax at the rate of 15% from 2007 to 2011;

(b) foreign institutional investors are subject to a final withholding tax at the tax rate of 20% from year 2007 to 2011;

(c) foreign corporate investors are subject to a final withholding tax at the rate of 27%(2007) and 26%(2008);

(d) local corporate investors are subject to the existing treatment and tax rates. Currently dividends declared by REITs are subject to a withholding tax of 15% for individual and institutional investors. The 15% withholding tax for REITs is lower than the corporate tax rate of 26% in 2008 and 25% in 2009. Thus among investment options that provide consistent dividend incomes, REITs has a more favourable position since the withholding tax (15%) is lower than the corporate tax (26%) (refer Table 3).

Whilst Table 3 shows a higher after tax dividend income under the single-tier system than the REIT withholding tax regime, however the amount of after tax income of different individual investors may vary as their personal income tax rate differs. Table 4 shows the impact of different personal income tax rate on the after tax income for dividends earned from indirect property investment options under the single tier system and the RIET tax regime.

Results from Table 4 shows that individual REIT investors with an income tax bracket of 24% and below enjoy a higher after tax income of 2.7% to 35.14% higher than dividends received under the single-tier system.

However for individual REIT investors with an income tax bracket of 27% and 28% will suffer from a lower after tax income ranging from 1.35% to 2.7% compared to dividends received under the single-tier system.

Conclusion

Under the single-tier system, investors in indirect property investments in the form of shares in the property, hotel and plantation sectors may receive lesser dividend income from these share investments as shareholders will no longer receive tax credits with their dividend income. This means tax-exempt bodies and individuals will no longer receive such refunds and therefore will suffer from a lower after tax dividend income.

Table 3: A comparison of after tax income on dividends of listed companies under the single-tier system and REIT withholding tax regime.

	Single-tier system		REIT withholding tax regime	
Shareholder	Institutional investor (RM)	Individual[2] (RM)	Institutional investor (RM)	Individual[2] (RM)
Shareholder's income1	100	100	100	100
(a) Company tax (26%) (b) Withholding tax for REIT (15%)	26	26	 15	 15
Dividend received by shareholder	74	74	85	85
Income tax rate	0	0	28	28
Net income	74	74	57	57
Imputation credit	Not applicable	Not applicable	15	15
After tax income	74	74	72	72

Note
1 Assuming a dividend of RM100.
2 Assuming the individual has a personal income tax rate of 28%.

Table 4: A comparison of after tax income for dividends receivable from listed indirect property companies (single tier system) and REITs (REIT tax regime).

PROPERTY SHARES		REIT				
Single tier system (RM)	After tax amount receivable (RM) (a)[1]	**Dividend imputation system** (RM)	Income tax bracket (%)	After tax amount receivable (RM) (b)[2]	Difference (c) = (b) - (a)	Percentage higher (c)/(a) x 100%
100	74	100	Tax exempt	85	11	14.86
100	74	100	0	100	26	35.14
100	74	100	1	99	25	33.78
100	74	100	3	97	23	31.08
100	74	100	7	93	19	25.68
100	74	100	13	87	13	17.57
100	74	100	19	81	7	9.46
100	74	100	24	76	2	2.70
100	74	100	27	73	-1	-1.35
100	74	100	28	72	-2	-2.70

Note
1 Company tax in 2008 is 26%.
2 Withholding tax for REIT is 15%.
3 Appendix 3 shows the chargeable income and personal income tax rate.

When compared to REITs the net after tax amount received by investors with income tax bracket of 24% and below is lesser when their share investments are made in the property, hotel and plantation sectors. But for individual investors with a higher income tax bracket of 27% and 28% will enjoy a higher after tax dividend income under the single tier system compared to the REIT withholding tax regime.

Whilst REIT remains a favourable investment yielding high dividend distributions, a lower withholding tax on distributions by REITs will make REITs a more attractive high yield indirect property investment option.

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Appendix 1: Income tax schedule (2007)

Category	Chargeable income range (RM)	Tax rate (%)	Income tax (RM)
A	0 to 2,500	0	0
B	2,501 – 5,000	1	1 – 25
C – D	5,001 – 20,000	3	26 – 475
E	20,001 – 35,000	7	476 – 1,525
F	35,001 – 50,000	13	1,526 - 3,475
G	50,001 – 70,000	19	3,476 – 7,275
H	70,001 – 100,000	24	7,276 – 14,475
I - J	100,001 – 250,000	27	14,476 – 54,975
K	>250,000	28	54,976 and above

DIVERSIFICATION EFFECTS OF INDIRECT REAL ESTATE IN A MIXED ASSET PORTFOLIO: THE MALAYSIAN EXPERIENCE

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Abstract

The high percentage of world investable wealth held in property coupled with price volatility and poor returns in the equity trading market have make investors turn to property for higher return. With the introduction of Modern Portfolio Theory, portfolio investments have become the norm whereby investors seek to achieve higher portfolio returns at a given risk level or lowest risk at a given level of return.

The intent of this study is to present the benefits of including indirect real estate in a mixed asset portfolio of stocks, bonds and cash using the Malaysian data. Indirect real estate is proxed by REITs and property share.

Different return interval (monthly, quarterly, semiannually and annually) for two study period (12/1995-12/2007- whole study period; 12/1998-12/2007- post crisis period) are used to analyze the benefits of including these two indirect real estate in a portfolio. First, by applying the optimal portfolio without the indirect real estate, and then, with the inclusion of indirect real estate for both the study periods.

Low correlation between assets class is one factor which determines the attractiveness of an asset for inclusion in a mixed asset portfolio. The mean-variance criterion shall be applied in which investors are assumed to try to achieve highest return of the portfolio based on average returns and standard deviations as measure of risk. Optimal portfolio returns is computed based on equal investments of asset class and highest Sharpe ratio.

Although earlier international and local studies suggested that REITs provide a good diversification benefits in a portfolio, the findings showed that Malaysian REITs is less appealing compared to stocks, bonds and cash. Property share as expected have very high correlation and underperformed stock and are more volatile making it a less attractive investment option.

The conclusion drawn is that indirect real estate in Malaysia does not provide diversification benefits. REITs may be considered for inclusion during good economic period, but not otherwise. Historical data computed for analysis should not be in the longer period as it erodes the effectiveness of the computation. A shorter period of analysis allows changing investment environment to be taken into consideration.

Keywords: indirect real estates, mixed asset portfolio, REITs, property share, Malaysia

1.0 INTRODUCTION

The main asset classes of investments are stocks, bonds and fixed income investments while real estate is grouped under alternative investments. However investments in real estate have begun to gain popularity and real estate is becoming a main asset class of investments. There are various contributing reasons such as real estate is one of the highest percentage world investable wealth, availability and easy access to investing in securitized property, the dismal performance of stocks and bonds and the introduction of modern portfolio theory and portfolio investments.

According to Goetzmann and Ibbotson (2006), at the end of 1984, real estate comprised of 35.6% of the total investable wealth, followed by equities and bonds at 23% and 19.2%. Thus, investing in property should commensurate with the percentage of total investable wealth which it represents.

The increasing number of securitised property which is more liquid and readily accessible in the market such as REITs and listed property trusts has increased interest in real estate investments. Ciochetti, Craft and Shilling (2002) found that institutional investors have a preference for liquid investments like REITs and a declining preference for illiquid assets like direct real estate. This is possibly due to its liquidity characteristics.

The dismal performance of stock and bonds investment especially during the 1960s and 1970s as evidenced by the US markets has make investors turn to other alternative investments which provides higher returns on investments. Property, having inflation hedging characteristics provides investors a form of security against escalating inflation rate and provides higher return on investments.

The introduction of modern portfolio theory by Harry Markowitz in 1952 has also contributed to the increasing popularity of real estate as an asset class in which real estate increases portfolio returns especially its low correlation with other asset class has make it a good diversifier in a mixed asset portfolio.

The purpose of this paper is to examine the effect of including indirect real estate investment in a mixed-asset portfolio using Malaysian data. Focusing on the main issues mentioned earlier, the objectives are:

(1) To investigate the risk and return characteristics of REITs and Property Share under different study period and different return interval; and

(2) To examine the effect of including indirect real estate investment in a mixed-asset portfolio in a whole period and one sub period

It is hoped that findings from this paper will enable investors and researchers to properly assess indirect real estate performance in a mixed-asset portfolio. The findings also should enrich the empirical literature on the benefits of diversification of indirect real estate in the Malaysian context of investments. For institutional investors, the risk and return profiles of the asset class and its performance in different economic cycle would lead to policies that can reduce risk and enhance funds values, thereby maximizing shareholders wealth.

This paper is structured as follows. Section 2 reviews the literature on investments, risk and returns, correlations with other asset class and benefits of indirect real estate in a mixed-asset portfolio. Section 3 discussed the methodology and data. Section 4 reports the empirical and analyses the results. Section 5 concludes the paper.

2.0 LITERATURE REVIEW

Many researches have been undertaken to discuss the effect of including indirect real estate in a mixed asset portfolio using data in US, Europe, Australia as well as in Malaysia.

In Malysia, investments in indirect real estate can be in many forms particularly REITs and property shares. Investment in property trust in Malaysia was first in the form of unlisted property trust in 1989. The two property trusts were Amanah Harta Tanah PNB (AHP) and Mayban Property Trust Fund One (MPT). Later when Bank Negara Malaysia (BNM) approved the regulatory framework for listed property trusts, Arab Malaysian First Property Trust (AMFPT) became the first property trust listed on Kuala Lumpur Stock Exchange on 28 Sept. 1989. This is followed by the listing of First Malaysia Property Trust (FMPT) in November 1989, AHP in December 1990 and MPT in March 1997. Later when the new guidelines on Real Estate Investment Trust was introduced in 2005 these listed property trust are then known as REITs. Currently there are thirteen REITs listed in the stock exchange.

Property company shares are based on property shares index in the property sector of the Bursa Malaysia.

Risk and Return of Indirect Real Estate

Previous computations of returns and standard deviations are tabulated in Table 2.1 below. For comparisons, the monthly and quarterly risk and return in column A and B are annualized in column C. The performance of real estate securities varies quite substantially from one country to another; from one period to another; and from one asset class to another.

Generally, US, UK, France and Australia being a matured market, record steady returns and less variability of returns. On the other hand, established markets in Asian countries such as Hong Kong, Japan and Singapore generally recorded large variability.

In presenting the returns and variability of returns of a matured, established and emerging market, the returns and variance of Australia, Japan and Malaysia are discussed below.

Australia recorded annual average returns between 7.31% - 22.15% and variability of returns between 10.20% - 27.68% for various period of study between 1986 and 2004, and for different types of securitized real estate. Japan recorded annual average returns between – 2.37% to 5.59% and variability of returns between 29.20 to 32.22% for various periods between 1976 and 2004. Malaysia recorded annual average returns of between 3.66% - 23.61% and variability of returns between 22.17% to 114.67% for various periods between 1991 and 2006.

The long study period from 1976 to 2006 covers several economic situation which one way or another affects the world financial market. The 1987 market crash was a global phenomenon which affects the whole world, while the Asian Financial Crisis in 1997 affects most of the emerging markets in Asia. There are however some events peculiar to individual countries such as the real estate bubble in Japan in 1989 which causes a price decline of about 70% in the country (Kishore, 2007). Such economic happening affects countries in the world and these differentiate the returns and variability of returns of the securitized real estate.

There are few possible reasons for the difference in the risk and returns characteristics between the matured market and the new established market. In a matured market, investors perceived

Table 2.1: Risk and Return of Securitised Real Eatate

Country	Period	Asset Class	Monthly		Quarterly		Annual		Reference
			Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	
Australia	1990-2004	Securitised Real Estate	0.59%	2.96%	5.13%	13.84%	7.31%	10.25%	Hoesli and Moreno (2007)
	1976-1998	Indirect Real Estate					22.15%	27.68%	Stevenson (2001)
	1986-2001	Domestic R. Estate Stocks					16.00%	10.20%	Hoesli, Lekander and Witkiewicz (2004)
France	1990-2004	Securitised Real Estate	0.40%	3.69%	2.34%	16.18%	4.91%	12.78%	Hoesli and Moreno (2007)
	1976-1998	Indirect Real Estate					9.69%	32.36%	Stevenson (2001)
	1986-2001	Domestic R. Estate Stocks					5.20%	17.00%	Hoesli, Lekander and Witkiewicz (2004)
Hong Kong	1990-2004	Securitised Real Estate	1.19%	11.44%	5.19%	22.78%	15.25%	39.63%	Hoesli and Moreno (2007)
	1976-1998	Indirect Real Estate					22.43%	45.56%	Stevenson (2001)
Japan	1990-2004	Securitised Real Estate	-0.20%	8.43%	1.37%	16.11%	-2.37%	29.20%	Hoesli and Moreno (2007)
	1976-1998	Indirect Real Estate					5.59%	32.22%	Stevenson (2001)
UK	1990-2004	Securitised Real Estate	0.29%	5.25%	3.58%	10.84%	3.54%	18.19%	Hoesli and Moreno (2007)
	1976-1998	Indirect Real Estate					15.11%	21.68%	Stevenson (2001)
	1986-2001	Domestic R. Estate Stocks					11.70%	28.70%	Hoesli, Lekander and Witkiewicz (2004)
US	1990-2004	Securitised Real Estate	0.66%	4%			8.21%	13.86%	Hoesli and Moreno (2007)
	1976-1998	EREITs			3.94%	6.62%	16.72%	13.24%	Stevenson (2001)
	1/1976 - 6/1993	NAREIT Equity	1.46%	3.85%			19.00%	13.34%	Mueller, Pauley and Morrill (1994)
	1972-2002	EREITs					12.40%	18.00%	Waggle & Moon (2006)
	1980-2002	REITs	0.9875%	3.5737%			12.52%	12.38%	Lee & Stevenson (2005)
	1986-2001	Domestic R. Estate Stocks					10.60%	20.00%	Hoesli, Lekander and Witkiewicz (2004)
Singapore	1990-2004	Securitised Real Estate	0.81%	12%			10.16%	39.94%	Hoesli and Moreno (2007)
	1976-1998	Indirect Real Estate			3.51%	19.83%	14.80%	39.66%	Stevenson (2001)
Malaysia	1992-2002	LPT					23.61%	114.67%	Hishamuddin et al (2003)
	1/91-12/06	Property Share	0.003	0.107			3.66%	37.07%	Lee & Ting (2008)
		REITs equal weighted	0.013	0.218			16.77%	75.52%	
		REITs value weighted	0.004	0.064			4.91%	22.17%	

REITs more like a typical equity play, a growth play and not an income play or a longer term hedge against the markets. Thus, established REITs markets are anti-cyclical and offered long term yield and not subjected to cyclical ups and downs of the market, which is reflected in its less volatile risk.

Another possible reason for the volatility is the relative size. The money movements in matured market which are relatively bigger compared to new established market would have cause minimal change and volatility, but would cause substantial change and volatility in the new emerging markets due to the smaller market capitalization of the stock markets. In 2008, the market capitalization of Malaysian REITs stands at USD1.5 billion, in contrast with Singapore of USD19.5 billion and US of USD294.6 billion (Ernst & Young, 2008).

The infrastructure for securitized markets is still not well in place in emerging markets. Coupled with local factors such as transparency lacking in valuation process, few and far between property for investments due to landownership restrictions, lack of tax incentives, prime real estate in big cities largely owned by developers or corporate conglomerates and scarce sales transactions are some of the factors which causes the market to be more volatile.

Risk and Return of Other Asset Class

Idzorek, Barad & Meier (2007) documented the risk and return characteristics of different asset class of investments in US for the period from 1990 to 2005. Table 2.2 below records the returns and standard deviations of Global Real Estate which is represented by FTSE EPRA/NAREIT Global Real Estate Index (representing eligible real estate stocks worldwide) and its three regional sub indices along with other traditional asset class.

Global Real Estate stocks returns are slightly lower than large and small cap stocks returns, but performed better than bonds and cash.

Table 2.2: Historical Returns and Standard Deviations, 1990-2005

Asset Class	Returns	Standard Deviations
Cash	4.23%	1.88%
U.S. Bonds	7.50%	5.61%
Non U.S. Bonds	8.13%	10.62%
U.S. Large Cap Stocks	11.95%	17.89%
U.S Small Cap Stocks	12.32%	19.72%
Non U.S. Stocks	6.82%	19.37%
Global Real Estate	**11.36%**	**24.77%**
North American Real Estate	16.97%	20.44%
European Real Estate	9.53%	23.81%
Asian Real Estate	11.58%	32.56%

Source: Idzorek, Barad & Meier (2007)

In Australia, Newell & Wen (2007) tabulated the risk and return of LPTs between Q3:1995-Q4:2005 which was calculated based on quarterly returns, as in table 2.3:

The LPTs returns are higher than the stock shares and bonds return. It also registered less variability at 8.09% compared to stocks of 10.91%. Bonds returns as expected registered slight variability at 1.32%.

Risk and Returns of Malaysian LPTs

Table 2.4 tabulates the risk and returns of Malaysian LPTs.

Kok & Khoo (1995) analysis is for the period of 1/1991 – 3/1993 and 1/1991 - 3/1994. They found that generally Listed Property Trust, LPTs underperformed the market portfolio which is proxied by Kuala Lumpur

Table 2.3: Historical Returns and Standard Deviations, Q3:1995- Q4: 2005

Asset Class	Returns	Standard Deviation
LPTs	13.65%	8.09%
Shares	12.58%	10.91%
Bonds	7.51%	1.32%

Source: Newell and Wen (2007)

Table 2.4: Malaysia's LPTs Performance

Data Interval	Period	Measures	Property Trust				KLCI	MHPI	Reference
			AHP	AMFPT	FMPT	Average			
Weekly	1/1991-11/1993	Sharpe Index	0.025	0.046	0.127	0.066	0.282	-	Kok & Khoo (1995)
	1/1991-3/1994	Sharpe Index	0.141	0.118	0.147	0.135	0.176	-	
Annual	1991-1998	Sharpe Index	0.225	0.030	0.201	-	0.044	0.187	Ting (1999)
		Annual Return	52.870	9.270	36.130	-	9.17	9.27	
		Annual Risk	218.88	70.46	155.13	-	43.36	10.63	
	3/1991-3/2000	Annual Return	24.68	5.38	7.40	-	15.03	-	Newell, Ting & Acheampong (2002)
		Annual Risk	85.80	36.60	41.52	-	39.12		
			•	LPT	FD	TB	KLCI	MGS	
Annual	1992-2002	Annual Return		23.61	5.73	4.75	7.36	5.24	Hishamuddin et al (2003)
		Annual Risk		114.67	2.24	1.62	36.87	0.02	
Monthly	1/91 – 12/06			Value Weighted	Equal Weighted				Lee & Ting (2008)
		Means Std Deviation		REITs	REits	Prop. Share	Stocks	Bonds	
				0.004	0.013	0.003	0.007	0.004	
				0.064	0.218	0.107	.080	0.002	

- LPT- Listed Property Trust
- FD – Fixed Deposit
- TB – Treasury Bill
- KLCI – Kuala Lumpur Composite Index
- MGS – Malaysian Government Securities

Composite Index (KLCI) in both periods. The average Adjusted Sharpe Index for period 1/1991-11/1993 is 0.066 compared to the market portfolio of 0.282. Similarly, the average Adjusted Sharpe Index for period 1/1991 -3/1994 is 0.135 compared to the market portfolio of 0.176.

Ting (1999) compares the three LPTs with KLCI (representing shares) and Malaysian House Price Index, MHPI (representing direct properties - residential properties). Overall, LPTs performed better than shares but they are very volatile with standard deviation recorded between 70.46 – 218.88 for the period 1991-1998. It should be noted here that the KLCI was subject to over speculation period during Dec 1993 – Feb 1994, which distorts the risk and return profile of LPTs.

Hishamuddin et al (2003) analysed LPTs data from 1992-2002 on an annually basis comparing it with other asset class. Their findings showed that LPTs has the highest return and risk compared to other asset class.

Lee & Ting (2008) analysed stocks, bonds, property share and REITs performance from 1/1991 – 12/2006 based on monthly basis. The equally-weighted REITs index provides the highest returns of 15.6% but the value-weighted REITs index provides only 4.8% returns. The variability of returns for the equally-weighted REITs index appears to be the largest at 0.218 compared to stocks standard deviation of 0.080 and bonds of 0.107.

These mixed results show that under different study period, indirect real estate register different return and risk profile.

Correlations

Table 2.5 below show the correlation between indirect real estate with stocks, bonds and other asset class based on findings from previous studies.

Generally, indirect real estate are highly correlated with stocks but lowly correlated with bonds and treasury bills.

The correlation coefficient between securitized real estate and stocks in US and Australia is less compared to Hong Kong, Japan and even in Singapore and UK (UK REITs was launched in January 2007).

As for Malaysian indirect real estate, Ting (1999) study of Malaysian LPTs for the period 1991-1998 showed that the correlation coefficient between the three LPTs with stocks is between 0.88-0.91, and with direct property between -0.2 to -0.26, indicating that LPTs is not a good diversifier with stocks.

Newell, Ting & Acheampong (2002) also found that the correlation coefficient of LPTs with stocks for the period 3/1991 – 3/2000 is between 0.56 – 0.77. The lower correlation coefficient with stocks in this period compared to the findings for 1991-1998 period indicates that LPTs will benefit mixed asset portfolio with stocks during poor economic situation (Asian Financial Crisis hit the region between 9/97 – 6/98). The correlation coefficient of LPTs with stock for 1992-2002 period is 0.8433, while with cash -0.1372, with treasury bill -0.0604 and with Malaysian government securities -0.0273. This indicates that LPTs is a good diversifier for all other asset class except stock.

A study by Lee & Ting (2008) for period between 1/1991 - 12/2006 found that the correlation coefficient between equal weighted REITs with stocks and bonds are moderately strong (around 0.500) and having low negative correlation with property share and bonds.

Table 2.5: Correlations Between Asset Classes

Country	Period	Assets correlated	Correlation Coefficient	Reference
US and world	1990-2005	Global real estate and Cash Global real estate and US Bonds Global real estate and US Large Cap Stocks Global real estate and US Small Cap Stocks	-0.48 0.04 0.22 0.48	Idzorek, Barad & Meier (2007)
Australia	Q3:1995 -Q4:2005	LPTs and Shares LPTs and Bonds Bonds and Shares	0.22 0.5 -0.22	Newell and Wen (2007)
Australia	1/1990 - 6/1997 7/1997 - 12/2004	Securitised real estate and stocks Securitised real estate and stocks	0.56 0.47	Hoesli and Moreno (2007)
Hong Kong	1/1990 - 6/1997 7/1997 - 12/2004	Securitised real estate and stocks Securitised real estate and stocks	0.95 0.87	"
Japan	1/1990 - 6/1997 7/1997 - 12/2004	Securitised real estate and stocks Securitised real estate and stocks	0.87 0.47	"
Singapore	1/1990 - 6/1997 7/1997 - 12/2004	Securitised real estate and stocks Securitised real estate and stocks	0.83 0.86	"
UK	1/1990 - 6/1997 7/1997 - 12/2004	Securitised real estate and stocks Securitised real estate and stocks	0.77 0.47	"
US	1/1990 - 6/1997 7/1997 - 12/2004	Securitised real estate and stocks Securitised real estate and stocks	0.51 0.27	"
US	1980-2002	REITs and Treasury Bill REITs and S&P500 REITs and US Government Bonds 5-7 years	-0.0304 0.4524 0.16972	Lee & Stevenson (2005)

Indirect Real Estate Performance in a Mixed-Asset Portfolio

If REIT performance is different from other financial investments performance, then adding REITs to a mixed-asset portfolio should have an impact on portfolio performance.

Mueller et al (1994), study the effect of REITs in a mixed asset portfolio of stocks, bonds and small cap, for data between January 1976 to June 1993. They found that REITs play a dominant role in increasing the risk-adjusted returns of a mixed asset portfolio at all risk levels. Adding REITs will yield additional historical returns of between 1 and 14 basis points per month or an annual increase in returns of between 12 and 168 basis points (without compounding) for the same level of risk.

Mueller & Mueller (2003) study the effect of inclusion of both public and private real estate in a mixed-asset portfolio of stocks and bonds for a five time periods, 5-, 10-, 15-, 10- and 25-year annual returns. It was found that both inclusion of public and private real estate in a mixed-asset portfolio simultaneously enhances efficiency gains over the entire risk return frontier.

Weight of REITs in optimal portfolios is large where in some cases it is up to 80% in some portfolios. Liang et al (1996) who study a period from first quarter of 1982 to the fourth quarter of 1993 however showed that the weights is in the range of 15%-20% for equity and apartment REITs.

Georgiev et al (2003) found that REITs are not suitable diversifiers for stock and bond portfolios as their returns seems to

incorporate a significant equity market component.

As Seiler, Webb & Myer (1999) pointed out after reviewing extant literatures on real estate diversification, they noted that REITs warrant inclusion in an optimal mixed-asset portfolio as it behaves more like small cap, as such having unpredictable returns and have high correlations with other asset classes, and REITs returns is significant in predicting unsecuritised return.

In the Malaysian context, using data from 1992 to 2002, Hishamuddin et al (2003) found that by including Listed Property Trust in a mixed asset portfolio has a positive effect on the efficient frontier. It provides higher return at the same level compared to a portfolio without LPTs. In other words, by including listed REIT in the investment portfolio would offer better performance.

Lee & Ting (2008) however finds that equal weighted REITs could offer some diversification benefits and return improvements for a mixed asset portfolio but not the value weighted REITs.

However, as Waggle & Moon (2006) found out, using different time interval return (monthly, quarterly, semiannually and annually) and estimation period have severe impact on optimal portfolio recommendations using the mean-variance analysis.

3.0 METHODOLOGY AND DATA

The mixed asset portfolio shall consist of stocks, bonds, fixed deposit and indirect real estate. Data will be collected for the period from 12/1995 to 12/2007. 1995 is taken as the start date to accommodate bond index which is available from 1/1994. As the country was affected by the Asian Financial Crisis, a sub period from 12/1998 to 12/2007 will be looked into. The results would provide a better picture of the effects of including indirect property during different economic scenarios i.e. during and after the Asian Financial Crisis.

- Stocks data is represented by the Kuala Lumpur Composite Index (KLCI) available from Bursa Malaysia. The data is also downloadable from Datastream. Available from 1980 onwards, it consists of daily index which records the last transaction price for the trading day.

- Bond data is sourced from MGS RAM-Quantshop Index Database available from the website http://www.quantshop.com/malaysian%20bond%20v1.htm.. There are various bond indices available from 12/2003 except the RAM Quantshop MGS index which is available from 1/1994 onwards. For this study, the RAM Quantshop MGS All Index shall represent the bond index.
- Fixed deposit data are extracted from Bank Negara Malaysia Reports. There are various term of fixed deposit rates available such as 1 month, 3 month, 6 month, 9 month, 12 month and 15 month duration, available daily from 7/1982. The rate for 6 months is adopted as it is the middle of the other durations and therefore would be representative.

- For indirect real estate, a simple price index for REITs will be constructed based on all thirteen available REITs, and for property share, data for property sector index in Bursa Malaysia is used.

- Risk free rate is represented by the Treasury bill discount rate for 3 months. The monthly data which is available from January 1986 was downloaded from Datastream. The risk free rate is applied to compute the optimal portfolio based on highest Sharpe ratio.

Returns and Standard Deviations

Total returns will be used in the computation, i.e. capital returns plus any dividend payout. According to Estrada (2005), monthly return intervals are most widely accepted in computing return intervals. However, Waggle & Moon (2006) study has shown that different return intervals yield different results and eventually different mixed asset portfolio composition.

For this study, the mean returns will be computed based on monthly, quarterly, semi-annually and annual returns. The monthly, quarterly and semi annual returns will be annualized using the following formula:

$r_A=(1+r_n)n - 1$

where rA is the annualized return

r_n is mean return for the return interval

^{n} is the number of periods there are per year

The standard deviations will be computed based on each of the four intervals and annualized using the following formula:

$\sigma_A = \sqrt{n}\,\sigma_n$

where σ_A is the standard deviation of the return interval

σ_n is the standard deviation for the subject return interval

n is the number of periods there are per year

Optimal Portfolio

In a mixed asset portfolio, the portfolio returns is a weighted average of the expected returns of individual securities or asset class comprised in a portfolio. However, the portfolio risk is not straight forward. There is a need to consider the relationship between the assets in the portfolio, i.e. the covariance of returns, which is used to calculate the portfolio variance. The standard deviation of a portfolio (SDp) is a square root of variance given by (in terms of two asset class) as follows:

$$SD_p = \{X2_1\, Var(R_1) + X^2\, 2\, Var(R_2) + 2X_1 X2Cov\,(R_1\, R_2)\}^{1/2}$$

To build an efficient set of portfolio based on Markowitz model requires three important parameters. These are expected returns, risk and correlation coefficient.

Correlation coefficient measures the strength of the (linear) relationship between two variables (Barua, Raghunathan & Varma, 1991) or series of numbers representing data of any kind. In terms of risk reduction, the correlation determines the extent to which risk can be reduced by combining stocks or different asset class in a portfolio. Therefore, even if one asset class is volatile, but if its correlation coefficient is low, it may lower substantially the volatility of a portfolio of investments which it is included in.

The correlation coefficient is computed as follows:

$$Corr_{xy} = \frac{Cov_{xy}}{SD_x\, SD_y}$$

Where;

$Corr_{xy}$ = correlation coefficient between x and y

Cov_{xy} = $E\{[x - E(x)][y - E(y)]\}$ = (covariance between x and y)

$SD_x\, SD_y$ = standard deviation of $_x$ multiply by standard deviation of $_y$

Diversification benefits shall be determined by analyzing the expected portfolio returns before and after inclusion of indirect real estate. A higher expected portfolio return or lower portfolio risk level after inclusion of indirect real estate in a mixed asset portfolio is considered as yielding benefits to the portfolio investment.

For this paper, optimal portfolio is those which provide the highest risk-adjusted returns based on Sharpe ratio and those which increase portfolio returns based on equal investments of assets.

The computation for Sharpe measure is as follows:

Sharpe measure = (Portfolio Return – Risk-Free Rate) / Std Deviation

4.0 FINDINGS AND DISCUSSIONS

Normality Test

Returns distribution of asset classes were tested for normality using Kolmogorov-Smirnov test in SPSS. The result is as in Table 4.1 below showed that fixed deposit and reits returns are not normally distributed.

Returns

The annualized returns as well as the semiannual, quarterly and monthly returns are tabulated in table 4.2 below. Generally, stocks and property share have similar returns trend in which the quarterly return intervals recorded higher average compared to the other returns intervals period. Bonds and cash returns did not differ much between the four return intervals for both study periods. REITs returns trends however differ between the two study periods. The returns did not differ much between the different interval returns during the whole study period behaving more like bonds and cash, but during the recent period, it behave more like stocks and property shares in which the quarterly returns interval is higher.

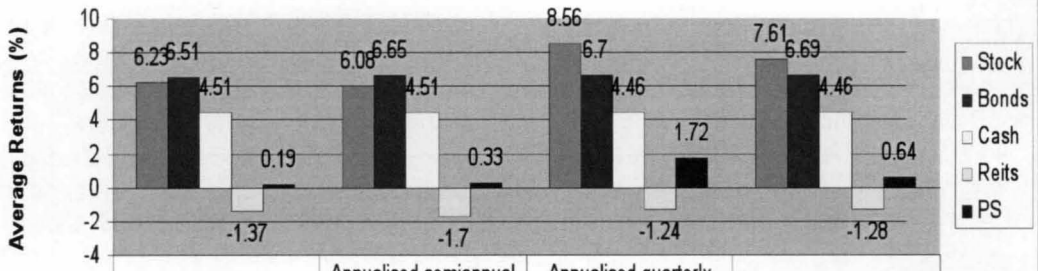
Returns for Whole Study Period (12/1995-12/2007)

The whole study period from 12/1995 – 12/2007 includes the Asian Financial Crisis of 1997/1998. The low returns especially the negative returns of REITs investment reflect the bad economic situation. REITs return was negative (-1.37 based on annual return interval). Bonds was the most attractive investment class providing highest return (6.51% based on annual return interval) followed by stocks at 6.23%, and cash at 4.51%. Property share too yield low returns at 0.19% throughout the whole study period. Figure 4.1 display the annualized returns based on semi, quarterly and monthly return intervals.

Table 4.1: Return Distributions of Asset Class

		Property Share	KLCI	Bonds	FD	REITs
N	Mean	167	167	167	167	167
Normal Parameters(a,b)		-.0005	.00471	.00489	4.61	-.0023
	Std. Deviation	.1056	.0797	.0102	1.930	.1001
Most Extreme Differences	Absolute	.086	.094	.112	.310	.175
	Positive	.086	.094	.112	.310	.175
	Negative	-.067	-.083	-.097	-.202	-.114
Kolmogorov-Smirnov Z		1.111	1.209	1.453	4.004	2.257
Asymp. Sig. (2-tailed)		.170*	.108*	.029*	.000	.000

* normal distribution (p-value of greater than 0.025)



	Annualised data	Annualised semiannual data	Annualised quarterly data	Annualised monthly data
Stock	6.23	6.08	8.56	7.61
Bonds	6.51	6.65	6.7	6.69
Cash	4.51	4.51	4.46	4.46
Reits	-1.37	-1.7	-1.24	-1.28
PS	0.19	0.33	1.72	0.64

Return Intervals

Figure 4.1: Annual Returns for Various Asset Classes Based on Different Return Intervals for Period 12/1995-12/2007

Returns for Post Crisis Period (12/1998 – 12/2007)

The recent period from 12/98 to 12/2007 reflects the improving economic situation. Stock recorded highest return among the four asset class (10.61% based on annual return interval and 20.58% based on quarterly return interval). Property share which are also stocks recorded high returns (6.97% based on annual return interval and 13.53% based on quarterly return interval). REIT too improved its performance for this post crisis period by providing 8.83% return based on annual return interval and 12.93% based on quarterly return interval. Bonds recorded slightly higher returns in the recent period (7.15% based on annual return interval). Cash is less attractive investments during strong economic period recording lower returns of 3.58% based on annual return interval.

Risk

The standard deviations for all four asset class are as in figure 4.3 and 4.4 below. Stocks, REITs and property shares are risky investments. In both periods, these three asset classes showed higher standard deviations of returns compared to bonds and cash. The standard deviation measured based on quarterly intervals for these three groups of `stocks' were higher among the four intervals. Bonds and cash are less risky. The low standard deviation in both periods showed that both bonds and cash are a better investment options for investments especially during bad economic situation.

Standard Deviation for Whole Study Period (12/1995-12/2007)

Based on quarterly interval for the whole study period, property shares are the most volatile investment, recording as high as 0.4064 standard deviations. Next is REITs which registered as high as 0.3598

Table 4.2: Means and Standard Deviation of Asset Class at Different Period Interval

	Stocks	Bonds	Cash	REITs	Prop Share	Stocks	Bonds	Cash	REITs	Prop Share
	12/1995 – 12/2007 (Whole Study Period)					12/1998 - 12/2007 (Post Crisis Period)				
1 Annual Returns										
Mean	6.23%	6.51%	4.51%	-1.37%	0.19%	10.61%	7.15%	3.58%	8.83%	6.97%
Std Dev.	0.2386	0.044	0.0196	0.3389	0.3410	0.1797	0.0473	0.7649	0.2765	0.2947
2 Annualised semi annual returns										
Mean	6.08%	6.65%	4.51%	-0.17%	0.33%	14.82%	7.46%	3.45%	11.51%	10.92%
Std Dev.	0.2487	0.047	0.0208	0.3406	0.3578	0.2017	0.0511	0.0058	0.3005	0.3226
Semi annual returns										
Mean	2.99%	3.27%	n.a.	-0.85%	0.16%	7.15%	3.66%	n.a.	5.60%	5.32%
Std Dev.	0.1759	0.0332	n.a.	0.2409	0.2530	0.1427	0.0361	n.a.	0.2125	0.2281
3 Annualised quarterly returns										
Mean	8.56%	6.70%	4.46%	-1.24%	1.72%	20.58%	6.90%	3.42%	12.93%	13.53%
Std Dev.	0.3419	0.0399	0.0196	0.3598	0.4064	0.325	0.0392	0.0051	0.3359	0.384
Quarterly returns										
Mean	2.07%	1.63%	n.a.	-0.31%	0.43%	4.79%	1.68%	n.a.	3.09%	3.22%
Std Dev.	0.1709	0.0200	n.a.	0.1799	0.2032	0.1625	0.0196	n.a.	0.168	0.192
4 Annualised monthly returns										
Mean	7.61%	6.69%	4.46%	-1.28%	0.64%	14.93%	6.54%	3.39%	8.83%	6.60%
Std Dev.	0.2825	0.0347	0.0201	0.2997	0.3581	0.2206	0.0289	0.0045	0.2587	0.2633
Monthly returns										
Mean	0.61%	0.54%	n.a.	-0.11%	0.05%	1.17%	0.53%	n.a.	0.71%	0.53%
Std Dev.	0.0815	0.01	n.a.	0.0865	0.1034	0.0637	0.0083	n.a.	0.0747	0.076

n.a.- not available

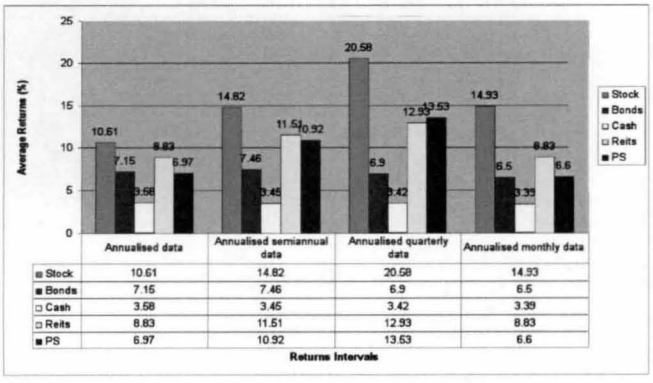


Figure 4.2: Annual Returns for Various Asset Classes Based on Different Return Intervals for Period 12/1998-12/2007

followed by stocks at 0.3419. Bonds and cash both registered 0.0399 and 0.0196 standard deviations respectively.

less volatility during good economic period after the Asian Financial Crisis. Based on quarterly interval, property share recorded

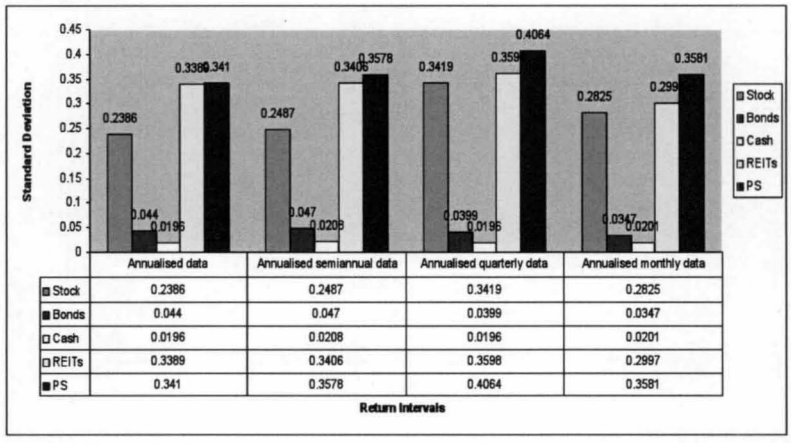


Figure 4.3: Standard Deviations of Various Asset Classes Based on Different Return Intervals for Period 12/1995-12/2007

Standard Deviation for Post Crisis Period (12/1998-12/2007)

The same trend continues in the second period for all asset class. Property share, REITs and stock registered high standard deviation between the asset class but lower than that registered for the whole study period. This indicates that there is

as high as 0.384 standard deviations followed by REITs at 0.3359 and stock at 0.325. Bonds and cash too recorded a lower standard deviations compared to the whole study period at 0.0399 and 0.0051.

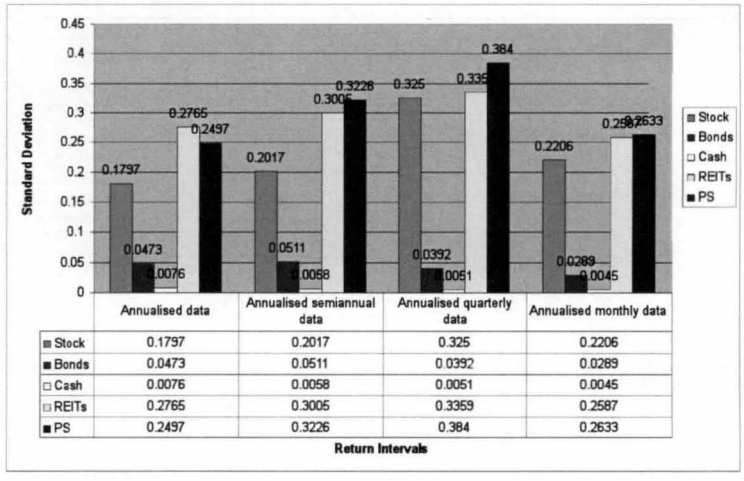


Figure 4.4: Standard Deviations of Various Asset Classes Based on Different Return Intervals for Period 12/1998 - 12/2007

REITS Correlations with Other Asset Class and Diversification Benefits

The following table shows the correlation coefficients of REITs with other asset class. However REITs correlations coefficient with cash is negative during the whole study period (between -0.234 to -0.542) and low positive (between 0.037 to 0.501) during post crisis period suggesting that REITs diversify better with cash during poor economic period.

Table 4.3: REITs Correlation Coefficients With Other Assset Classes for Both Study Period.

REITs with Stocks				
	Annual	Semi annual	Quarterly	Monthly
Whole period (12/95-12/07)	0.482	0.61	0.645	0.492
Post Crisis period(12/98-12/07)	0.008	0.351	0.56	0.258
REITs with Bonds				
	Annual	Semi annual	Quarterly	Monthly
Whole period (12/95-12/07)	0.09	0.306	0.267	0.1
Post Crisis period (12/98-12/07)	-0.251	0.16	0.154	0.014
REITs with Cash				
	Annual	Semi annual	Quarterly	Monthly
Whole period (12/95-12/07)	-0.542	-0.399	-0.306	-0.234
Post Crisis period (12/98-12/07)	0.268	0.501	0.246	0.037

Generally REITs have low positive correlations with bonds, low positive and negative correlations with cash at different study period, and moderately strong correlation with stocks.

REITs have lower correlations with stocks during post crisis period as shown in table 4.3 above. The correlation coefficient is between 0.008 – 0.351 based on different return intervals at post crisis period compared to between 0.482 – 0.645 during the whole study period. This indicates that REITs diversify better with stocks during better economic period.

Correlation coefficient with bonds is also better during recent study period. Its correlation coefficient with bonds seemed low for both periods i.e. between 0.09 to 0.306 during the whole study period and between 0.014 to -0.251 during post crisis period, indicating that REITs is a good diversifier for bonds at any economic situation.

Property Share Correlations with Other Asset Class and Diversification Benefits

Table 4.4 below shows the correlation coefficients of Property Share with other asset class. Property Shares have very high positive correlation coefficients with stocks for both study periods reflecting its characteristics as share. Its correlation coefficient is between 0.803 - 0.932.

Property Share has low positive and negative correlation coefficient with bonds (between -0.011 – 0.314) for both periods indicating a good diversifier at all times. Similarly, Property Shares have negative correlation coefficient with Cash during whole study period (between -0.191 to -0.458) and mixed positive and negative correlation coefficient (between -0.005 to 0.382) during recent period, also indicating a good diversifier for cash at all times.

Table 4.4: Property Shares Correlation Coefficients With Other Asset Classes for Both Study Period

Property Shares with Stocks				
	Annual	Semi annual	Quarterly	Monthly
Whole period (12/95-12/07)	0.932	0.895	0.891	0.86
Post Crisis period (12/98-12/07)	0.896	0.834	0.881	0.803
Property Shares with Bonds				
	Annual	Semi annual	Quarterly	Monthly
Whole period (12/95-12/07)	-0.011	0.314	0.246	0.114
Post Crisis period (12/98-12/07)	-0.35	0.15	0.086	-0.095
Property Shares with Cash				
	Annual	Semi annual	Quarterly	Monthly
Whole period (12/95-12/07)	-0.458	-0.358	-0.245	-0.191
Post Crisis period (12/98-12/07)	-0.025	0.382	0.237	-0.005

Diversification Gains - REITs

Equal Investments - Based on equal investments, the portfolio returns have increase marginally, between 0.11% - 0.72%. The standard deviation, on the other hand, has increased between 2.1% - 3.58%. The Sharpe ratio too reduced between 0.1119 – 0.1645 points. Therefore, REITs do not provide much diversification benefit.

Highest Sharpe Ratio - There is a very little difference in terms of portfolio returns, standard deviation as well as the increase in Sharpe ratio, with the inclusion of REITs. Cash dominates the portfolio with an asset allocation of approximately 80% followed by bonds for the remainder 20%. Allocation to REITs is less than 1%.

Table 4.5 below tabulated the results of REITs in a mixed asset portfolio.

Diversification Gains - Property Share

Similar to REITs, the inclusion of property share in a mixed portfolio of stocks, bonds and cash too do not yield much diversification benefits. This is especially so since property share returns at all different returns intervals are lower than REITs and its standard deviation are higher than stock. Furthermore its, correlation with stock is also high, thus providing little diversification benefits with stock.

Equal Investments - Based on equal investments, the portfolio returns have increased marginally, i.e. less than 1%. The standard deviation, on the other hand, has increased between 3.7% - 6.08%. The Sharpe ratio too reduced between 0.1819 – 0.3066 points. Therefore, Property Share too does not provide much diversification benefit.

Highest Sharpe Ratio - There is no difference in terms of portfolio returns, standard deviation as well as the increase in Sharpe ratio, with the inclusion of Property Share. Cash dominates the portfolio with an asset allocation of approximately 80% followed by bonds for the remainder 20%. There is NO allocation for Property Share.

5.0 CONCLUSION

In this paper, using monthly, quarterly, semi annually and annual return interval of stock, bonds, cash, REITs and property

Table 4.5: Benefits of REITs in a Mixed-Asset Portfolio.

	Returns		S. Deviation		Sharpe Ratio		Difference		
	Before	After	Before	After	Before	After	Returns	Std Dev	Sharpe Ratio
1. Equal Investment									
Annual	7.11%	7.50%	0.0585	0.08	0.7136	0.575	0.39%	0.0215	-0.1386
Semiannual	8.58%	9.30%	0.0753	0.109	0.7485	0.584	0.72%	0.0337	-0.1645
Quarterly	10.30%	11.00%	0.1132	0.149	0.6499	0.538	0.70%	0.0358	-0.1119
Monthly	8.29%	8.40%	0.075	0.096	0.7125	0.571	0.11%	0.021	-0.1415
2. Highest Sharpe Ratio									
Annual	4.40%	4.80%	0.012	0.015	1.2119	1.24	0.40%	0.003	0.0281
Semiannual	4.07%	4.10%	0.0113	0.011	1.0013	1.001	0.03%	-0.0003	-0.0003
Quarterly	3.95%	3.90%	0.0086	0.009	1.1681	1.168	-0.05%	0.0004	-1E-04
Monthly	4.09%	4.10%	0.0077	0.008	1.4881	1.491	0.01%	0.0003	0.0029

Table 4.6: Benefits of Property Share in a Mixed-Asset Portfolio.

	Returns		Std. Dev.		Sharpe Ratio		Difference		
	Before	After	Before	After	Before	After	Returns	Risk	SR
1. Equal Investment									
Annual	7.11%	7.10%	0.0585	0.102	0.7136	0.407	-0.01%	0.0435	-0.3066
Semiannual	8.58%	9.20%	0.0753	0.13	0.7485	0.479	0.62%	0.0547	-0.2695
Quarterly	10.30%	11.10%	0.1132	0.174	0.6499	0.468	0.80%	0.0608	-0.1819
Monthly	8.29%	8.00%	0.075	0.112	0.7125	0.449	-0.29%	0.037	-0.2635
2. Highest Sharpe Ratio									
Annual	4.40%	4.40%	0.012	0.012	1.212	1.212	0.00%	0	0
Semiannual	4.10%	4.10%	0.011	0.011	1.001	1.001	0.00%	0	0
Quarterly	4.00%	4.00%	0.009	0.009	1.168	1.168	0.00%	0	0
Monthly	4.10%	4.10%	0.008	0.008	1.488	1.488	0.00%	0	0

share representing indirect real estate, has shown that different estimation period (12/95 – 12/2007 and 12/98 -12/2007) and different return intervals resulted in means, standard deviation and correlation coefficient of asset returns variations. These variations affect the portfolio returns, risk reduction and sharpe ratio of the portfolio.

Indirect properties returns are generally the lowest during the long study period (12/95-12/2007) which includes the Asian Financial Crisis (97/98). REITs register a negative returns in this period. Both performed better during the post crisis period beginning after the Asian Financial Crisis (12/98-12/2007), registering returns higher than bonds and cash, but lower than stock. These findings is inline with Waggle & Moon (2006) which noted that estimation period for REITs is best used based on recent period as it would be more relevant, taking into consideration changing nature of the investment environment. In this case, the changing economic environment has substantial effect on the mean-variance input.

In terms of risk, both REITs and property share are very risky asset class, with standard deviations higher than stock, which is already known for its volatility. It is however less volatile during good economic period as shown in the post crisis period.

Different study period, in this case between 12/1995 – 12/2007 and between 12/1998 – 12/2007 and different return interval i.e. annually, semiannually, quarterly and monthly, resulted in different portfolio returns and risk as the average returns,

standard deviation and correlation coefficient computed varies. During the longer period, the effect of Asian Financial Crisis has caused a negative returns in REITs while in the post crisis period, REITs over performed Bonds and Cash.

Including indirect property in a mixed asset portfolio do not gain much diversification benefits. Correlation coefficient with stock is moderately strong and correlation with bonds and cash is positive and negative low. But the lower returns compared to stock and higher standard deviations have made these asset classes less appealing. The increase in portfolio returns are minimal and in some instances, are reduced and the portfolio risk increases much higher than the increase in portfolio returns. Coupled with a reduction in the Sharpe ratio, including REITs or Property Share does not provide diversification benefits.

Summary

Both the indirect real estate did not gain much allocation in a mixed asset portfolio. The increase of both portfolio returns and Sharpe index is very much negligible and at some point, based on different return interval tested, decreases the portfolio returns and Sharpe index. Most of the allocations are dominated by bonds and cash. Referring to the annual returns computation, the allocation for an optimal portfolio based on highest Sharpe Index is 76% cash, 19% bonds and 5% stock. For other return intervals tested too showed that both cash and bonds dominated the portfolio.

The results suggest that REITs do not warrant inclusion in a mixed asset portfolio during bad economic situation but could be considered during stable economy. Bonds and cash, and to some extent, stocks are still the best option in a mixed asset portfolio in the Malaysian context.

The limitation for this study is the absence of a proper REITs index to represent the indirect property. The index created based on simple price index, are also shown to be not normally distributed.

Further studies could be extended in the future for a longer study period and availability of more REITs data and the analysis of risk profiles of investors in order to come up with a proposed asset allocation which best reflect an investor's tolerance towards risk.

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LOCATION ANALYSIS FOR THE SHOP HOUSE VALUATION IN KOTA KINABALU USING GIS-MRA

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Abstract

The location of the shop houses is one of the most important factors that affecting its rental value. In the past studies, MRA has been used as an attribute analysis for property valuation problem since 1920s. Characterized by its "correlation" and "prediction" features, this technique provides statistical reasoning capabilities. However, although the statistical functions provides models that are capable of producing relatively accurate and consistent regression estimates, the technique does not possess distance measuring capability. This capability is felt necessary because the incidences of property values are locationally distributed. GIS fills in this gap. With a proper framework, both GIS and MRA can be combined as a new tool of spatial reasoning in property valuation analyses. This paper first described the influence of location factors on rental values in which the information is then measured and quantified using distance analysis that could portray how far the location factor affects the shop houses rental value. The outcome of this will then be analysed using MRA to show the relationship between all the location factors and rental value of shop houses. The results revealed that using GIS is possible to improve the variable of location factor in MRA and subsequently produce a better rental model.

Keywords: *Location, Shop House, Rental Value, Multiple Regression Analysis (MRA), Geographic Information System (GIS).*

Introduction

The value of property is based on the assessment of 'value factors' that are considered relevant to the value of the subject property. With regard to commercial property, the 'value factors' may include locational influences, physical attributes, legal factors and planning and economic factors (Wyatt et. al. 2003).

According to Wyatt et al. (2003) and Gallimore (1996) locational influences is the primary influence on value such as accessibility, proximity to Central Business District (CBD), neighbourhood or important nodes such as bus stations and car parks need to be considered.

Using the combination of GIS and MRA provides an opportunity to investigate locational influences on value more objectively. The MRA had contributed a lot in property valuation to determine the value of property using the 'value factors' as its variables. Although most researchers manage to show the effectiveness of using MRA in property valuation but it still lacks geographical value factors.

Although the use of GIS is commonly but concentrate mainly in describing and displaying spatial influence on property value rather than analysis. This research attempts to explicitly measure the locational influence at the intra-urban level. Therefore, this paper will show the

integration of GIS with MRA, to provide a more accurate result for decision-making in property valuation.

Why GIS-MRA techniques?

As stated by many researchers (Shenkel, 1971; Ashton, 1972; Dalgiesh and Buchart, 1998), MRA is an effective method to calculate the rental or price of the property. By using MRA, the cost, time and human resource will be reduce significantly when doing property valuation is done especially in mass appraisal.

GIS in the other hand, is a 'computer system for capturing, managing, integrating, manipulating, analysing and displaying data which is spatially referenced to the Earth' (McDonnell and Kemp, 1995). GIS has the capability to relate layers of data for the same points in space, combining, analysing, and finally, mapping out the results. Spatial information uses location, within a coordinate system, as its reference base.

Therefore, by integrating MRA technique and GIS capabilities, it is possible to produce a model that have both spatial and aspatial characteristics. Some previous works in property (Curry, et. al., 1990; Rosiers & Theriault's, 1991; Hamid and Vui, 2006; Oliver, 2006) have shown some examples of spatial analyses, incorporating GIS and MRA.

In Rosiers & Theriault's (1991) study, the ability of GIS-MRA technique had been explored to provide an analytical framework for information of a thematic, aspatial nature (e.g. property prices) which can be link with geographic support that allows spatial analysis of various phenomena.

Curry, et. al.'s (1990) study showed that the use of GIS has enhanced the understanding of the spatial pattern of the effects of the location factors (e.g. distance from a defined point in town, existence of bank, in or outside town) on property values.

Hamid and Vui., (2006) study produced a much more extended version of GIS-MRA in which the model capable to generate surface value analysis using extensive GIS interpolation techniques such as (Inverse Distance Weighting) IDW and Kriging integrate with MRA model.

Influence of location factor to the shop house value

Location is an important factor in determining the values of properties. The influence 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 factor may be differ to that of residential. As mention 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. For example, easy access to parks significantly influences residential property but not commercial property. Parking spaces greatly influence the value of commercial property but rarely for residential property.

Area of study

The area of study is located in Kota Kinabalu, Sabah. However, the place chosen as case study for this paper is the city of Kota Kinabalu. The type of property used for this study is the ground floor shop houses.

Measuring locational variable for shop houses

The identification of locational influence factor is needed for this study and is obtained through review of the literatures and interviews.

From the area of study, the author has outlined 23 of the locational factors that may influence the shop house. The identified influence factors are listed in Table 1.

Therefore, this distance, is indicated using GIS tool, in which the term for this approach is called neighbourhood analysis.

Neighbourhood analysis

One of the neighbourhood analysis used in this study is the Buffer analysis. The attribute data for the location factors is coded using "Dummy" or variable's indicator that depicts the impact of location on the properties.

Table 1: List of Location Factors Identified in The Study Area.

LOCATION FACTORS	
BANK	SURROUNDING VIEW
EDUCATION CENTRE	LIBRARY
LODGING	CINEMA
HOTEL	PUBLIC HALL
ROAD1 (MAIN/SECONDARY)	OFFICE CENTRE
ROAD2 (1 OR 2 WAY)	BUS/TAXI STAND
RECREATION PARK	POLICE STATION
HEALTH CENTRE	PETROL STATION
POST OFFICE	GARBAGE SITE
SHOPPING COMPLEX	PUBLIC TOILET
TOURISM CENTRE	ACCESSIBILITY
MARKET	

Based on the research carried out by Ibrahim (1995), Low (2005) and Shirley (2008), the suggested walking distances suitable for the influence of the locational factors listed above to the shop houses' rental value are as follows (Table 2).

Figure 1 show the result of one of the neighbourhood analysis to identify the buffer for a particular location. The buffer area (pink color) represents the radius distance of the bank's influence and the highlighted (yellow color) represents the

Table 2: Suggested Distance for Buffer Analysis to The Locational Factors

Locational Factor	Distance Suggestion (meter)
Garbage Site	50
Bank, Hotel, Lodging,Office Centre, Education Centre, Post Office, Cinema, Recreation Park, Tourism Centre, Public Toilet, Library, Market, Health Centre, Public Hall, Police Station, Petrol Station	150
Shopping Complex	200
Bus/Taxi Stand	300

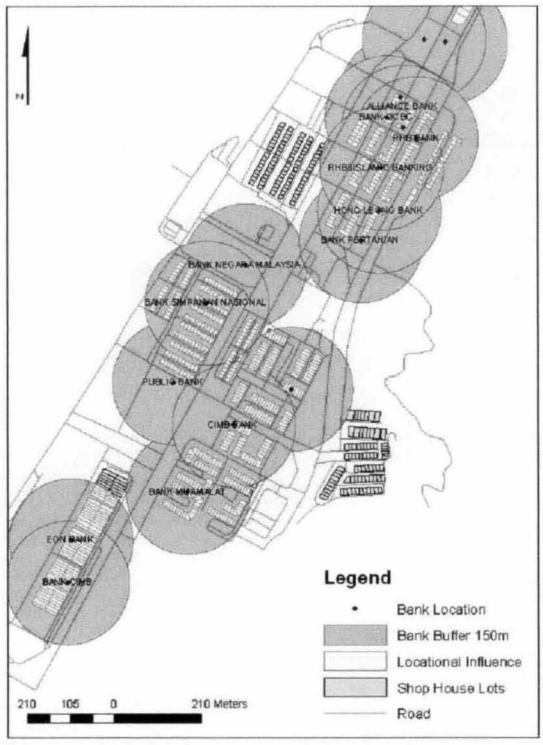

Figure 1: Buffer Analysis showing the impact of location of Banks on the commercial properties.

shop house's property that receives the impact of the banks. Therefore, if the surrounding of the shop house has more locational factor (e.g. post office, shopping complex) then it will receive a higher rental value.

The coded attribute of the locational influence data (1 and 0) will then be added with other non-locational influence to be analysed in order to develop the rental model for each locality. Code '1' means the locational factor give influence while code '0' means the locational factor does not give influence to the shop house.

Construction of Multiple Regression Analysis (MRA) model

In order to account for the variation in shop houses rental in the study area, the MRA regression model needs to be constructed. The MRA is based on the linear model using enter regression technique, in which rental values are regressed against physical and location characteristics of the properties.

This paper construct the MRA model based on 163 data samples taken in the year 2007. The construction of the model is based on the formula as follow:

$$RV = B_0 + B_1X_1 + B_2X_2 ..... B_nX_n$$

Where RV is the estimated rental value for each shop house which is calculated as the sum of B_0, constant, physical characteristics and location characteristics variables (B_1X_1 ..... B_nX_n). Not all location characteristics in the model were based on GIS buffer analysis, some are determined based on site observation from the authors in the area of study. Table 3 shows which variable that uses GIS buffer analysis and site observation.

Once the construction of the model is completed, hence, an output of the MRA model with GIS inclusion is produced.

Results

The MRA models with GIS inclusion are then tested to see the variation of the rental value through coefficient of determination (R2), accuracy of the variable (F test) and whether the model is best overall (Significant F).

The summary output of the model in Table 4 shows the R square (R2) of 0.392 indicates that 39% of the model variation determine the rental value of the shop houses. Theoritically, the higher the R2, the better the model. However, based on Mchaney dan Croan (1998), the R2 value 0.38 is still acceptable and reliable.

Next, the measurement of the significant F from the Analysis Of Variance (ANOVA) in Table 5 is to identify whether the model as a whole is significant. The model has the value of 0.000 shows that it is significant in 99% confidence level. So the model is highly significant and can be accepted. Further test, the F test, was conducted to measure the contribution of each independent variable, measuring the overall goodness fit or correctness of the model when all the variables are considered simultaneously. The test reveals that the model has F value with significance level of 99%. This shows the accuracy of the model can be accepted. Hence, the model passes the entire test and we can rely on the coefficient (B) of the model.

Finally, the variables which are most significant can be determined from the model's coefficient (B) in Table 6. In this study, only the variables that have Sig. t below 0.01 (in bold text) will be taken into account as significant. The model shows that the Bus/Taxi Stand variable gives the most significant influence with 0.001 and based on the coefficients B, it increases the rental value by RM1325.211 to the shop house. This means that the Bus/Taxi Stand provide major positive influence towards shop houses' rental value as this maybe because most of the people use public transports to the city. This is followed by Public Hall and Cinema and both gives significant influence of 0.007. Based on the coefficients B, Public Hall variable increase the rental value by RM1889.579 to the shop house and it also provide positive influence

Table 3: The Methods Use in Determining The Location of The Shop House for The Mra Model

GIS Buffer Analysis		Site Observation
Garbage Site Tourism Centre Petrol Station Health Centre Bank Market Police Station Office Centre Post Office Bus/Taxi Stand	Education Centre Public Toilet Shopping Complex Library Cinema Petrol Station Public Hall Hotel Recreation Park	Accessibility Surrounding View Road1 (Main/Secondary) Road2 (1 or 2 Way)

Table 4: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.626	.392	.291	1230.62941642

Table 5: Analysis of Variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	135706560.933	23	5900285.258	3.896	.000
Residual	210508377.718	139	1514448.761		
Total	346214938.650	162			

towards shop houses' rental value. The Cinema variable however, decreases the shop house rental value by RM-892.684. This maybe occurs because the big cinema building is blocking the front part of the effected property from the main road and this in turn have deterred the chances of potential tenant to promote their products effectively.

Therefore, by using this model, the shop house's rental value can be predicted. Based on the residual statistics in Table 7, the predicted rental value of the shop house in the study area is ranging between RM1682 to RM6627. This is slightly different than the current rental value which is ranging between RM1000 to RM8150. A visual map of the prediction rental value of the shop houses can then be produced as shown in Figure 2.

Conclusions

The study shows that addition of GIS into the MRA model can improve the rental value prediction. Eventhough GIS can provide a good MRA model, but the right type of GIS analysis must be chosen to produce a better result. The result in the model clearly shows that some locational factor affects the shop house rental value based on its existence in the neighbourhood area.

As the R2 in the MRA model garners only 39% of the variations in determining the rental value, the accuracy can be increase if other variables can be included such as rental duration aggreement, family connection, unidentified location factors (e.g. feng shui), building physical characteristics and also depends on the sincerity of the respondents in giving the information for this study and thus improve the MRA model.

Therefore, this study only shows the useful of GIS analysis in fascilitate the variable specification for the shop house's rental value and explores the possibility of improving the variable of locational dummy in MRA model.

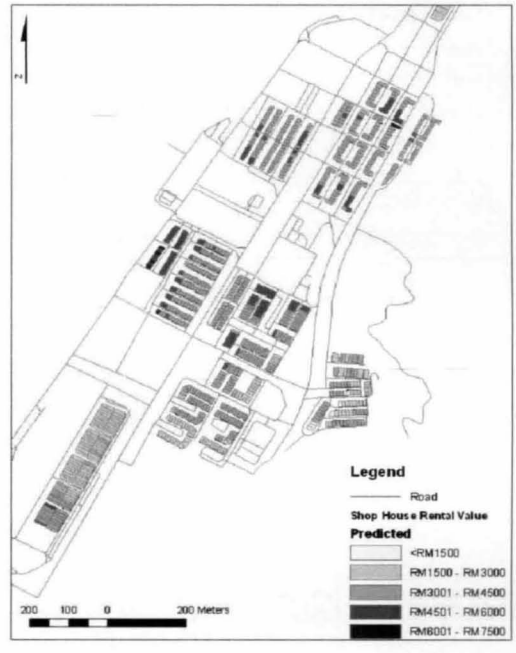

Figure 2: Prediction for all of the shop house's rental value using GIS-MRA in Kota Kinabalu City

Table 6: Coefficient B of The Model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2809.690	895.684		3.137	.002
Lodging	406.836	505.091	.113	.805	.422
Hotel	348.184	591.541	.048	.589	.557
Shop Complex	311.288	294.775	.101	1.056	.293
Office Centre	-583.336	381.733	-.116	-1.528	.129
Bank	-245.725	341.715	-.069	-.719	.473
Bus/Taxi Stand	**1325.211**	**397.829**	**.305**	**3.331**	**.001**
Education Centre	-832.071	433.693	-.241	-1.919	.057
Post Office	-637.724	828.188	-.059	-.770	.443
Cinema	-892.684	326.659	-.234	-2.733	.007
Recreation Park	-632.296	642.484	-.104	-.984	.327
Tourism Centre	-195.486	541.042	-.044	-.361	.718
Public Toilet	524.216	387.768	.166	1.352	.179
Library	26.178	894.007	.002	.029	.977
Market	1343.742	614.570	.258	2.186	.030
Health Centre	1152.435	613.379	.198	1.879	.062
Public Hall	**1889.579**	**695.941**	**.263**	**2.715**	**.007**
Garbage Site	-275.585	1065.188	-.025	-.259	.796
Police Station	414.891	596.852	.087	.695	.488
Petrol Station	229.758	345.585	.061	.665	.507
Surrounding View	602.536	374.139	.154	1.610	.110
Accessibility	149.863	467.011	.025	.321	.749
Road1	1736.380	790.897	.242	2.195	.030
Road2	-585.940	502.065	-.129	-1.167	.245

Table 7: Residual Statistics of The Model

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1831.7171631	6626.7988281	4100.6134969	915.25669655	163
Residual	-2626.79907227	3639.10009766	.00000000	1139.92737942	163
Std. Predicted Value	-2.479	2.760	.000	1.000	163
Std. Residual	-2.135	2.957	.000	.926	163

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OPTIMAL LIFE CYCLE COSTING ANALYSIS FOR FACULTY OF GEOINFORMATION SCIENCE AND ENGINEERING FLOOR'S MATERIAL

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Abstract

One of the biggest challenges facing regulated utilities today is aligning the management of their infrastructure with corporate objectives. The emerging discipline of asset management is a promising approach to this problem, because it can do things that techniques such as balanced scorecards and total quality cannot. Decisions must be made about operating and maintaining infrastructure assets. A misguided perception of life cycle costing is that the longer something lasts, the less it costs over time. The purpose of this research is to examine flooring materials including ceramic, homogeneous, vinyl and carpet for the Faculty of Geoinformation Science and Engineering. Besides, this paper concern of the creation of a decision making tool based on real life data that will facilitate practical evaluation of flooring materials. A life cycle cost (LCC) analysis will be used as an economic evaluation tool. LCCA quantifies incurring costs commonly overlooked (by property and asset managers and designers) as replacement and maintenance costs. The impact of the used substrate materials and the installation methods used for each alternative will be assessed for possible potential effects on the service life cycle cost. Using the life cycle cost analysis (LCCA), the true cost of each material will be computed projecting 60 years as the building service life and 5.4% as the inflation rate percentage.

Keywords: Life Cycle Costing Analysis, Assets, Flooring Material

INTRODUCTION

For the last two decade, the growing recognition of property and assets management (PAM) as a management process that embrace the whole life of an asset, has had the impact of raising the awareness to the need to consider the operational period of building assets. There is a growing recognition of a need for a property management budgeting method that gives proper evaluation to overall cost of the asset including their operational and maintenance expenses throughout its life-cycle. As in general Malaysia property management-asset significances, budgeting would be the vital practice in this country for the beginners before applying the advanced method in PAM. Synchronize to that needs, researcher will expand this study to implement the life cycle costs analysis (LCCA) to the property and asset management community at Faculty of Geoinformation Science and Engineering to give them an idea about the benefits of LCCA for the period of the decision making process and cost effective.

Malaysia as one of the development countries in South East Asia was growing

rapidly almost in all sectors. Despite of that, there are still lacking in managing the correct way especially in property and assets management requirement. To meet the high demand of public and private sectors, it is expected that many error and deficiency will have occurred during the design and construction phase of the project, later resulting the high cost of property and assets maintenance. The proper selection of the asset material for any building contributes considerably to the overall life cycle cost (LCC) of a building. As a simple task given until the asset fix to the building, it will involve the cost. However, the selection of the materials is typically based on manufacturer's information, property professional, asset professional or the initial const of the product and budget constraints.

By respecting to the physical asset management, many of them focusing on the maintenance management models and tools (Amadi-Echendu, 2004; Harvey, 1976). Dealing to Waeyenbergh, and Pintelon, (2002), they mention that an asset proceeds through a number of sequential phases during its life cycle; acquisition, operation and maintenance, refurbishment or enhancement, and, finally, disposal. The life cycle of an asset begins with a planning process that identifies the need for that asset and determines how and when it is to be procured (Department of Public Work, Queensland, 1996). The asset is then acquired either an existing asset is purchased or a new one is created. The asset then enters its operational phase. As the asset ages, it may deteriorate or become obsolete, at which stage a decision is made to either refurbish, enhance or dispose of it.

Budgeting is most often thought of as having to do with the planning and control of revenues and expense, such as with managing the common operations of a business or other organization (Lally, 2003). Profit budget gets most attention, because it is the area of the primary goal of a business. Therefore in many companies the balance sheet and cash flow statements are left to their own devices. Nevertheless, the fact on balance sheet budget and cash flow budget are logical supplements to an operating budget and bring many benefits, though less apparent; they are more profound and lasting especially in providing supports for financial decision making (Dunk, 2004, pp.401-414).

On the other hand, where customer loyalty is volatile, product life cycle are shortening, competitors can arise suddenly from anywhere and the best people are attracted to organizations that promote supervisory freedom and responsibility, the traditional budgeting approach is a severe handicap. Put another way, budgets are barriers to competitive success economic resources. The use of alternative systems of budgeting usually makes financial decision making processes more complicated due to time pressure (Myers, 2001, pp.81-102). Although budgeting is the solution process through which supervision can change and direct the organization's performance, it is not good enough just to make the process more efficient. After all, a simple shortening of the budgeting cycle by one month does not put a stop to the fact that the resulting budget is still irrelevant after only a few months. The focus of any revised budgeting process has to be on helping the organization compete more effectively in the market.

One possible way is to focus the budgeting process on implementation of the strategy, and it has to add value to the organization (Lally, 2003). Therefore, the budgeting model must be designed around the strategies and the associated tactical plans. On the other hand, quick updating of budgeted data is one of the indispensable conditions for the following budgeting

process reorganization and turning to alternative systems such as rolling budget or forecasts, which are updated every few months in effect, reassessing the company's outlook several times a year.

Changing approaches to an old dilemma are not merely of academic interest. All of the approaches to the basic budgeting problem whether normative or positivist in target, have influenced the design of budget institutions, procedures and analytical methods. Changes in budget practice moreover, tended to proceed incrementally and cumulatively, so that many of the innovations introduced in early reforms are still in place at present. Thus, nowadays budget structures are essentially the same as those introduced in the late 19th centuries when modern budgeting systems were first established. Similarly, the analytical methods and process proposed by rationalists in the 1960s persist to be used these days. Indeed, the rationalist approach is still the prevailing paradigm for policy makers.

Schools and other public services in which access can be restricted share these characteristics (Khumalo and Wright, 1997, pp.155-168). In addition, Suthiwart Narueput (1998, pp.1-35) demonstrates that a large proportion of public expenditures is allocated in the provision of private goods that could, and by implication should, be provided and financed by the private sector. Notwithstanding the sensitivity of the results to the scope of impact analysis, cost and benefit valuations, discount rates and the distributional weightings applied, the technique does provide a rigorous basis for decision making at this level. Unfortunately application of the technique to higher level, inter sectoral and inter programme allocation decisions is impractical owing to information constraints.

Although the general principle of benefit valuation can be applied, this can only be considered an approximate cost benefit measurement based on the valuation of a narrow range of direct impacts (Pradhan, 1996, pp.99-105). The nature of the budget process also promotes incremental decision making. Furthermore, budgeting is repetitive, with the same allocation issues being addressed in successive budgeting exercises. In this way, participants arrive at an implicit agreement regarding each claimant's fair share and, constituting a convergence of expectation on roughly how much an agency is to receive in comparison to others (Wildavsky, 1992).

Additionally, the experienced of Amadi-Echendu, (2004) in order to keep going the value of the assets, the assets management requires beyond typical cost principles of maintenance. Real estate asset management offers a structure approach in handling real estate assets considering all the factors that accompanies investing in real estate. It may be described as the systematic process of maintaining and upgrading real estate assets in a cost effective manner that would work well for the property owner.

MODIFICATIONS NEEDED

Most of the organisations have a culture that is focused on the financial and service they provide. In such a culture, people are naturally inclined to emphasis issues that are tangible, visible or measurable. Come to the problems, Property Managers be inclined to consider that the focus on financial, process and process improvements result in productivity increases.

Cost of asset ownership is playing a pivotal role in performance assessment. As a result, organizations are being encouraged to increase accountability and minimize risk through more comprehensive and innovative asset management techniques. Life cycle costing strategies are steadily

replacing traditional costing tools in a move to identify and monitor long-term cost of ownership. By extending previous calculations to include customer, social and environment considerations, life cycle costing can provide a valuable tool in assessing economic efficiency in complex infrastructure asset management. The question then becomes how to identify, analyze and respond to ever changing costs throughout the development, building, maintenance and end stages of a complex asset.

Organisations of all kinds in different economics around the world recognise that the rising costs of occupying buildings, materials, providing services to support business operations and improving working conditions are important factors in profitability. Amaratunga, D., Sharshar, M., and Baldry, D., (2002), emphasise that the organisations need to find the right balance between focusing on the product and focusing on process together with the life cycles.

The following changes in design, assets procedures and construction methods provided once in a lifetime opportunity to study the life cycle costs of flooring materials at the Faculty of Geoinformation Science and Engineering building.

Regarding to Universiti Teknologi Malaysia-Skudai campus, (UTM)'s maintenance and asset management necessity, it is important to identify whether the present maintenance management implemented of furnishes especially the flooring materials is still suitable or not. The development of the faculty building in UTM since 1975 has dramatically changes the assets provided. The different in assets and renovations that had been made would trigger different maintenance dealing which requires the study to identify whether the present maintenance management is still acceptable or can be replacing with looking into consideration of implication of the Life Cycle Costs Analysis in decision making process at earlier stage. The new of implementation perhaps can be easier and more effective with less costly.

SIGNIFICANCE OF THE PROBLEM

The study focuses on the Faculty of Geoinformation Science and Engineering, Universiti Teknologi Malaysia, Skudai. This building uses varieties of flooring materials depend to the departments' placed. This building is essentially among the earliest building construct in UTM, it is of primary importance to know if the flooring materials used is the best alternatives when maintenance and operational costs are considered.

The objective of LCCA is to choose the most cost effective approach from a series of alternatives to achieve the lowest long-term cost of ownership. LCCA is an economic model over the project life span. Usually the cost of operation, maintenance, and disposal costs exceed all other first costs many times. The best balance among cost elements is achieved when the total LCCA is minimized. As with most engineering tools, LCCA provides best results when both engineering art and science are merged with a good judgment.

This research uses a life cycle cost analysis as a method of depicting the true overall cost of each floor covering over a predetermined period of time. Life cycle cost analysis can appear complicated and difficult to comprehend from the standpoint of establishing the real value of a floor covering expenditure. Selecting the materials and components of the floor based on a life cycle cost analysis can significantly decrease the lifetime cost of construction, maintenance and repair.

Together with that, selecting materials and components based on initial costs disregards future costs over the intended life of the system such as maintenance, repair, and reconstruction.

The initial purchase cost, installation charges, maintenance requirement and associated costs, plus the costs of cleaning chemicals must be factored into the analysis to yield the true expenditure of money over a period of time. The result of the life cycle cost analysis is intended to be a quantitative decision-making tool that will allow design professionals and asset managers to make informed choices about asset flooring materials prior to incurring replacement restoration expenses.

For the purpose of this research, flooring material finishes are studied and compared. "As a finish material, it is often considered the most important specification in the interior design scheme. Floor finishes choices create an opportunity to expand a colour palette and specify a product that is conductive to the type of activities and purpose of the building" (Harris, 2000).

Floor surfaces are daily exposed to foot and equipment traffic, exposure to direct and indirect sunlight, and possible contamination of organic and chemical sources. Another important issue of flooring materials is associated with safety. "Floor surfaces are a crucial factor in preventing falls and need very careful consideration in relation to anticipated users and patterns of use and behaviour . . . there is no such thing as a non-slip floor"(Berman, 1997).

METHODOLOGY

In the effort to meet the ultimate research objective, the following research methodologies are being considered in the process of generating fundamental understanding in property and assets management and the analysis of archives data on property and assets build at the area of study scope;

1. Literature review.
2. Conducting a structure questionnaire to interview the person-in-charge of the property and assets.
3. Analysis of archive data on property and assets (refer to the floor's material)

PROJECT BACKGROUND

The completed study was conducted in phases whereby the first phases consisted of reviewing the official documents such as specifications, drawings, finishes schedules, and purchase invoices. The second phase required the collection of the empirical data regarding the construction of the building performance, cleaning procedures, repair and maintenance and replacement of the building materials. The third phases are involved the calculation of the empirical data in LCC with manufacturer standard of the products currently in used. The last phase was to collect, compile and analyse the gathered data using the methods of LCC measurement.

Phase I: Analysis of Official Documents

The Faculty of Geoinformation Science and Engineering (FKSG), Universiti Teknologi Malaysia, provided official documents such as construction documents and specifications, AutoCAD Drawing, finishes schedules and purchase invoice for Faculty of Geoinformation Science and Engineering. Those documents provided the information regarding the type of flooring material used, the manufacturers, initial cost, total area for each material been used and the systems specification. The data collected on this stage is summarized at Table 1: Material used at Faculty of Geoinformation Science and Engineering.

Table 1: Material Used at Faculty of Geoinformation Science and Engineering.

MATERIAL	TOTAL AREA (SQ.FT)	MANUFACTURER	TYPE	COLOUR
Ceramic Tile	**45,438.11**	DuroGres CERAMIC TILES	Floor Class II-Medium [30cmx30cm]	String Gray
Homogeneous Tile	**40,655.15**	NIRO GRANITE THE SWISS QUALITY TILE	Floor Class II-Medium [5cm x 5cm]	Tinsel Cream Pearl White
Vinyl	**20,327.58**	Durafloor House of Vinyl Flooring	Floor Class II-Medium [30cmx30cm]	Vivid Blue Medium Gray
Carpet	**15,544.62**	floorStyle malaysia sdn. bhd.	Lexus Soft Class -Medium	Royal Blue

Source: Author, 2009

Besides that, the document also contained the information of the building plan (layout), location, and size of the building. All the documents used to create a preliminary list of material commonly used in FKSGs' asset.

Phase II: Empirical Data Collection

Survey and direct observations of the faculty's asset were used to collect empirical data. The Deputy Registrar at the Faculty of Geoinformation Science and Engineering, Universiti Teknologi Malaysia provided accurate information on the performance of flooring materials and the current cost of operating and maintaining them. Together with it, direct site observations were conducted at FKSG.

The information collected from direct observations included data on the service use of the flooring materials in the asset. The amounts of students who used the asset also have been observed by the researcher. Even though, almost all the data collected from the Deputy Registrar, researcher still doing the informal interview with university's maintenance staff, university's drawing planner staff, and university's cleaner staff to support the direct observations.

These interviews provided additional data regarding the custodial work salary, time consumed for various cleaning and repair procedures, actual type of equipment and cleaning materials used for regular maintenance, and frequency of standard operations and maintenance procedures.

After computing the data, floor area for the FKSG by referring to C01 to C06 are shown as below (Table 2).

Phase III: Materials Specifications and Standards

Once the flooring materials were identified, manufacturer's technical specification data sheet were collected. For each finish, these sheets provided information regarding the

Table 2: Floor Area Calculated Manually.

Block	∑ Floor Levels	Floor Area (m2)	Floor Area (ft2)
C01	1	98.998 m2	**1,065.605 ft²**
C02	4	4234.534 m2 x 4 levels – (35% of the ∑ Floor Area)	**118,508.3744 ft²**
C03	4		
C04	4		
C05	4	45580.144 ft² x 4 levels – (35% of the ∑ Floor Area) 118,508.3744 ft²	
C06	4		
		TOTAL AREA	**119,573.9794 ft²**

**35 % is including the Lecture Hall which is constraint 2 levels, spaces for the stairs, unneeded corridor, beams & columns.*
**1 square meter = 10.763911 square feet*

Source: Author, 2009

materials characteristics, recommended cleaning and maintenance procedure and expected durability. The information was used to compare the actual cleaning and maintenance procedures with those specified by manufacturer.

In addition, the Minimum Standards of Housing and Amenities Act 1990, Uniform Building (Amendment) By-laws (UBBL) 1991, and Guidelines used for Standards and Cost of Building Planning by Standard and Cost committee (2008) were used as a basis for refining the list of flooring alternatives.

Phase IV: LCC Analysis

A service life cycle cost analysis of actual projected cost for Faculty of Geoinformation Science and Engineering during the used and replacement of the flooring materials over a 60 years building service life was completed. For this reasons, the analysis consisted of a service LCCA comparison of selected materials. The Ringgit Malaysia values used in the LCCA calculations come from the monetary expenditure to purchase, properly maintain and replace these flooring materials to serve the building for 60 years.

Life Cycle Cost (LCC) Analysis Assumption

The basic assumptions (Table 3) for the LCC analysis are based on materials specifications and standards set by the Office of the Asset and Construction, Universiti Teknologi Malaysia-Skudai campus, Johor (OAC-UTM) and the Faculty of Geoinformation Science and Engineering, Universiti Teknologi Malaysia (FKSG-UTM). Besides that, all the assumption also based to the Malaysia's Prime Minister Malaysia's Office and Ministry of Works.

Selection of Materials for Analysis

For the purpose of this project, interior floor surface were studied, which include not only floor finishes but also the substrate or sub-floor where they are applied, and the material used to attach the finish to the substrate. Table 4 shows the floor surface material considered in the LCCA modus operandi. The materials major flooring characteristics and the actual maintenance procedures are listed. The table is divided into three segmentations which are sand to hard flooring categories, resilient flooring categories and soft flooring categories allowing for proper comparison between flooring alternatives.

Table 3: Basic Assumptions

Inflation Rate	A general inflation rate 5.4% was used based on the Department of Statistics Malaysia and BNM (January, 2009).
Discount Rate	The FKSG does not allocate funds for future replacements or maintenance cost, thus the discount factors said to be zero (0).
Operation and Maintenance	Maintainability can be defined as ease of which the maintenance activity can be carried out on an item of product or system (Rosenberg, 2000).
Building Service Life	A 60-years building service life
Initial Capital Cost	Based on contract and manufacturer's provided data, including material and installation.
System Service Life	Derived from the manufacturer's information and direct observations. It is assumed that the manufacturer's recommendation for cleaning and maintenance are performed.
Number of Replacement	Assumed to support the asset during the 60 years of expected service life.
Selvage Value	It is assumed that there is no salvage value at the time of replacement. Source: Author, 2009

RESEARCH DESIGN

Research designed for the purpose of producing results that may be applied to real world situations. It is also known as a plan outlining how information is to be gathered for an assessment or evaluation that includes identifying the data gathering method, the instruments to be created, how the instruments will be administered, and how the information will be organized and analysed.

Case Study Strategy

After researcher scanning and handling observation, it is come to the next action before continue with the analysis. This is call research design. The researcher will use the case study strategy for the development of this study. Groat and Wang (2002) define the case study as an empirical inquiry that investigate a phenomenon or setting, which includes historic phenomenon and both historic and contemporary setting as potential foci of case studies.

The essence of a case study strategy is its focus on studying a setting or phenomenon embedded in its real context. It implies much more than simply studying a phenomenon "in the field". Rather, it involves studying a case in relation to the complex dynamics with which it intersects (Groat and Wang, 2002). A case study can be based exclusively and quality data or have a theory driven focus.

Survey Analysis

Table 5 is broken into flooring systems: ceramic tile, homogeneous, vinyl and carpet. The information is a description of the materials used for evaluation. In this research all the systems were laid in the same type of substrate material and were installed accordingly to the manufacturer's specifications.

The second (2) columns represent the service life in years of each material. This information was obtained from manufacturer's specification data sheets. The third (3) columns is the capital cost which represent the Ringgit Malaysia values on a per square foot basis including materials and installation. Some of these values were obtain from record documents and others from direct interviews with manufacturers and suppliers. Column number four (4) is the cost of O&M for each material expressed as cost per square foot.

Table 4: Analysis of Life Cycle Costing Results

Types	Area %	Area (psf)	
		119,573.98	Total Area
Ceramic	38%	45,438.11	
Homogeneous	34%	40,655.15	
Vinyl	17%	20,327.58	
Carpet	13%	15,544.62	

Types	Initial Cost RMpsf	Life Span	Inflation Rate	O&M (%of Initial Cost)
Ceramic	1.87	50	5.40%	7.00%
Homogeneous	3.92	55	5.40%	18.00%
Vinyl	12.00	15	5.40%	32.00%
Carpet	2.7	10	5.40%	22.00%

Building Service Life	Cost of O&M RMpsf	Maintenance of the system -first year end	Increment Amount	
59	0.13	5,947.85	321.18	per year
59	0.71	28,686.28	1,549.06	per year
59	3.84	78,057.89	4,215.13	per year
59	0.59	9,233.50	498.61	per year

Types	A yearly cost for O&M	Annual Cost (uniform series) for the next 59 years	Present Worth Formula (59 years)
Ceramic	5,056.66	11,004.51	194,633.89
Homogeneous	24,388.12	53,074.39	938,712.74
Vinyl	66,362.22	144,420.12	2,554,320.37
Carpet	7,850.02	17,083.52	302,151.68

Types	LCC (RMpsf)
Ceramic	**30.22**
Homogeneous	**93.81**
Vinyl	**152.07**
Carpet	**24.01**

Source: Author, 2009

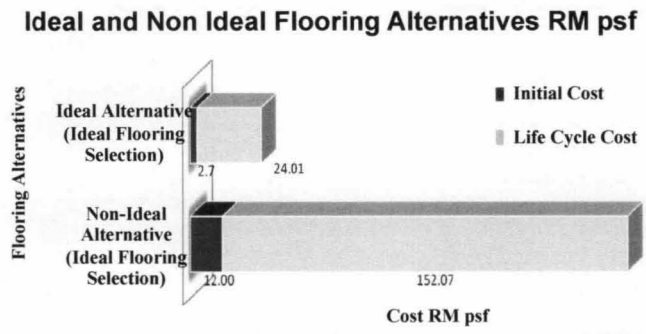
Table 5: Summary of Results

Types	Life Span	Initial Cost RMpsf	O&M (%of Initial Cost)	Cost of O&M RMpsf	LCC (RMpsf)	RANK
Ceramic	50	1.87	7.00%	0.13	**30.22**	2
Homogeneous	55	3.92	18.00%	0.71	**93.81**	3
Vinyl	15	12.00	32.00%	3.84	**152.07**	4
Carpet	10	2.70	22.00%	0.59	**24.01**	1

Source: Author, 2009

For example, a material with 50 year service life, an initial cost of RM 1.87 psf and an O&M cost equal to 7% of the initial cost would have an O&M cost of RM 0.13 psf. If the total area of that material is said to be 45,438.11 sf, then the total O&M cost for that system would be RM 84,969.27 year. It is assumed that the maintenance and operation cost will increase at a rate equal to the inflation over the service life of the system (i.e. 5.4%). The calculation is then repeated for the period of years from 11-20, 21-30, 31-40, 41-50, and 51-60. The value obtained is then brought back to the present using a zero discount rate value.

Column number five (5) is the Net Present Worth or Life Cycle Cost of the system, over a period of 60-year. This value takes into



Source: Author, 2009

Figure 1: Initial Cost versus Life Cycle Cost for Ideal and Non-ideal Flooring Alternatives

consideration: NPW of initial cost, NPW of O&M costs, and NPW of replacements. The last column shows a ranking system that organizes the materials in ascending order of NPW.

The flooring system rank one (1), ceramic tile is the preferred alternative based on LCC followed by Ceramic, Homogeneous and Vinyl. An important observation from the results is that the lowest initial cost is not necessarily the lowest cost based on the net present worth values. This means that there is no direct correlation between initial cost and life cycle cost results as seen in Figure 1. From the Table 5 it can be notice that carpet, which are ranked two (2) based on initial cost of RM 2.70 psf, are rank one (1) based on the NPW value of RM 24.01. Mean while ceramic, which are ranked one (1) based on initial cost of RM 1.87 psf, are rank two (2) based on the NPW value of RM 30.22; Homogeneous, which are ranked three (3) based on initial cost of RM 3.92 psf, are rank three (3) based on the NPW value of RM 93.81, and vinyl, which are ranked four (4) based on initial cost of RM 12.00 psf, are rank four (4) based on the NPW value of RM 152.07.

Table 7 shows that for an area of 5,000 sf of alternative flooring inverting RM 0.83 psf more in the initial cost of carpet would save the asset RM 31,050.00 over the service life of the asset of 60 years.

Table 8 shows the results of the analysis between LCC and O&M psf. There is a direct relationship between the total maintenance and operation cost per square feet of the material and the NPW (Figure 2). Figure 3 to Figure 5 shows the relationship between increasing O&M and NPW for type of materials such as carpet, ceramic, vinyl and homogeneous, as the service life increase the NPW decreases. This is because longer the service life of a material, fewer replacements, then lowers NPW values.

Upfront the purchase and installation costs of ceramic are less than those for carpet,

Table 6: Value Diverse for Initial Cost and LCC

Types	Life Span	Initial Cost RMpsf	LCC (RMpsf)	Value Diverse	RANK
Ceramic	50	1.87	**30.22**	28.35	2
Homogeneous	55	3.92	**93.81**	89.89	3
Vinyl	15	12.00	**152.07**	140.07	4
Carpet	10	2.7	**24.01**	21.31	1

Source: Author, 2009

Table 7 is an example that compares two alternatives assuming an area to be covered of 5,000 sf.

Table 7: Comparison Between a Low Initial Cost Alternative and a Low LCC Alternative

	Option One *Low Initial Cost*	**Option Two** *Low LCC*
Alternative Flooring	**Ceramic Tile**	**Carpet**
Initial Cost	RM1.87	RM2.70
Total NPW	RM30.22	RM24.01
Total Initial Cost	RM9M350.00	RM13,500.00
Total Life Cycle Coat	RM151,100.00	RM120,050.00
Additional Initial Cost Needed for Lower LCC Alternative	**RM4,150.00**	
Total Saving from LCC	**RM31,050.00**	

Source: Author, 2009

Table 8: Comparison Between a LCC and O&M Cost

Type	LCC (RMpsf)	O&M Cost (RMpsf)
Ceramic	**30.22**	**4.28**
Homogeneous	**93.81**	**23.09**
Vinyl	**152.07**	**125.66**
Carpet	**24.01**	**19.44**

Source: Author, 2009

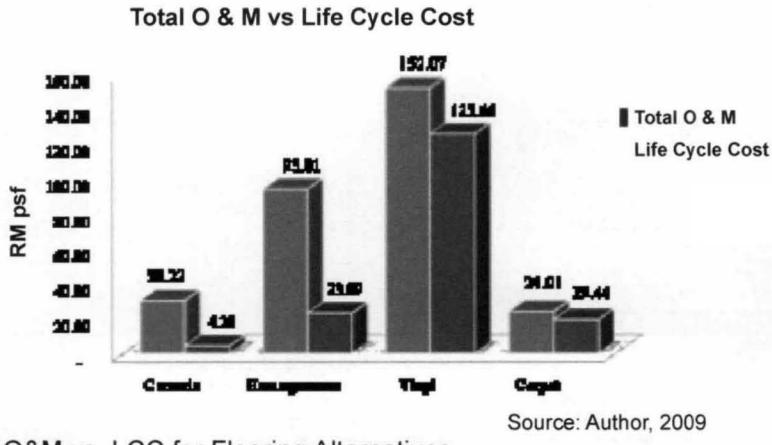
RM 1.87 psf and RM 2.70 psf respectively. However, at the end of the 60-year service life carpet is more cost efficient than ceramic. It cost 133% more to maintain and operate ceramic than carpet (Figure 6).

No correlation was found between service life values and values for NPW and O&M cost (Figure 7). For example, vinyl has the second lowest value for service life (15 years) but the highest value for life cycle cost, RM152.07. Homogeneous, which has the highest value of service life (55 years), has the runner up lowest value for maintenance and operational cost. A low service life value means more frequent replacements but does not means higher values for life cycle cost and/or maintenance costs.

CONCLUSION

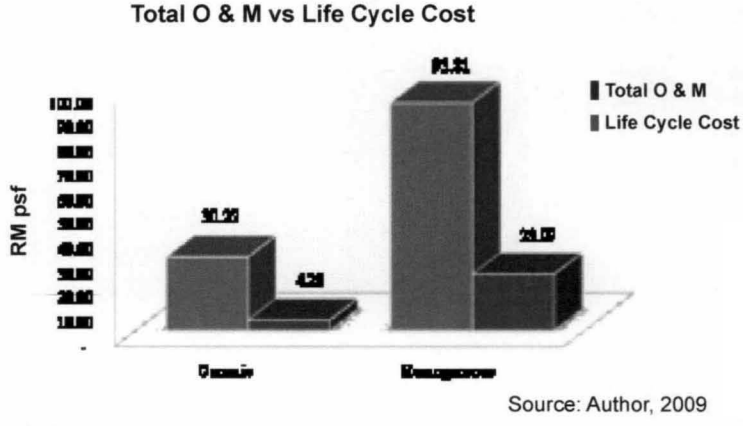
Life cycle costing can, therefore, be particularly useful when analysing the economics of decision regarding buildings, since they and their associated components often have long life cycles. As results, the benefits (or disadvantages) accrue over a long period of time. If the action leads to reduce costs over its lifetime, it can pay back any additional costs required to take the action and then save money over the long term.

It is clear from the earlier chapter that the task of providing and managing the Life-Cycle Cost Analysis within the Faculty of Geoinformation Science and Engineering setting is complex. Research on Faculty of



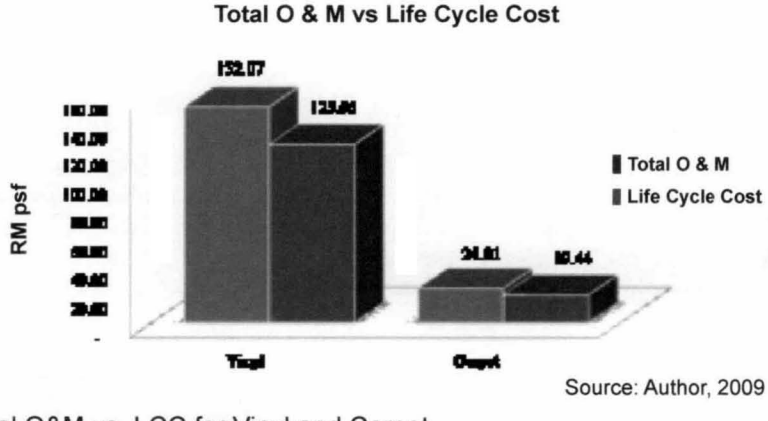
Source: Author, 2009

Figure 2: Total O&M vs. LCC for Flooring Alternatives



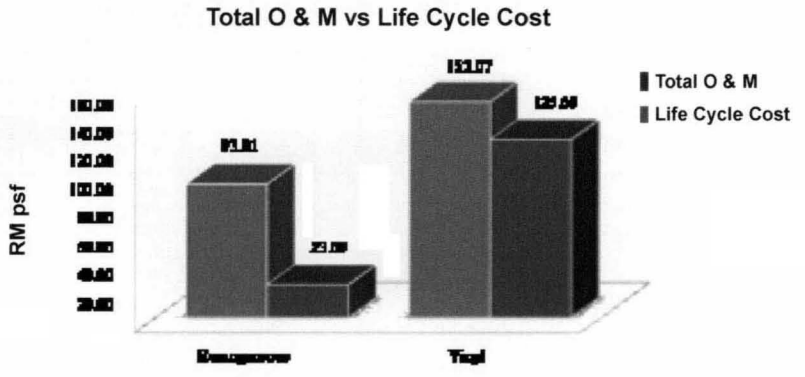
Source: Author, 2009

Figure 3: Total O&M vs. LCC for Ceramic and Homogeneous



Source: Author, 2009

Figure 4: Total O&M vs. LCC for Vinyl and Carpet



Source: Author, 2009

Figure 5: Total O&M vs. LCC for Homogeneous and Vinyl

Geoinformation Science and Engineering asset management (FKSG-asset) is limited to the scope of instruction. Moreover, the research conducted to date is to value in illustrating the consequences of FSG-asset. Therefore, it is important to distinguish every single vital data towards asset of flooring materials had been calculated in to the formula.

Flooring selection for educational assets is not an easy task. The process should take into account the needs of the users, and the physical qualities of the space. Also, design professionals need to understand the impact that their selection of materials may have on the users and on the global environment. Due to the rapidly growing worldwide interest in achieving global sustainability, a special interest should be placed on the selection of environmentally friendly materials. However, a successful design does not conclude with the proper and responsible selection of materials.

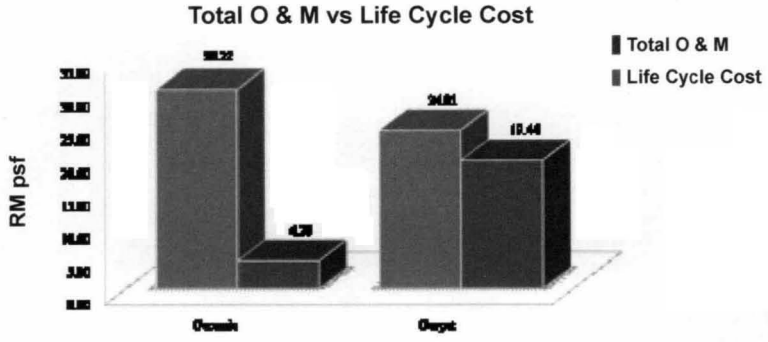
Critical Success Factor for LCC

Choosing flooring material as an asset based for the property management case study is one of the initial idea to show the impact. Any flooring substitute chosen is dependent upon the maintenance program (cleaning, replacement and repair) and is appropriate implementations. Lower initial cost materials are of little benefit if the maintenance costs are beyond the asset budget.

For this reason an ideal choice for selecting flooring material is a low LCC material. These materials will have a little cost after the original capital cost. Other materials may or may not have low initial cost but they will always have high values of LCC. A low life-cycle cost material may not be suitable for requirement associated with an educational asset. Materials characteristics and properties must be considered before selecting any flooring material or any asset (during decision making process).

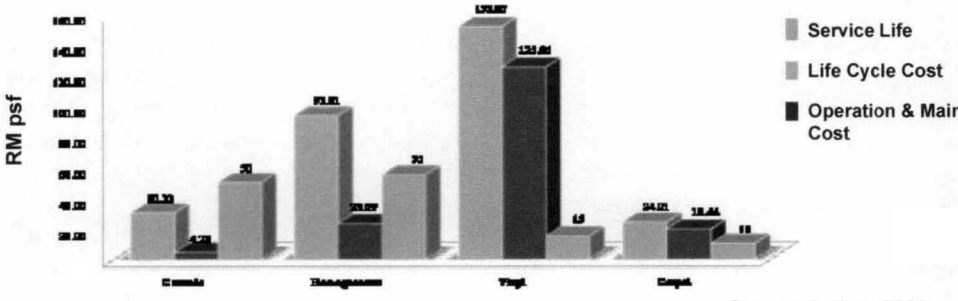
This case study also illustrates the importance of LCCA approach to the economic evaluation of real estate. In the foregoing case, not only is the initial capital investment considered but annual operating and maintenance cost for each alternative as well. The LCCA approach typically ensures a fair impartial treatment of all cost associated with economic alternatives.

After examination of the LCCA results, the initial hypothesis is confirmed; the most



Source: Author, 2009

Figure 6: Total O&M vs. LCC for Ceramic and Carpet



Source: Author, 2009

Figure 7: Increasing Service Life Versus LCC and O&M Cost

economical material was not necessarily the one with the lowest capital cost. Within an increasingly competitive global economy that enforces the maximising of cost saving with subsequent profit increases, successful organizations have demonstrated an understanding and commitment to two key issues that have been identified (Latino, 2002) which are increased productivity and growth.

It is proposed that both of these objectives can be achieved if new projects are identified and executed while simultaneously focusing on optimising the value from assets over the life cycle of assets.

For example, ceramic was the alternative with the lowest initial cost (RM1.87 psf) but was rank number two (2) based on the NPW value of RM 30.22 for a 60 building service life. Vinyl, which is the material with higher values of life cycle cost (RM 140.07), is also the one with the highest value for operation and maintenance cost of RM 12.00 psf.

Based on this research, it can be concluded that not all low initial cost alternatives will have a high life cycle cost, neither a high initial cost will guarantee a low life cycle cost. There must be a balance among the initial cost, the service life, and the O&M cost that allows for flooring alternatives that are within the budget limits of a property and asset's maintenance program.

This can only be achieved with contentious knowledge of the different alternatives for flooring and their specific characteristics

and maintenance requirements. From this study, a direct correlation between initial cost and the resulting NPW values was not found. However for both, flooring alternatives, correlations were found between cost of operations and maintenance and the resulting life cycle cost. It was clearly demonstrated that in most of the cases the benefits of selecting alternatives with low initial cost are overshadowed by the projected cost for the proper maintenance of the asset.

A low life cycle cost material may not be suitable for the requirements associated with an educational asset. Materials characteristics and properties must be considered before selecting any flooring material. Property and asset managers' experience and knowledge is needed to properly evaluate the most effective alternatives taking into consideration not just a low LCC but also to ensure the proper functionality of a building. Life cycle cost quantitative results should only be used as partial indicators and not a final decisive tool for the selection of interior flooring surfaces.

Recommendation for Future Research

The observations of the research actually bring a few ideas that may be; the future researcher can examine this analysis to the other assets either from the public sectors or private sectors. Besides that, this present research only based to the zero (0) discounted rate, so that, the future researcher may examine them into the materials and institution which provide some amount in the property and asset maintenance to their institution funding and budgets. Moreover, work out for the different way of materials, location, purposes of the analysis will help the new result especially in appreciating the functions of LCCA.

The LCCA model must be further tested with the universities or public sector to determine if the holistic approach does overcome the disadvantages that cause the maintenance models not to address PAM adequately in the acquisition phase of assets. Also in this present from the LCCA focuses on the total maintenance costs only. Additional aspect of corporate sustainability must be considered in terms of asset performance (Labuschagne et al, 2004) and the analysis must be revised accordingly.

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