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ARTICLE

Exploring the Knowledge, Skills and Abilities of Malaysian Mall Managers

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ABSTRACT

This study is motivated by the dissimilarity of opinion among licensed and unlicensed mall managers in Malaysia. Differences lie in the areas related to knowledge, skills, attitude, abilities and performance of the mall managers. This article explores and outlines the knowledge, skills, abilities and other characteristics which are vital for superior performance. Variables are identified and validated by a number of experts in the subject matter. Self-administered survey forms are distributed via post. However, to increase the response rate, face-to-face surveys are also conducted. Instrument reliability is verified by internal consistence analysis. Exploratory factor analysis recovers three constructs which contribute to competency framework; these are knowledge, skills and conscientiousness. Conscientiousness is a new construct that has been discovered in this research, one that is originated from the "big five" theory. This framework can be harmonised with the human resource practices adopted in shopping mall organisations to gain competitive advantage.

Keywords: *Mall Manager, Competencies, Knowledge, Skills, Abilities and Conscientiousness.*

I. INTRODUCTION

Nowadays, property management has been emerging as managerial science, altogether suggesting that it has gone beyond rent collection (Scarrett, 2010). Managing properties involve establishing goals, objectives and policies and executing strategies to achieve those goals and objectives. Fuss et al. (2012) posits that property management is an activity that seeks to control the interests of property owners and the particular purpose for which the property is held. Property management is considered the work carried out to supervise and maintain a development and its facilities, at the level that will maintain or improve the value of the development, create a safe, functional and conducive living environment for occupants, keep or restore every facility in well-organised working order and in good state of repair, and project a good appearance or image for the development. Lane (2010) believes that economic and physical liveliness of property assets should also be considered a responsibility of the property management.

II. SHOPPING MALL DEVELOPMENT IN MALAYSIA

A shopping mall is defined as a group of retail and other commercial establishments that is planned, developed, owned, and managed as an operating unit, with their common properties being the location, size, and type of shops to the trade area that the unit serves (Singh & Sahay, 2012). The property manager has the responsibility to enhance the business value, through the successful management of the tenant mix, leases, building maintenance and operations and promotions (Yiu, et al., 2008).

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The development of shopping centres in Malaysia can be divided into three stages. In Kuala Lumpur, the early growth of shopping confines at Jalan Tuanku Abdul Rahman, Jalan Bukit Bintang, Jalan Petaling and Jalan Sultan marked the commencement of stage 1 (1960-1970). The type of development was departmental store in nature. Supermarkets that were launched in 1963 included The Weld, Selangor Emporium, Yuyi Supermarket and Batu Road Supermarket. Ampang Park Shopping Complex was the first to be built to fulfil the requirements of a purpose-built, true shopping complex developed in the 1970s incorporating car park facilities, public amenities, restaurants and other features. Subsequently, other developments that followed were Campbell Shopping Centre, Wisma Stephen, Wisma Central, Sun Complex, Pertama Complex and Wisma MPI. Later on, Plaza Armada and Jaya were erected in the suburban area of Kuala Lumpur.

Stage 2 (1980-1990) saw the mushrooming of better purpose-built shopping centres in the “Golden Triangle”. Sungei Wang Plaza commenced development in 1978 and BB Plaza in 1979. Others that followed through were Kota Raya, Plaza Yow Chuan, Imbi Plaza, Plaza KL, Lot 10 and Ampang City. In a few suburban areas, noticeable improvements were seen in buildings like The Atria and Subang Parade. These shopping centres are better in terms of their designs, shop lots configuration, shopper amenities and tenant mix. The development of shopping centres then progressed to the southern states, evident in Komtar, Lien Hoe Complex, Holiday Plaza and Merlin Towers in Johor Bharu. Notably in Penang, Komtar (acronym for Kompleks Tun Abdul Razak) was the only purpose-built shopping centre in the north during that time.

Mega-size centres were introduced during stage 3 (1990 onwards). They were Sunway Pyramid, Mid Valley Megamall, The Mines Shopping Centres, Suria KLCC and Berjaya Times Square. Sunway Pyramid, Mid Valley Megamall and Suria KLCC have been built in tandem with hotels, convention centres and leisure outlets. Hypermarkets are huge and this evolution signifies the independence of development that combines supermarkets, departmental stores and retail outlets. In the 1990s, Carrefour, Giant, Tesco and other hypermarket branches have been established throughout Malaysia. The latest development in shopping centres trended towards a significant number of power centres which contain large warehouse, factory or discount stores and specialty outlets. Ikano Power Centre and IKEA, on the other hand, have been developed in 2003. The fast-paced developments of the shopping malls mark the increasing demand for competent mall managers ("Shopping centres over the years," 2004). In Malaysia, shopping malls have transcended their early function in the economy as the community centre for social and recreational activities. There has been an increasing sense of inclination among Malaysians to shop for pleasure and spend their leisure time in shopping malls (Ahmed, et al., 2007). Research conducted by Frank Small and Associates indicates that Malaysian adults (above 18 years old) spend 48 percent of their leisure time in shopping malls. This age-cohort group consisting of people from 18 to 44 years old forms the largest group in Malaysia. This age-cohort group is also roughly 49 percent of the total population and therefore, becomes a clear target market for retail marketers (Lee, 1995). Shopping Mall developers across Malaysia have realized the importance of students as key targets for shopping malls, resulting in the fact that some shopping malls are expressly built close to institutions of higher learning. The Mines Shopping Mall is located close to University Putra Malaysia and University Tenaga Nasional whilst the Mid Valley Mega Mall is built within the proximity of University Malaya, and One Utama Mall is constructed in close vicinity to College Damansara Utama and College Bandar Utama. Closeness to students has become a key factor in the positioning of shopping malls in Malaysia (Ahmed, et al., 2007).

III. SHOPPING MALL RESEARCH AREAS

Rigorous literary research on shopping mall management performance notes that studies are mostly centred on prominent subjects such as location (Chebat, et al., 2010), design (Boen, et al., 2010), environment (Pitt & Tucker, 2008), maintenance (Park & Hong, 2011), investment (Morgan & Walker, 1988), parking (Morgan & Walker, 1988), market value and planning (Howard, 1997). Other areas in shopping mall research that attract the concern of scholars are demography (Carpenter & Moore, 2005), customer behaviour (Hong, 2008), shopping mall format (Yan & Eckman, 2009), tenancy and marketing (Pitt & Musa, 2009), entertainment facilities (Kim, et al., 2005), environment (Blair & Larsen, 2005), investment capital (Baum, 2008), management skills (Gok & Hacioglu, 2012), factors attracting shoppers (Ali & Ling, 2010); trust and cooperation (Roberts, et al., 2003) and sale staff satisfaction (Kantabutra, 2011). Despite the importance of planning in the shopping mall sector, research about the relationships between shopping mall management (the property manager or shopping mall manager) and shopping mall performance has been scarce.

IV. PROPERTY MANAGER COMPETENCIES

The Property Manager is a person who always concentrates on implementing and interpreting owner policies, while Practicing Officer in charge of the property management seeks to give advice on the possible outcomes from any proposed alternative actions. He is also the person who leads a team which provides, supervises and controls the property management activities towards achieving the landlord's goals and objectives. The Property Manager is the expert who manages property for a fee. He manages the property to realize the potential capitalisation that can be gained as the property is held. These benefits can come in the form of maximised income, insurance coverage, reduced taxes and the maintenance of high capital appreciation (Noor, 2004; Singh, 1996).

Competency is a set of behavioural patterns that incumbents need to perform when performing their tasks and functions (Boyatzis & Saatcioglu, 2008). McClelland (1973) first proposed the concept of competency-based human resource management which was related to performance 38 years ago. Competency is distinct as a capability or ability (Boyatzis & Saatcioglu, 2008). It is a set of interrelated but different sets of behaviour organised around an underlying construct called the "intent." The behaviours are alternate manifestations of the intent that are appropriate in various situations or times. Competency is a group of "underlying characteristics that indicate ways of behaving or thinking, generally across situations, and endure for a reasonably long period of time." (Guion, 1991) A threshold competency is "a person's generic knowledge, motive, trait, self-image, social role or skill of a person that is casually related to performance on the job." This means the job is done well enough so that the person is not fired. It is not associated to superior performance (Lees & Cordery, 2000).

Hence, competency is more related to behavioural patterns while competence (threshold competency) is more related to the job roles needed for a specific job. The two variables of competencies and job roles must be kept separate (Woodruffe, 1993). There are three clusters of competency that differentiate outstanding performers from the average in many countries of the world (Koman & Wolff, 2008). They are *Cognitive Competency* that involves thinking systems and pattern recognition, *Emotional Intelligence Competency*, that involves self-awareness and self-management (self-control) and Social *Intelligence Competency* that involves social awareness and relationship management (empathy and teamwork).

We learn that there is very little research done on the competency of shopping mall managers. Pheng and Lee (1993) have carried out a survey on 350 residential property managers in Singapore and concluded that the property managers have good knowledge on land title, communication skills and the ability to build rapport with council members. They also make the assertion that cooperative council members and council members should be committed and active. Tas (1996) in his research on property management trainees, of a hotel, has chosen the skills in public relation, professional ethics and diplomacy in both oral and written relations as the competency requirements to guarantee the success of a management. Johnson (1996) discovers in his research that involves 486 property managers, that to become a successful property manager, skills (interpersonal, supervisory, oral communication, leasing/sales, accounting, computer) and knowledge (financial management, marketing, maintenance, landlord/tenant law) are very important. Mc Lagan (1980) in turn, has developed the concept of "competency models" and defines the models as "decision tools which describe the key capabilities required to perform a job." These tools are defined as a set of knowledge, skills, attitudes or intellectual strategies. *"At their best, competency models can be more reliable than job description (which talks about job, not skill and knowledge specification), more succinct and valid than the skill list, and more consistently on target than "gut feel."*

Spencer & Spencer (1993) identify very similar uses for competency models: assessment and job-person matching for recruiting, placement, retention and promotion; succession planning; development and career patching. In addition to these, the following uses have been identified as applications of competency model: performance management, competency-based pay, integrated human resource management information system and competency-based workforce planning. Alias (2007) suggests that the core competencies for the Facilities Asset Manager and which are very similar to the Property Manager, consist of core competencies and new competencies needed. The core competencies are education, experience, specific body of knowledge, skills and other training, while the new competencies needed are business process knowledge, strategic thinking planning, strong analytical capabilities, relationship building skills, ability to negotiate, listening and communication skills, interdisciplinary team management and the need to establish user evaluation schedule for new and old asset facilities.

There are four types of competency that a property manager needs to acquire: Administrative Competency (Managing time and prioritising, setting goals and standards, planning and scheduling work), Communication Competency (Listening and organising, giving clear information, getting unbiased information), Supervisory Competency (Training, coaching and delegating, appraising people and performance, disciplining and counselling), and Cognitive Competency (Identifying and solving problems, making decisions, weighting risks, thinking clearly and analytically) (Gross, 1976; Johnson & Gross, 1996; Parry, 1998). Donnellan (1998) has conducted a survey involving major retailers in the United States and claims that communication skills and entertaining customers appear to be the most important factors to triumph in retail business. Li (1997) further emphasises that it is always important to bear in mind that the basic management tool in good property management practice is human resources and the target of service is people, rather than the physical building.

V. SHOPPING MALL MANAGER COMPETENCIES

Woodruffe (1993) recommends that competency must be oriented towards the future and not a device for cloning the past. Athey and Orth (2005) conclude that competency embraces all possible attributes of KSA - Knowledge, Skills, Attitudes and Behaviours at the individual level. A broader term known as KSAO - Knowledge, Skills, Abilities and Others as characteristics which correspond to competency, is also used occasionally.

KSAOs are more likely to be associated with performance (Subramony, 2009; Takeuchi, et al., 2007). These are accepted by most scholars in the related field (Campion, et al., 2011). Referring to this perception, the competencies for shopping mall managers are summarized as in Tables 1, 2, 3 and 4.

VI. METHODOLOGY

This cross-sectional survey uses questionnaire for collecting data. The questionnaire consists of the five-point Likert scale and is divided into five sections namely demography, knowledge, skills, abilities and other characteristics. It consists of 45 items which can be categorised into knowledge (9), skills (12), abilities (11) and others (13). The questionnaire has been validated by an expert panel of five shopping mall managers. Following this, the questionnaire is upgraded and sent to all shopping mall managers in Malaysia. The population (275) is used due to the small number of shopping malls in Malaysia (Allvin, et al., 2009; Rossiter, 2008). The survey is conducted by combining both the postal and face-to-face methods.

The questionnaires are distributed in two stages and the response rate is 45.45%. The exploratory factor analysis (EFA) with varimax rotation is used to group the underlying factors together (Vaus, 2002). The factor loading used is 0.3 (Tabachnick & Fidell, 1996).

Table 1: Knowledge

Knowledge			Scholars
1	Customer and Personal Service	The principles and processes in providing customer and personal services.	(Chung-Herrera, et al., 2003)
2	Administration and Management	Principals involved in strategic planning, resource allocation, human resources modelling, leadership technique, production methods and the coordination of people and resources.	(Chung-Herrera, et al., 2003)
3	Sales and Marketing	The principles and methods of marketing strategies and tactics, product demonstration, sales techniques and sales control systems.	(Donnellan, 1998)
4	Economics and Accounting	Economic and accounting principles and practices, financial markets, banking and the analysis and reporting of financial data.	(Alias, 2007)
5	Personnel and Human Resources	The principles and procedures for personnel recruitment, selection, training, compensation and benefits, labour relations and negotiation, and personnel information systems.	(Phillips & Roper, 2009)
6	Building and Construction	Knowledge on materials, methods, tools involved in the construction or repair of buildings and structures such as roads.	(Ismail, 2007)
7	Computers and Electronics	Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.	(Hashim, 2008)
8	Law and Government	Knowledge of laws, legal codes, court procedures, precedents, government regulations, executive orders and agency rules.	(Bennett, et al., 2008)
9	Public Safety and Security	Knowledge of relevant equipment, policies, procedures, and strategies to promote effective protection of people, data, property and institutions.	(Cheng, et al., 2005)

Table 2: Skills

Skills			Scholars
1	Active Listening	Giving full attention to what other people are saying, taking time to understand the points being made, asking questions appropriately and not interrupting at inappropriate times.	(Cooper, et al., 1998; Shepherd, et al., 1997)
2	Critical Thinking	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.	(Kent, 2007)
3	Social Perceptivenes s	Being aware of others' reactions and understanding why they react as they do.	(Prastacos, et al., 2002)
4	Management of Personnel Resources	Motivating, developing and directing people as they work, identifying the best people for the job.	(Boyatzis & Saatcioglu, 2008)
5	Service Orientation	Actively looking for ways to help people.	(Phillips & Roper, 2009)
6	Judgement and Decision Making	Considering the relative costs and benefits of potential actions before choosing the most appropriate one.	(Bloom, et al., 2010)
7	Writing	Communicating effectively in writing as appropriate for the needs of the audience.	(Cotts, et al., 2010)
8	Management of Financial Resources	Determining how money will be spent to get the work done, and accounting for these expenditures.	(Eccles & Holt, 2001)
9	Instructing	Teaching others how to do something.	(Hashim, 2008)
10	Negotiation	Bringing others together and trying to reconcile differences.	(Erkip, 2003)
11	Monitoring	Assessing performance of you, other individuals and organisations to make improvements or take corrective actions.	(Baharum & Pitt, 2010)
12	Complex Problem Solving	Reviewing related information, developing and evaluating options, to implement solutions.	(Chakravorty, et al., 2008)

Table 3: Abilities

Abilities			Scholars
1	Oral Comprehensio n	The ability to listen to and understand information and ideas presented through spoken words and sentences.	(Hausknecht & Langevin, 2010)
2	Oral Expression	The ability to communicate information and ideas in speaking, so others will understand.	(Hausknecht & Langevin, 2010)
3	Written Comprehensio n	The ability to read and understand information and ideas presented in writing.	(Donnellan, 1998)
4	Written Expression	The ability to communicate information and ideas in writing, so others will understand.	(Donnellan, 1998)
5	Speech Clarity	The ability to speak clearly, so others can understand you.	(Donnellan, 1998)
6	Speech Recognition	The ability to identify and understand the speech of another person.	(Ingram, et al., 1992; Shepherd, et al., 1997)
7	Problem Sensitivity	The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognising that there is a problem.	(Amaratunga, et al., 2000)
8	Near Vision	The ability to see details at close range (within a few feet of the observer).	(Tregoe & Tobia, 1995)
9	Deductive Reasoning	The ability to apply general rules to specific problems to produce answers that make sense.	(Nobre & Walker, 2011)
10	Inductive Reasoning	The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).	(Baharum, et al., 2009)
11	Selective Attention	The ability to concentrate on a task over a period of time without being distracted.	(Andersen, 1972)

Table 4: Others

Others			Scholars
1	Dependability	Job requires being reliable, responsible, dependable and fulfilling obligations.	(Grossman, 1998)
2	Integrity	Job requires being honest and ethical.	(Kaiser & Hogan, 2010)
3	Attention to Detail	Job requires being careful about detail and being thorough in completing work tasks.	(Boyatzis & Saatcioglu, 2008)
4	Stress Tolerance	Job requires accepting criticisms and dealing calmly and effectively with highly stressful situations.	(Forgie & DeRosa, 2010)
5	Self Control	Job requires maintaining composure, keeping emotions in check, controlling anger and avoiding aggressive behaviour, even in very difficult situations.	(Jensen-Campbell, et al., 2007)
6	Adaptability/ Flexibility	Job requires being open to change (positive or negative) and being open to considerable variety in the workplace.	(Chong, 2011)
7	Cooperation	Job requires being pleasant with others on the job and displaying a good-natured, cooperative attitude.	(Teller & Elms, 2010)
8	Innovation	Job requires creativity and alternative thinking to develop new ideas for, and answers to, work-related problems.	(Amidon, et al., 2006; Stephenson, et al., 2010)
9	Independence	Job requires developing one's own ways of doing things, guiding oneself with little or no supervision, and depending on oneself to get things done.	(Yu-tong, 2011)
10	Leadership	Job requires a willingness to lead, take charge, and offering opinions and direction.	(Zaccaro, 2007)
11	Analytical Thinking	Job requires analysing information and using logic to address work-related issues and problems.	(Wu, 2009)
12	Persistence	Job requires persistence in the face of obstacles.	(Fernandez-Duque, et al., 2000)
13	Initiative	Job requires a willingness to take on responsibilities and challenges.	(M. I. Cheng, et al., 2005; Khandwalla, 2004)

The validity of each factor is tested with the internal consistency analysis. The non-response bias analysis has been conducted on the data gathered from the mail and face-to-face methods to verify the answers given by the two groups, and to make sure that they are consistent and not biased. The non-response bias can be tested by comparing the mean between the early received questionnaires and the questionnaires that arrive late (Bjertnaes, et al., 2010). Usually 10% of each sample are analysed using the T-test to see whether there is any significant difference (Baark, et al., 2011; Lenzer & Broedel-Zaugg, 2011). The items that are examined are demographic items which are not primary (Abraham, et al., 2008). However, in this article, there are 92 responses received by mail (92) and 33 by face- to-face (33), and this is explained by the fact that the latter is considered late due to the respondents failing to respond after numerous reminders.

VII. RESULTS

A total of 125 useable samples have been collected. Eighty-seven of the respondents are male (70 percent) and only 38 (30 percent) of them are female. The majority of the respondents are Malays (62 percent), followed by Chinese (28 percent), Indians (8.8 percent) and Others (1.6 percent).

The biggest age group, as found in this study, is the age group of 30 to 39 years old (46 percent) and this is followed by those under 30 years old (17 percent), from 40 to 50 years old (32 percent) and above 50 years old (5 percent). The majority of the respondents have less than 5 years of working experience (30 percent), and the rest have 5 to 9 years of experience (28 percent), 10 to 14 years (16 percent), 15 to 19 years (14 percent) and 20 to 29 years (12 percent) of experience. In terms of levels of education, 67 respondents (54 percent) have been reported to have degrees, 37 respondents (30 percent) have diplomas, 14 respondents (11 percent) have Master's degrees and the rest admit to have only certificates (6 percent).

The data have been analyzed with SPSS 15. The first rotation is done by selecting the Eigen value greater than 1. Seven factors have been generated, but only the first three factors have more than 5% of variance. The data have been rotated again by forcing the factors into three groups (Piaw, 2009). The items that load to more than one factor are omitted (Piaw, 2009). These new factors are labelled as skills, conscientiousness and knowledge, and the total variance explained are 66.19%. Conscientiousness is a new construct and it originates from one of the Five Factor Model (FFM) constructs. The details of the factors are tabulated in Table 5. Since the response rate is less than 70%, there is a tendency for bias in the data. Therefore, the data have been tested using the non-response bias test and they are proven to have no significant difference. This means that there is no biasness in the study and the details are given in Table 7.

Table 5: Exploratory Factor Analysis

	Components		
Item	**1**	**2**	**3**
C301 Oral Comprehension	**0.806**		
C211 Monitoring	**0.790**		
C206 Judgement & Decision	**0.783**		
C302 Oral Expression	**0.779**		
C210 Negotiation	**0.764**		
C203 Social Perceptiveness	**0.763**		
C205 Service Orientation	**0.753**		
C304 Written Expression	**0.739**		
C202 Critical Thinking	**0.732**		
C412 Persistence	**0.731**		
C209 Instruction	**0.728**		
C406 Adaptability/Flexibility	0.728	0.434	
C303 Written Comprehension	**0.726**		
C208 Management of Financial	**0.718**		
C413 Initiative	0.715	0.437	
C401 Dependability	0.715	0.415	
C411 Analytical Thinking	**0.684**		
C101 Customer and Personal	**0.677**		
C307 Problem Sensitivity	**0.675**		
C207 Writing	**0.674**		
C311 Selective Attention	**0.657**		
C404 Stress Tolerance	0.653	0.413	
C109 Public Safety & Security	**0.612**		
C102 Administration and	0.552		0.414
C405 Self Control		**0.895**	
C308 Near Vision		**0.808**	
C410 Leadership		**0.787**	
C403 Attention to Detail		**0.774**	
C402 Integrity		**0.741**	
C408 Innovation		**0.723**	
C409 Independence		**0.707**	
C407 Cooperation		**0.698**	
C309 Deductive Reasoning		**0.695**	
C305 Speech Clarity		0.686	0.400
C204 Management of Personnel	0.408	0.638	
C306 Speech Recognition		0.625	0.436
C310 Inductive Reasoning		**0.621**	
C212 Complex Problem Solving	0.426	0.575	
C201 Active Listening		0.547	0.437
C104 Economic and Accounting			**0.762**
C106 Building & Construction			**0.760**
C107 Computers and Electronics			**0.651**
CI08 Law & Government	0.498		0.588
C103 Sales and Marketing	0.538		0.539
C105 Personnel & Human		0.422	0.477

Table 6: Test of Internal Consistency

Skills - Component Matrix			
1	Oral Comprehension	0.806	Cronbach's Alpha 0.971
2	Monitoring	0.790	
3	Judgement & Decision Making	0.783	
4	Oral Expression	0.779	
5	Negotiation	0.764	
6	Social Perceptiveness	0.763	
7	Service Orientation	0.753	
8	Written Expression	0.739	
9	Critical Thinking	0.732	
10	Persistence	0.731	
11	Instruction	0.728	
12	Written Comprehension	0.726	
13	Management of Financial Resources	0.718	
14	Analytical Thinking	0.684	
15	Customer and Personal Service	0.677	
16	Problem Sensitivity	0.675	
17	Writing	0.674	
18	Selective Attention	0.657	
19	Public Safety & Security	0.612	

Conscientiousness - Component Matrix			
1	Self Control	0.895	Cronbach's Alpha 0.944
2	Near Vision	0.808	
3	Leadership	0.787	
4	Attention to Detail	0.774	
5	Integrity	0.741	
6	Innovation	0.723	
7	Independence	0.707	
8	Cooperation	0.698	
9	Deductive Reasoning	0.695	
10	Inductive Reasoning	0.621	

Knowledge - Component Matrix			
1	Economic and Accounting	0.762	Cronbach's Alpha 0.780
2	Building & Construction	0.760	
3	Computers and Electronics	0.651	

VIII. DISCUSSION

The outcomes of this paper substantiate that the competency for shopping mall managers encompasses the three important traits namely knowledge, skills, conscientiousness. EFA somehow, has eliminated two constructs namely abilities and other characteristics. This is due to the difficulty in inferring abilities and other characteristics to job performance. KSAOs reflect the psychological construct and is not directly observable (Morgeson, et al., 2009). The exclusion of the two constructs is also consistent with the fact that knowledge and skills are often directly linked to the performance of tasks and defined in terms of learned, observable behaviours, whereas ability and other characteristics are much more hypothetical and not generally tied to specific behaviours identified in a job description (Morgeson & Campion, 2000).

A new construct has materialised and it is more observable and can be directly linked to performance. It is labelled as conscientiousness and is related to personalities. Morgeson et al. (2009) affirms that a personality is built on the dimensions of extraversion, emotional stability, agreeableness, conscientiousness and open to experience. In many studies, conscientiousness has shown a significant correlation with performance and it is the one global factor of personality that is important across all jobs (Barrick, 2005). Schmidt and

Table 7: Independent Sample T-Test

Levene's Test for Equality of Variances				t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Professional Background	Equal variances assumed	1.653	.201	-.569	123	.570	-.358	.629	-1.603	.887
	Equal variances not assumed			-.526	49.323	.602	-.358	.681	-1.727	1.011
Education	Equal variances assumed	.970	.327	.210	123	.834	.032	.151	-.267	.330
	Equal variances not assumed			.223	63.742	.824	.032	.142	-.252	.315
Race	Equal variances assumed	.565	.454	-.455	123	.650	-.067	.148	-.359	.225
	Equal variances not assumed			-.481	63.026	.632	-.067	.140	-.346	.212
Age	Equal variances assumed	.181	.671	-.808	123	.421	-.241	.298	-.831	.349
	Equal variances not assumed			-.822	58.304	.415	-.241	.293	-.827	.346
Experience	Equal variances assumed	.829	.364	-.587	123	.558	-.171	.292	-.749	.406
	Equal variances not assumed			-.588	56.685	.559	-.171	.291	-.755	.412
Types of Mall	Equal variances assumed	2.043	.155	.817	123	.416	.079	.096	-.112	.269
	Equal variances not assumed			.794	53.674	.431	.079	.099	-.120	.278

Hunter (1992) have called conscientiousness the most important trait-based motivation construct in organisational science.

It has been well established that, of all of the FFM personality dimensions, conscientiousness has demonstrated the strongest relationship with job performance, generalising across a range of positions (Barrick & Mount, 1991; Salgado, 1997). Relatively speaking, conscientious individuals are also characterised as organised, hardworking, determined, self-disciplined and achievement-oriented (Costa & McCrae, 1992; Goldberg, 1992). The outcomes of the study are consistent with the recent research findings which claim that job performance does not depend entirely on knowledge or skills, but it also depends on individual personalities (Forero, et al., 2009; Ozer & Benet-Martinez, 2006). This study also satisfies Howard's (1997) recommendation that shopping mall research needs to focus on how centres can best be managed to ensure that tenants and centre managers are working for common goals. We hope this study can further add values to the body of knowledge on shopping mall management and competency. Despite this, the relationship between knowledge, skills and conscientiousness to job performance is yet to be explored, in the forthcoming issue.

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ARTICLE

Exploring Stress With Focus On Students In A Higher Educational Institution: A Case Study In Universiti Sains Malaysia

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ABSTRACT

Stress management of degree students in their final year at the School of Housing, Building and Planning (HBP), Universiti Sains Malaysia (USM) was explored and analysed in this study. The factors, the effects and the effective ways to cope with stress were delved into. The stress levels between genders were also compared. The results of the feedback of 157 final-year HBP students were subjected to statistical analysis. The top five factors contributing to stress were identified: academic workload, frustration, conflict and pressure, unexpected situations, financial problems and grade pressure. The positive effects of stress made the students more responsible, much more prepared for stress, and enhanced their performances. On the contrary, the negative effects of stress were difficulty in concentrating, feeling stressed out, and tiredness. There were several ways to cope with stress: self-control, calmness in facing problems, taking care of one self and seeking support from others. The comparisons between genders showed that male students were more affected by stress. Stress had positive and negative effects on male students in comparison to female students. In terms of coping with stress, the analysis revealed that female students were able to deal with stress more effectively.

Keywords: *Stress, construction-related programme, male and female students.*

INTRODUCTION

Stress is a general term applied to the pressure people feel in life. Stress build-up causes adverse strains on emotions, thought process and physical condition (Mathur et al., 2007). D'Aurora and Fimian (1998) defined stress as an emotional tension rising from life events, or a feeling of threat to the safety or self-esteem of a person. In other words, stress is the reaction people get from excessive pressure and other types of demands placed on them. Stress generally arises when someone is worried that he or she may not be able to cope with the various demands (Roney and Cooper, 1997). Thus, Murdock and Scott (1993) defined stress as the imbalance between the perception of the demand and the perception of the ability to cope with it.

Stevenson and Harper (2006) stated that "stress is widely accepted to have two effects which are positive and negative on individuals. Broadly, accepted levels of stress help to improve an individual's performance whilst excessive amounts of stress can lead to a decreased performance." Girdano et al., (2001) argued that stress can be motivating, energizing, exciting and fun because it challenges an individual to reach greater endeavours but it is also known to cause at least 80% of illnesses that plague modern society.

How students perceive stress can influence the quality of their learning performance. According to Stevenson and Harper (2006), stress can have an impact on the learning experience of students. Student performance, which is normally measured through various assessment methods, determines the quality of students. For example, negative effects such as reduced efficiency, decreased capacity to perform and dampened initiative (Fairbrother and Warn, 2003) decrease the quality of student performance.

A college year is a period of immense changes in the life of a young adult (Sher et al., 1996). Stress is a common problem among students in institutions of higher learning and contributes to a significant number in the dropout rates of students (Whitman et al., 1984). In relation to gender, previous studies revealed contradictory findings on stress faced by men and women (HSE, 2004). For example, Gadzella (1994) and Kohn et al., (1990) reported that women belong to a high-risk group because they face more psychological distress than men. Cahir and Morris (1991) concluded that female students have higher stress scores than males because of the impact of emotional, financial and academic stressors.

CASE STUDY

Established in 1967, the School of Housing, Building and Planning (HBP) at the Universiti Sains Malaysia (USM) aims to educate future players in the construction industry. The programmes offered are Quantity Surveying, Architecture, Construction Management, Interior Design, Building Technology, and Urban and Regional Planning. The teaching approach in this school is quite different from programmes based on the arts or the social sciences. Besides the lectures in classrooms, the school implements the studio approach. In the studio, other than being taught about theories, students have to conduct actual fieldwork. This activity includes producing drawings and models, and determining pricings based on original data or observation from the industry. Studio work normally carries more marks compared to normal courses. The passing mark is higher and student attendance is compulsory. However, most of the projects are conducted in groups. Moreover, the HBP curriculum also requires final year students to get involved in specific programme activities such as arranging seminars, presenting papers, writing a dissertation, and participating in national design competitions. Thus, when comparing with students taking other similar arts stream courses, HBP students have extra work and assignments besides maintaining their good examination performance. Hence, the different stress factors faced by the students under the different curriculum contribute to their stress (Jogaratnam and Buchanan, 2004).

Several studies on stress have been conducted in workplaces (Donovan and Kleiner, 1994; Dewe and O'Driscol, 2002; Juniper, 2003; Shuttleworth, 2004; Mathur et al., 2007). However, a few researchers, such as McNeely (1995), Ross (1995), and Jogaratnam and Buchanan (2004) conducted studies on stress among nursing students. Stevenson and Harper (2006) looked into the stressors on academicians. Stress management in construction-related courses has yet to be studied in higher educational institutions in Malaysia.

The purpose of this research is two-fold viz. i) to study stress management among final-year degree students in HBP, USM, and ii) to explore how stress affects these students and how they manage it. The overall objectives of this research are i) to identify the stressors in the students' daily life; ii) to compare stress levels between genders; iii) to analyse the effects of stress on students' performance; and (iv) to find effective ways for students to cope with stress. In the latter part of this paper, the authors present the following: lengthy discussion on stress, research methodology, statistical analysis on the collected data, results and discussion, and conclusion and recommendation.

LITERATURE REVIEW

The word "stress" is borrowed from physics and mechanics, where it means the physical pressure exerted upon, and between parts of a body; when deformation occurs, and as a result it is called "strain" (Madders, 1988). However, stress has been widely used in different context. In general and simple terms, Mathur et al., (2007) stated that stress applies to the pressure people feel in life. When pressure builds up, it can cause adverse strains on emotions, thought process and physical condition. Stress occurs when the body is required to perform beyond its normal range of capabilities (Hindle, 1998). More specifically, Fontana (1989) views stress as a demand made upon the adaptive capacities of the mind and the body. If these capacities can handle the demand and enjoy the stimulation involved, then stress is welcome and helpful. In contrast, the inability of the individual to adapt and manage these stressors creates anxiety, which results in distress. Normally, if the individual has the ability to use the anxiety phase as a trigger or a stimulant, then these stressors can be managed (Mohan, 1995).

Stress and students

The university years bring to mind the written Chinese character with a dual meaning viz. *crisis and opportunity*, wherein the university journey will definitely put them to personal tests that are most likely to be beyond anything they have ever experienced before (Schafer, 2000). Moreover, university years begin with the time when students often move away from their homes, and develop and establish their new peer-based support system. Students will face challenges and new academic and intellectual rigors in the university. Dunkel-Schetter and Lobel (1990) agreed that these factors might contribute to distress among a relatively large proportion of students and in the significant student dropout rate during the undergraduate years (Whitman et al., 1984). Furthermore, having a programme with curricula that combine classroom work and exposure to practical aspects such as internship, cooperative education placement, and practicum, create more stress than the traditional programmes (Jogaratnam and Buchanan, 2004).

Stress may interfere with the learning ability of an individual and disrupt motivation to focus on academic pursuits (Polson and Nida, 1998). Many students claim experiencing stress during their academic years. Among the factors that contribute to their stress are ineffective time management, academic workload, expectation of academic achievement, changes in lifestyle, inability to plan for upcoming obstacles, unpreparedness for academic challenges, frustration, conflict, changes, pressure (Tharbe, 2006), financial uncertainty, grade pressure, and role difficulties (Schafer, 2000). Nursing students feel the combination of curricula and classroom work, financial problems, and high levels of turnover experienced in the industry as their main sources of stress (Jogaratnam and Buchanan, 2004).

Effects of stress

Stress normally results in two situations (Mathur et al., 2007). If the capacities of the individual can handle the demand and enjoy the stimulation involved, stress is welcome and helpful. However, if the individual cannot cope with the stress demand, then stress is unwelcome and unhelpful. Stress provides stimulation, challenges, and is essential for development, growth and changes (Davidson, 1999). Good stress or positive effect is known as *eustress*, whereas *distress* is the unpleasant, debilitating and unhealthy stress. Good stress can be related to motivation without which human beings will not strive to achieve greater heights (Davidson, 1999). Stress is also positive when it warns individuals that they are not coping well and a lifestyle change is warranted if optimal health is to be maintained (Girdano et al., 2001).

The negative effects of stress are harmful to individuals, families and society (Hindle, 1998). For example, a negative effect happens when it exceeds someone's ability to cope, fatigues body system, and causes behavioural or physical problems (Girdano et al., 2001). Bad stress or distress makes one anxious and irritable, dampens the spirit, and even shortens one's life due to its adverse psychological and physical effects (Davidson, 1999).

COPING WITH STRESS

There are several ways to handle stress. Mills (1982) proposed four major categories to handle stress, namely, getting ready, working on one self, working on the task, and working on the environment. All these methods are interrelated with each other.

To cope with stress, students can take either a proactive or a reactive action. Sometimes, they can learn from experience and observation on how to manage a stressful situation even before it happens. In contrast, others resort to reactive coping behaviours that are not constructive. Proactive coping skills include planning, goal setting, organising and mental stimulation (Aspinwall and Taylor, 1997). Maintaining a positive lifestyle, which includes turning challenges into positive stress, facilitates academic learning and personal development of students (Whitman et al., 1984).

RESEARCH METHODOLOGY

In this study, the population consisted of final-year degree students of the School of HBP, USM. The questionnaires were distributed by hand to 240 students. The breakdown of the students is as follows: 45 from Construction Management, 38 from Quantity Surveying, 47 from Building Technology, 43 from Architecture, 32 from Urban and Regional Planning, and 35 from Interior Design. The method used is stratified random sampling approach. From the questionnaires distributed, only 157 students (65.4%) responded with complete answers. The percentage of accepted questionnaires for this research was 78.5%.

In this study, the five-point Likert scale (1=strongly disagree, 5=strongly agree, and 1=never, 5=almost always) used one extreme value to the other with an equal number of positive and negative response possibilities and one neutral category (Rea and Parker, 1997). The research questionnaires were divided into four parts. Part A asked for the background of the respondents. Parts B, C and D respectively looked into the factors, the effects, and the coping mechanisms of stress. Ten postgraduate students from the School of HBP, USM, were chosen to be the respondents for the pilot study.

All the data in this study were analysed by using the Statistical Package for Social Science (SPSS, version 17.0). The obtained data were analyzed using mean rank, t-test, and one-way analysis of variance (ANOVA).

FINDINGS AND ANALYSIS

Based on the survey of 157 respondents who answered the questionnaires, 38.9% (61 respondents) of the students were male and 61.1% (96 respondents) were female. The majority of the respondents, 84.7% of the total respondents (133 students) belonged to the age group between 22 and 24 years. Of the respondents, about 10.2% (16 students) were between the age of 19 and 21 years while 3.8% (6 students) were between the age of 25 and 27 years. Only 1.3% (2 students) was above the age of 27 years. The 157 respondents were further categorized under different majors: Quantity Surveying 22.3% (35 students), Construction Management 19.7% (31 students), Urban and Regional Planning 19.1% (30 students), Building Technology 14% (22 students), Interior Design 13.4% (21 students), and Architecture 11.5% (18 students).

Based on Table 1, the top five major factors contributing to stress among the respondents are academic workload; frustration, conflict and pressure; unexpected situations; financial problems; and grade pressure. Stress affects student-respondents both in positive and negative ways. Table 2 shows the effects of stress on the students. Most students agreed that being "always prepared" is a positive effect of having stress in their daily lives. Becoming more responsible and enhancing performance are the second and third good effects of stress, respectively. In terms of the negative effects, most of the students agreed that the main bad effects of stress on them as in Table 3 are difficulty in concentrating, feeling harassed due to stress, and feeling tired. Based on Table 4, the five most effective ways that the respondents would do to cope with stress are self-control, being calm when facing problems, take caring of one self, seeking support from others, and being tough and patient.

Table 1: Descriptive statistics on factors of stress

Variables	Mean	Standard Deviation
Academic workload	4.06	0.915
Frustration, conflict and pressure	3.99	0.947
Unexpected situation	3.90	1.176
Financial problems	3.83	1.181
Grade pressure	3.82	0.932
Inefficient facilities	3.82	1.224
Ineffective time management	3.80	1.034
Higher expectation for academic achievement	3.79	1.080
Submission date	3.76	1.144
Work amendments after "presentation"	3.70	1.095
Combination of curricular and classroom work	3.64	1.013
Changes in life	3.57	1.039
Lack of confidence in presentation	3.56	1.048
Role difficulties	3.54	0.977
Problems with transportation	3.52	1.233
Do not have confidence in giving ideas	3.45	1.047
Poor registration procedure or system	3.39	1.304
Racist problems in group work	3.36	1.150
Personal problems	3.34	1.096
Negative perception from others	3.34	1.047
Inability to communicate	3.29	1.189
Difficulty mixing with others	3.27	1.164

Table 2: Positive effects of stress

Variables	Mean	Standard Deviation
Always prepared	3.94	0.952
Becoming more responsible	3.90	1.099
Enhanced performance	3.78	0.945
Giving praise to God	3.77	1.320
Self motivated	3.64	1.006
Becoming happier	3.62	1.318

Table 3: Negative effects of stress

Variables	Mean	Standard Deviation
Difficulty in concentrating	3.79	0.885
Feeling stressed out	3.73	0.943
Feeling tired	3.71	1.032
Lacking confidence	3.66	0.945
Feeling nervous	3.64	0.948
Showing panic or anxiety	3.62	1.046
Feeling sad	3.59	1.025
Losing temper	3.46	1.077
Having headache	3.42	1.116
Having pain in neck, chest or shoulders	3.39	1.142
Avoiding things	3.25	1.249
Having stomach distress	3.25	1.376
Becoming passive	3.23	1.260
Insomnia	3.22	1.319
Appetite changes	3.18	1.234
Weight gain or loss	3.13	1.354
Excessive worrying	3.11	1.256
Always getting colds or the flu	2.99	1.281
Personal neglect	2.45	1.538
Unexpected action	2.43	1.618

Table 4: Coping with stress

Variables	Mean	Standard Deviation
Control yourself	3.97	0.974
Be calm when facing problems	3.95	0.999
Take care of yourself (having sufficient rest or sleep)	3.91	1.015
Seek support (advice from friends, counsellor)	3.90	1.049
Be tough and patient when goal cannot be achieved	3.90	0.995
Reduce uncertainty	3.88	0.983
Get away from it all (get some leisure time)	3.88	1.094
Resolve unfinished business	3.88	1.046
Minimize changes	3.71	1.044
Integrate planning and preventive strategies	3.76	1.014

Stress and gender differences

Based on the comparison between genders, only three factors are significant (Table 5). The factors are difficulties in mixing with others (significant at $P \leq 0.01$), ineffective time management, and grade pressure ($P \leq 0.05$). Mean values indicate that male students have more difficulties in terms of managing time and mixing with other students, whereas female students are affected because of their aim to get good grades.

Based on this study, stress can provide significant effects according to gender. In terms of the positive effects, being self-motivated was more effective for males (mean=3.77) compared to female students (mean=3.56) with significant level of $P \leq 0.05$ (Table 6). Meanwhile, for negative effects, losing temper was the most significant, $P \leq 0.01$. This factor affected male students more than female students. This finding shows that men easily lose their patience when they are faced with problems. The other three significant negative effects of stress were having difficulties in concentrating, getting the flu, and having stomach distress, $P \leq 0.05$. The first two negative effects were experienced more by male students, whereas female students were more likely to have stomach distress compared to men when they were under stress.

Three most significant factors male and female students use to cope with stress are: being tough, having patience and calmness, at $P \leq 0.01$, whereas the other two factors that show significance at $P \leq 0.05$ are resolving unfinished business and minimising changes (Table 7). In all cases, it is shown that females easily adapted to stress more than men did.

DISCUSSION

Stress is unavoidable. Students often face stress in their daily lives. Many factors have been identified as important contributors to individual stress. Based on the analysis, five factors

Table 5: Gender comparison: Factors of stress

Variables	Male	Female	F	Sig.
Ineffective time management	3.84	3.78	4.278*	.040
Academic workload	3.80	4.22	1.449	.231
Higher expectation for academic achievement	3.66	3.88	1.060	.305
Changes in life	3.72	3.47	1.196	.276
Frustration, conflict and pressure	3.92	4.03	1.122	.291
Financial problems	3.80	3.85	0.531	.467
Grade pressure	3.75	3.85	4.241*	.041
Role difficulties	3.52	3.55	0.048	.827
Combination of curricular and classroom work	3.59	3.68	2.992	.086
Inability to communicate	3.31	3.28	0.822	.366
Submission date	3.64	3.84	0.017	.897
Difficulty mixing with others	3.46	3.16	7.470**	.007
Personal problems	3.38	3.32	0.004	.947
Racist problems in group work	3.30	3.41	0.003	.960
Negative perception from others	3.26	3.39	2.615	.108
Work amendments after "presentation" and comments by lecturers	3.67	3.72	0.191	.663
Inefficient facilities (wireless, parking lot, etc.)	3.66	3.92	3.140	.078
Problems with transportation	3.54	3.51	1.570	.212
Poor registration procedure or system	3.39	3.39	0.878	.350
Unexpected situation (broke laptop, lost files, etc.)	3.79	3.98	0.154	.695
Do not have confidence in giving ideas	3.28	3.56	0.122	.728
Lack of confidence in presentation	3.43	3.65	0.297	.587

*Notes: Level of significance: ** significant at $P \leq 0.01$ and * significant at $P \leq 0.05$*

are identified to contribute to stress among the final-year degree students in the School of HBP, USM. Most of the students agreed that academic workload is the major factor leading to stress. In most cases, each student had two or more assignments with the same deadlines. This task made them feel stressed out and sometimes unable to manage or organize their work properly. This finding is supported by Peach (1991), Hiebert and Arthur (1994) and Tharbe (2006). The study by Peach (1991) conducted in Tennessee reveals that among 240 students, 65% of female students and 56% of male students experienced academic stress due to heavy assignment workload. Hiebert and Arthur (1994) reported that academic workload is the main stressor among 94 students of an institute in South Alberta. In the School of HBP, USM, students are always burdened with too much workload, especially studio projects. Most of the studio masters require weekly project submissions. In one semester, students are required to take a minimum of two exempted subjects together with studio. Design students are busy with drawings and creating models, whereas non-design students are busy completing their reports. At the same time, other subjects also require submission of assignments.

The second set of stressors includes frustration, conflict and pressure. Studies show that students become depressed while facing these factors. Depression occurs when an external

Table 6: Gender comparison: Effects of stress

Variables	Male	Female	F	Sig.
Positive effects				
Self motivated	3.77	3.56	4.225*	.042
Enhanced performance	3.72	3.81	1.283	.259
Becoming more responsible	3.79	3.97	0.005	.945
Becoming much happier	3.67	3.59	0.045	.832
Praising God	3.69	3.82	2.885	.091
Always prepared	3.90	3.96	0.135	.714
Negative effects				
Feeling stressed out	3.74	3.73	0.010	.922
Difficulty concentrating	3.84	3.76	5.560*	.020
Feeling nervous	3.59	3.67	0.032	.857
Feeling sad	3.54	3.63	1.270	.262
Lacking confidence	3.74	3.60	0.001	.974
Showing panic or anxiety	3.69	3.58	0.467	.496
Losing temper	3.51	3.43	8.191**	.005
Avoiding things (relationship and work)	3.33	3.20	0.046	.830
Becoming passive	3.33	3.17	0.508	.477
Unexpected action (drug/alcohol addiction, commit suicide)	2.69	2.27	0.048	.827
Personal neglect (lots of debt, petty crime, violent behaviour)	2.69	2.29	0.172	.679
Excessive worrying	3.18	3.07	0.014	.905
Feeling tired	3.67	3.74	1.661	.199
Headache	3.41	3.43	1.089	.298
Insomnia (sleeping problems)	3.26	3.20	1.404	.238
Appetite changes	3.21	3.17	2.600	.109
Weight gain or loss	3.08	3.17	2.921	.089
Always getting colds or the flu	3.11	2.91	5.811*	.017
Having pain in neck, chest or shoulder	3.31	3.45	0.779	.379
Having stomach distress	3.10	3.34	4.272*	.040

*Notes: Level of significance: ** significant at $P \leq 0.01$ and * significant at $P \leq 0.05$*

or internal disruption affects students emotionally. When students feel emotionally exhausted, they eventually lose their interest in studies, thus neglecting their pursuit of excellence. Weiten and Lloyd (1994) identified this factor as the main element of psychological stress. In the School of HBP, USM, this factor has been created due to too much workload with limited timeframe, unsatisfied lecturers with the finished output, and conflicts arising in group activities. Conflicts often arise because each of the group members normally insists that his or her opinion be chosen. However, having a "sleeping member" in a group gives more stress to the group members who actually perform.

Based on the preliminary discussion with other students, facing unexpected situations such as problems with laptop, vehicle breakdowns, and blackout tend to make them feel stressed

Table 7: Gender comparison: Coping with stress

Variables	Male	Female	F	Sig.
Controlling one self	3.82	4.07	3.130	.079
Being calm when facing problems	3.90	3.98	8.130**	.005
Taking care of one self (have sufficient rest or sleep)	3.89	3.93	2.495	.116
Seeking support (advice from friends, counsellor)	3.87	3.93	0.000	.983
Being tough and patient when you cannot achieve your goal	3.69	4.03	20.432**	.000
Reducing uncertainty	3.85	3.90	3.885*	.050
Getting away from all sources of stress (get some leisure time)	3.87	3.89	1.173	.281
Resolving unfinished business	3.87	3.89	5.163*	.024
Minimizing changes	3.69	3.73	4.566*	.034
Integrating planning and preventive strategies	3.74	3.78	2.319	.130

*Notes: Level of significance: ** significant at $P \leq 0.01$ and * significant at $P \leq 0.05$*

out. As one of the students said, "I am in urgency to submit my report, suddenly my laptop goes off, and I do not know where to continue. I am very stressed because I do not have any backup copy." Other examples include accidental spillage of water on drawings or reports, loss of data, technical problems while having presentations, and technical problems with a printer that usually take place in the middle of the night especially when the report needs to be submitted early in the morning.

Financial problems are acknowledged as one of the factors leading to stress among the students. In reality, students have to spend a lot of money in completing their projects. Design students are required to print out their drawings and to make models, which would cost a minimum of RM150.00 for each project. About six to seven major reports need to be submitted each semester. Even though most students obtain loans or scholarships, the financial assistance they get is not enough to fulfil their needs and to buy the necessary equipment for their study. Schafer (2000) stated that financial difficulties may lead to time pressure, eroded sleep and decreased time devoted for exercise and friendship. Consequently, students show poor academic performance and their health deteriorates. Similar findings are shown among hospitality students (Jogaratnam and Buchanan, 2004). Polson and Nida (1998) claimed that competing demands in the students' limited time arising from the need for financial support and completion of their studies can become significant sources of stress.

The fifth factor is grade pressure. Sometimes, students have high expectations of themselves and become stressed when they fail to achieve such expectations. Grades are important as a scale for challenges, motivations, rewards, and problems (Schafer, 2000). The studio project is a primary concern among the HBP students as it carries five units compared to examination papers that only carry three. The grade obtained in the studio project is a major determinant of the students' performance at the end of the semester. Grade pressures could create a fear of failure or an elated feeling of success among the students. Tharbe (2006) cited that 65% of 331 students in nine American high schools experienced stress merely by thinking about an examination before they actually sat for it, while 59% of the students expressed that low achievement in the examination caused stress.

Based on this study, stress can affect student learning in many ways. The positive effects of stress include always being prepared, being more responsible, and enhanced performance. However, none of the previous studies supported such results. The discussion with the HBP students revealed that they agreed with the positive effects. The positive effects are similar to action-enhancing stress which gives an athlete the competitive edge and a public speaker the enthusiasm to project optimally. Girdano et al., (2001) stated, "We need to fall into a trap in order to enhance the performance." This statement shows that stress can enhance individual performance.

Stress can cause negative effects on students. Based on the analysis, the three negative effects of stress on students are difficulty in concentrating, feeling stressed out, and feeling tired. As a result, students experience mental fatigue which can harm them. Too much stress can cause students to feel tired and not able to think properly. In addition, students lose confidence and feel nervous. For those students who claim difficulty in concentrating, they will agree to this finding because they always feel tired after not getting sufficient sleep and rest.

Stress can be handled in several ways. In this study, some students managed their stress effectively. Exercising "self-control" is effective in dealing with stress. A study by Mills (1982) presented 20 proven methods for handling stress. The study suggested adopting an attitude of responsibility, seeking information, making choices and decisions, and being assertive to become in control. The respondents agreed that they need to remain calm and not panic in times of stress. Some people tend to be stressed out in discovering they have a lot of work to do in a limited time. Mills (1982) suggested positive affirmations such as *"I will be calm to face this problem"* to aid in relaxing. Pre-sleep is also a good antidote to stress.

Mills (1982) further emphasised that stress cannot be separated from our lives. Stress should be expected anytime and anywhere. While unwelcome, stress should be viewed as an opportunity for growth, and can be used to change lives for enhanced productivity. However, this change requires taking care of the self. Many respondents agreed that care for oneself is essential in coping with stress. Adequate rest and sleep prevent individuals from being overly tired and run-down. An individual with good physical health will experience less stress (Mills, 1982).

Finally, another significant way to cope with stress is to seek support. Gaining support keeps a person from feeling alone when handling stress. Mills (1982) supported this approach in his book entitled "Coping with Stress: A Guide to Living". He suggested six basic methods for obtaining support, which include talking with others and letting them know how the speaker feels, seeking advice and counselling from professional counsellors, and utilising resources such as publications and organisations that provide information and advice on handling stress. Understanding that many other people also face similar difficulties, and finding strength and comfort based on this fact are additional methods. Lastly, finding out more about stress and learning how to handle and cope by reading or watching movies and television help manage stress.

Stress and gender

Not all factors contributing to stress are significant to both genders. The factors considered significant by the respondents include difficulties in blending with others, ineffective time management and grade pressure. Male students face difficulties in blending with others. Majority of the male students are unable to approach new relationships unlike female students. Sher et al., (1996) stated that college years tend to be a period of immense changes in the lives of young adults. During this time, a student often moves away from home, which is an established support system, and needs to face a new peer-based support system. Once this new support system fails, the student feels the stress. In addition, personal problems and adjustment in work cause stress.

The analysis shows that male students are unable to manage their time properly. The preliminary study shows that male students are more likely to postpone their work until the time of submission. According to Tharbe (2006), students often neglect the quality of time, regardless of whether they are good or average students. Based on the present study, female students have high expectations of their achievements and feel stressed out when they fail to meet their expectations. The heavy emphasis on academic achievement among females is not surprising as they have been dominating the top higher institutions in Malaysia.

The effects of stress have been discussed in detail in the previous section. Stress is generally known to cause positive and negative effects on individuals. The positive effects of stress develop competencies whereas the negative effects can ruin lives. The male respondents in the present study agreed that stress enhances their self-motivation. Male students work better while under stress unlike their female counterparts. However, males are most likely to face negative effects compared to females. For example, they quickly lose their temper, find difficulty in concentrating, and always catch a cold or flu.

CONCLUSION

We hope this study can further contribute to the body of knowledge by identifying stress management of students enrolled in construction-related courses in a Higher Education Institution such as USM in Malaysia. Stress was found among the students of the School of HBP, USM. High stress levels affected the quality of the performance of students. However, quality is a highly subjective concept to measure (Parri, 2006), and several factors can contribute to student performance, such as evaluation methods and individual perception. A further study is proposed to clarify the relationship between stress and student performance. More importantly, a gender comparison yields significant results regarding whether females handled stress better than males. Compared to males, female students generally recognise and accept stress as part of their lives. Although faced with much work, females can manage their stress appropriately, hence they normally have higher expectations than males. Females are always calm when facing problems. Stress can be confronted and reduced when individuals understand themselves, and analyse and identify the stressors in their lives. However, this study does not claim to present a comprehensive list of the stress factors; it only includes factors relevant to the final-year students of the School of HBP, USM.

To overcome stress-related problems, students at the School of HBP, USM, need to identify and manage the factors and effects of stress. In this section, recommendations based on research findings to improve stress management among students are presented As follows:

1) Students should manage their time wisely and set realistic timelines, complete high priority work earlier, and allocate time for the various tasks each day. They should avoid attempting to do everything at once.
2) When there are many assignments, students need to plan their work ahead by prioritising those assignments that need to be submitted first.

3) Goals and objectives should be realistic and flexible. Setting impossible expectations results in failure, frustration and guilt.
4) Positive acceptance of changes and using these changes as motivation can enhance performance in studies.
5) Students should keep a positive view of themselves, control their emotions, and anticipate frustrations, failures and sorrows.
6) With frugal handling and wise use of their money, students can avoid financial problems during their study.
7) Uncertainty can be reduced by having a clear idea of what the future holds and what they want to become for career development.
8) Believing that one has the potential to be successful in life also reduces stress. In contrast, underestimating decreases the level of confidence.
9) Students need to improve their communication skills and broaden their social network so that they can blend better with different people.
10) Adopting a healthy lifestyle is important. This lifestyle can be achieved through relaxing techniques, such as proper exercise, a balanced diet and meditation.

Sharing these findings through an induction programme for new students is important so that they can anticipate stress and learn ways to manage it. The ability to manage stress is vital in improving the quality and the performance of students. To enhance studies on stress, it is suggested that future research is carried out to compare the stress levels among students of different year levels and the programmes. Additionally, it would also be useful to make a comparison of students in different universities enrolled in related programmes.

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ARTICLE

Technical Female Graduates in The Malaysian Construction Industry: Attrition Issues

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ABSTRACT

There is a discrepancy between the total number of Malaysian female graduates with construction-related degrees and the actual number of females who hold construction-related degrees working in the construction industry. This implies that many women graduates have either not proceeded to work in the industry or have prematurely left the industry. This paper reports the findings of a study that investigated the reasons why technical female graduates either refrain from entering or wanting to leave the construction industry. Data was collected via a questionnaire survey on Malaysian female graduates with construction-related technical qualifications. Findings revealed that the main problems faced by female graduates in entering and remaining in the construction industry are their negative perceptions toward the construction industry and the barriers they face working in the industry. The top negative perceptions are the 'harsh' working conditions, the male-oriented working culture and the 'glass ceiling' to job advancement. The top barriers are the long working hours, the lack of child-care facilities and the work conflict with family obligations. The top three recommendations by respondents for retaining females in the construction industry are the provision of a harassment-free work environment, training for career enhancement and equal opportunity policy.

Keywords: *Technical Female Graduates, Malaysian Construction Industry, Retaining, Barriers*

1 INTRODUCTION

The Department of Statistics, Malaysia (2011a. 2011b, 2012) indicated that of the total number of graduates in Malaysia, the percentage of female degree graduates has steadily risen from 20.4% in 1982 to 47.5% in 2010. The percentage of female degree holders in the Malaysian workforce was 47.1% in 2010. The construction industry, the real estate industry and the professional (both technical and scientific) sector each respectively employs 9.1%, 0.5% and 2.4% of the Malaysian workforce. Only 5.4% of the construction industry workers (inclusive of the professional and managerial class) are females. The female representation is only 22.6% of the construction industry's professional and managerial workforce class. Women constitute 35.3% of the total professional and managerial

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workforce in Malaysia and 36.1% of the total Malaysian workforce. According to the Ministry of Education (2011), the percentage of female graduates pursuing degree programmes in the field of engineering, manufacturing and construction in 2010 was 45%. These statistics point to the discrepancy between the total number of Malaysian female graduates with construction- related degrees and the actual number of females with construction-related degree qualifications working in the construction industry. Since Malaysians dominate the professional and managerial workforce in the construction industry, it implies that females who hold construction-related degrees have either left or not entered the industry.

A survey of the fees of private universities for construction-related degrees at the Campus Malaysia (2012) websites indicated that the fees for such programmes are generally more expensive than those for non-technical degree programmes. The fees for construction-related degree programmes in public universities are as low as 20% of the fees charged for equivalent degree programmes in private universities, thus implying substantial subsidies for public university degree undergraduates. In 2010, Malaysian private universities rolled out 5,405 graduates from the degree programmes of manufacturing, engineering and construction as compared to the rollout of 15,012 graduates pursuing the equivalent programmes from public universities in the same year (MOHE, 2011). According to the World Bank (2012), Malaysia spent 4.13% of its GDP on overall education in which tertiary education costs constitute a quarter of that expenditure (1.62% of GDP). Public tertiary education loans and subsidies, and private tertiary education imply high investment costs on the part of the students, their families and the taxpayers. Subsequently, the female graduates' non-entry to and attrition from the construction industry they are trained for results in a poor return performance of this substantial investment.

More participation of qualified females in the labour force provides individual, industry and societal benefits (Moore, 2006). It is important to incorporate females in the workforce to encourage them to participate fully in Malaysia's economic activities because they make up almost half of the population. Malaysia has had a steady increase of job vacancies since 2004 (Malaysian Statistics Department, 2010, 2011c). The dependency on foreigners in the Malaysian industries including the construction industry can be partially alleviated if the attrition and non-entry of qualified female graduates can be stemmed.

A research was done to investigate the reasons for the technical female graduates' non-entry or leaving of the construction industry. The study was aimed to:

(1) Investigate the perceptions that prevent the technical female graduates from entering the construction industry;

(2) Investigate the work barriers faced by the technical female graduate workers in the construction industry;

(3) Identify the possible solutions perceived by the technical female graduates that could help solve the problematic issues of attrition and non-entry in the construction industry.

This paper is based on the findings from a dissertation research (Abdullah, 2011).

2 LITERATURE REVIEW

2.1 Technical Female Graduates

This research focused on four main professions in the construction industry namely, quantity surveying, construction management, architecture and civil engineering.

A graduate in quantity surveying will mainly work as an estimator or quantity surveyor who manages all costs relating to building and civil engineering projects, from the initial calculations to the final figures. Surveyors seek to minimise the costs of a project and enhance value for money, while still achieving the required standards and quality. Many of these are specified by statutory building regulations, which the surveyor needs to understand and adhere to.

A graduate in construction management has many prospective career paths such as project managers, site managers, construction managers, project coordinators, planners and development managers. They can command good salaries especially with experience. Another option is to be self-employed as contractors or project developers. As a contractor, there are many specialisations that can be focused on to be distinguishable from the rest of the players in the construction industry. Project management is one of the fastest rising professions in Malaysia. Dainty, Frugulis and Langford (2007) stated that the construction industry's labour market is characterised by non-standard employment practices and insecure work. The plethora of different contractual arrangements and complicated project teams on site makes managing a construction project a complex affair.

A graduate in architecture will be in a demanding profession as it addresses many of the important issues that affect society today. In addition to designing, planning and supervising the construction of buildings, architects also explore new ways of living, and investigate new technologies and materials, all the time while balancing environmental issues. An architect's primary concern is to design a structure that is sustainable, functional and pleasing to the eye. There are also plenty of opportunities for those with an architectural degree to work in specialist fields such as planning, landscaping or conservation.

The willingness to deliver design on time and to the required desired quality, the levels of effort that are spent in actualising clients' needs and the commitment in seeking novel ideas and appropriate solutions designed to address problems among other things, are important issues for the successful management of design practices by architects (Oyedele, 2010). Thus, successful female architects are those who are able to compete in the job market as an architect holds a lot of responsibility in the construction industry.

The civil engineering profession is about creating, improving and protecting the environment in which people live. Without civil engineers, society would not function. Civil engineering attracts a broad range of female graduates because it offers so much as a profession and draws on a whole range of artistic and scientific talents. A female civil engineer could also be involved in seeing a project through from design stage to construction and completion. Possible projects might include the development and construction of bridges, tunnels, roads, railways, dams, pipelines and major buildings. A female civil engineer can either be in the office undertaking computer-aided design work or work on site, leading teams and solving problems. They must be able to translate numbers and drawings into reality. In general, the role they have on a project depends on the type of organisation they are employed by and what area of civil engineering they work in. Engineers in the construction industry usually work with consultant firms or as a part of a project management team.

2.2 WORK FORCE ISSUES

The culture of the construction industry is characterised by crisis, conflict and male domination (Gale, 1994). The construction industry is also fragmented and is a very people-reliant industry. The workforce is extremely diverse and includes unskilled, craft, managerial, professional and administrative workers (Dainty, et al., 2007). The Malaysian construction sector employs 0.98 million people in 2010 (Department of Statistics, 2012) but has a problematic dependence on foreign unskilled workforce. The foreign workers are often unskilled or semi-skilled and without their families. Their employment and stay in Malaysia are temporary. Training is also lacking. According to Dainty, et al., (2007), employers are reluctant to invest in developing the skills of their temporary employees because the employment will not last long enough to realize their investment return.

2.3 Challenges

Lips (2000) stated that there is also the issue of gender discrimination against women such as females are underemployed and underpaid in comparison to their male counterparts. According to Sasser's (2004), the elimination of the significant gender incongruity requires improvement in recruitment, retention, and advancement practices.

Women in the construction industry struggle mostly with sexist attitudes, behaviours and perceptions in the workplace. Equal concern is the inflexible working practices which often lead to problems regarding their work-life balance (Worrall, Harris, Stewart, Thomas and McDermott, 2010). Studies reviewed by Peus and Traut-Mattausch (2008) indicated that females continue to take responsibility for household tasks and child-upbringing despite spending many hours working outside the house. Their job satisfaction decreases while their stress increases when there is conflict between work and family roles.

Bennet, Davidson and Gale (1999) studied the expectations and experiences of construction undergraduates in the United Kingdom and found that professional women had higher expectations and were more committed to remaining in the construction industry. It was also discovered that female students had significantly higher financial expectations than male students. The findings also suggested that in comparison to men, there are fewer women in the construction industry over the age of 36. This clearly shows that the industry is unable to retain senior female workers. Chesler and Chesler (2002) and Watts (2007) noted a disproportionate absence of females in the higher technical and managerial ranks. Fielden, Davidson, Gale and Davey (2001) noted that most women in the United Kingdom construction industry were employed in administrative positions and were thus disadvantaged. Kaeswri (2011) also alluded to the Thai female engineers being traditionally given office-bound work rather than site-bound ones.

The construction industry is seen as promoting adversarial business relationships, poor working practices, environmental insensitivities and reputation for under-performance (Fielden et al., 2001). In a study by Leow & Yean (2008), 33 percent of Singaporean construction women graduates have left the industry while 29 percent of those remaining indicated they are considering leaving. The four main reasons for leaving are better prospects in other industries, personal reasons, poor job conditions and job not meeting expectations. Watts (2007) conducted a qualitative study on professional women on construction worksites. Her respondents narrated about negative work experiences arising from the male-oriented, conflict-ridden and long-hour work culture.

2.4 Career Choices

Women typically place a greater priority on interpersonal satisfaction and integration than men do. This potentially results in different career choices and life priorities. Moreover, women more often prioritise concerns for group affiliation over individual achievement and value social equality, community, collaboration and diversity more than their male counterparts. The socialisation of women as compared to men is particularly relevant to their success in the sciences and engineering because women are often less confident in and more alienated by the culture of fields that do not fit with their own learned styles (Chesler, 2002).

Women are face with more complex career choices than men. Their career patterns tend to move through phases where other aspects of life take priority, thus resulting in cyclical personal and career development. Many women in construction often do not perceive management as an appropriate path for them because of family commitments. Furthermore, it should be noted that there are fewer opportunities for women to work part-time in the construction industry. As women are rapidly approaching parity with men in education, the difference between them is no longer due to a lack of access to education (Bennet et al., 1999).

2.5 Barriers and Advancement

According to Yean & Yeu (2004), the Singaporean female undergraduates felt that construction jobs have poor image and this may have prevented them from entering the industry. They also felt that the jobs are stressful, demanding, time consuming and often entail long working hours. This will infringe on their social activities and family responsibilities. These female graduates also felt that the industry has a sexist attitude where females face hidden barriers (glass ceilings) and are not given equal opportunities for career advancement when compared to their male counterparts. Lu and Sexton (2010), Arditi and Barci (2009), Fielden, et al., (2001) and Watts (2009) alluded to the under-representation of women in the managerial ranks and the barriers women face to advance in their construction careers. However, Kaeswri's (2011) study showed that the Thai female engineers in consultant firms have relatively equal career advancement opportunities with their men colleagues compared to those who work in contractor firms.

Females who take a career break to start a family are faced with practical barriers including loss of seniority in the process. This resulted in many females having to decide on whether to have or not to have children, and how to reconcile this with their career expectations. (Bennet et al., 1999). Contractors or employers discriminate against women because they assume that family responsibilities make female employees costly and unreliable.

Another barrier for the female graduates is sexual harassment as noted in the studies by Kaeswri (2011) and Watts (2007). Many female workers avoid the situation by choosing to work in fields that have members of their own sex as employers (Smith, 1999).

3 METHODOLOGY

Data was collected via a questionnaire survey. The sample consisted of Malaysian female graduates having technical backgrounds with at least a degree in either construction management/building, architecture, quantity surveying and civil engineering from either local or overseas universities. They have at least a five-year gap after finishing their studies to ensure enough time has occurred for them to be properly employed. They are divided into age groups: 26-30, 31-35, 36-40 and 41-45. Questionnaires were administered either by face to face or by telephone. Survey questionnaires contained questions that would gauge the current situation of female graduates of technical background regarding their demographic profile, current employment status, their experiences, problems and recommendations. For a clear representation of the population of the intended samples, 40% of the samples were from the Alumni, 20% were from personal contacts, 20% from the construction industry and 20% from other referrals.

The survey questionnaire used in this research has four (4) sections i.e. A, B, C and D. Section A is the demographic profile section which contains questions for general data classification while section B has questions regarding employment information. Section C covers the perception and barriers, and the D section is on the recommendations and solutions. In sections C and D, respondents are required to rate the statements by the given Likert scales based on their experience or perception. The respondents are also encouraged to propose any other recommendations for the construction industry to attract or retain more female workforce. Descriptive statistics procedures in the SPSS version 17 software are used for the collected data. The results are then tabulated accordingly into tables and graphs.

4 RESULTS

Out of the 120 women samples, 42 persons participated in the survey. The response rate was 35%. Table 1 shows the breakdown for respondents by profession.

Table 1: Breakdown of Respondents by Profession

Field of Study	No. of Respondents
Construction Management/Building	15
Quantity Surveying	9
Civil Engineering	10
Architecture	8
TOTAL	**42**

The highest number of respondents is in the 26-30 years old group range, closely followed by the 31-35 years old age group. The lowest number of respondents comes from the 41-45 years old age group. Distribution of respondents by their education is almost equal among the four main fields of study with Construction Management being slightly higher at 35.7% compared to lowest number of respondents in Architecture (19.0%). Salaried employees at the managerial or professional level constitute 90.5% of the respondents The place of employment of the respondents are consulting firms (28.6%), public sector (19.0%) and contracting firms (14.3%). 35.7% of respondents have 5 to 10 years of working experience. The majority of respondents (88.1%) deliberately seek or would seek work in the construction industry after graduation, indicating that 21.9% of the respondents are not attracted to enter the industry.

4.1 Perception

Table 2 shows the responses to statements reflecting perceptions that could discourage female technical graduates from entering to work in the construction industry. Only the data provided by respondents who have never worked in the construction industry before were used to generate the findings of Table 2. The four highest ranked perceptions are construction jobs undertaken under 'harsh' working conditions, female graduates facing glass ceilings, female graduate not given equal opportunities and male culture existing at the workplace. The lowest ranked perception is female graduates facing sexual harassment at work.

4.2 Barriers

Table 3 highlights the responses to the section of the questionnaire on the barriers to respondents working in the construction industry. Only data from respondents who have some experience working in the construction industry were used to generate the findings in Table 3 was considered. The most important barrier in the construction industry is the long working hours, followed by lack of childcare and work conflict with family commitments. The lowest ranked barrier (in descending order) is intimidation by male fellow workers, lack of support from superiors and sexual harassment.

4.3 Possible Retention Solutions

Table 4 contains the responses to the statements in the questionnaire section on the possible solutions to retention of technical female graduates in the construction industry. The highest ranking solution suggested to retain women in the construction industry is ensuring harassment-free work environment, followed by providing training for career enhancement, adopting an equal opportunity policy and introducing flexible work schedule. The two lowest ranking suggested solutions are shortening working hours and reducing workload.

Table 2: Perceptions that could discourage female technical graduates from entering to work in the construction industry

Perceptions	Minimum	Maximum	Mean	Rank
Construction jobs are undertaken under harsh working conditions.	4	4	4	**1**
Female graduates face glass ceilings.	4	4	4	**1**
Male culture exists at the workplace.	4	4	4	**1**
Female graduates are not given equal opportunities.	3	4	3.6667	**2**
Construction jobs have poor image.	2	4	3.3333	**3**
Construction jobs are very competitive in nature.	2	4	3.3333	**3**
Construction jobs are stressful and demanding.	2	4	3.3333	**3**
Construction jobs are masculine in nature.	3	4	3.3333	**3**
Female graduates are given desk-bound jobs.	2	4	3.3333	**3**
Construction jobs have long working hours.	2	4	2.6667	**4**
Female graduates are not easily accepted at the workplace.	2	4	2.6667	**4**
Female graduates face sexual harassment at work.	2	3	2.3333	**5**

Table 3: Barriers Retention of technical female graduates in the construction industry

Barriers	Minimum	Maximum	Mean	Rank
Long working hours	1	5	3.8462	**1**
Lack of child care	1	5	3.7436	**2**
Work conflict with family commitments	1	5	2.8974	**3**
Excessive travel	2	4	2.8462	**4**
Few opportunities for promotion	1	5	2.7949	**5**
Dirty job	1	4	2.7692	**6**
Lack of female role model	1	4	2.7179	**7**
Low salary	1	4	2.5128	**8**
Lack of job security	1	4	2.359	**9**
Lack of training	1	4	2.2821	**10**
Lack of interest in career field	1	4	2.1795	**11**
Lack of support from family	1	4	2.1795	**11**
Intimidated by male fellow workers	1	4	2.1538	**12**
Lack of support from superiors/bosses	1	4	2.1282	**13**
Sexual harassment	1	4	2.0513	**14**

Table 4: Possible Solutions to help entry and retention of technical female graduates in the construction industry

Solution	Minimum	Maximum	Mean	Rank
Ensure harassment-free work environment	3	5	4.0476	**1**
Provide training for career enhancement	3	5	4.0238	**2**
Adopt equal opportunity policy	3	5	4.000	**3**
Introduce flexible work schedule	2	5	3.9762	**4**
Give ample notice before overtime or outstation work	2	5	3.9286	**5**
Allow work from home	2	5	3.7857	**6**
Better prospect in project management	2	5	3.7381	**7**
Longer maternity leave	2	5	3.4524	**8**
Recruit more females in senior management post	2	5	3.3095	**9**
Reduced workload	2	5	3.1667	**10**
Shortened working hours	2	4	2.6667	**11**

5 DISCUSSION

The main limitation of this study is the convenience sampling used and hence the findings cannot be generalised. Nonetheless, the respondents in this study were chosen to be diverse in their demographic profiles and employment history so as to obtain as general a viewpoint as possible. Their ages ranged from 28 to 44 years, and most are married. Only three respondents are currently not in employment due to family commitments. The respondents are selected from four main specialisations (construction management, quantity surveying, civil engineering and architecture). This reflects the complexity of the construction industry which requires a workforce from a variety of disciplines. Employers of the respondents also vary from consulting firms to project management firms. With the variation of age and employment status among respondents, their level of experience in the construction industry also varies from less than five years to more than 10 years. The majority of the respondents deliberately seek work in the construction industry while only one respondent is 'forced' to work in the industry out of desperation to be employed.

Respondents who never work in the construction industry before believe that construction jobs are done in 'harsh' working conditions and that the working environment in the industry is mostly male-biased. Most of them also perceive construction jobs as being very competitive, stressful, demanding and having poor image. These findings concur with previous findings by Yean & Yeu (2004) where the Singaporean female undergraduates felt that construction jobs have poor image and are highly stressful and demanding.

The respondents who have some or more working experience in the construction industry regard the long working hours as the main barrier. This is possibly because it reduces their family time thus creating guilt and conflicts in them. The choice of lack of childcare facilities and policy in the industry as an important barrier to their careers may be due to the respondents being mostly married with children. Too much travel for work is also a highly-ranked barrier. The findings on the long working hours concur with Yean and Yeu (2004), Watts (2007) and Lingard et al. (2007) regarding long working hours and interference with fulfilling of social and family commitments.

Three of the top four perceptions that could discourage female technical graduates from entering to work in the construction industry are female graduates facing glass ceilings, female graduates not given equal opportunities and the existence of male culture at the workplace. These are congruent with the top three suggestions on attracting and retaining more females in the construction industry; that of having a harassment-free work environment, providing training for career enhancement and adopting an equal opportunity policy in the company. This suggests that the top ranked perceptions regarding the male-biased working conditions in the construction industry are accurate. This is because there is agreement among all the respondents regardless of experience on the working conditions of the construction industry through the indirect inference of the low ranked suggestions.

However, the top three suggestions on attracting and retaining more females in the construction industry are having a harassment-free work environment, providing training for career enhancement and adopting an equal opportunity policy in the company. This contradicts the low rankings of barriers relating to sexual harassment at work, intimidation by male fellow workers and lack of support by employers. The contradiction possibly arises because the findings on the possible solutions were analysed from responses of all respondents regardless of their work experience while the findings of the barriers were derived from the analyses of responses of women who work or have worked in the industry. It suggests that the women who have worked in the industry have become accustomed to the male-dominated work environment of the construction industry although they may not like the male domination of the industry. Watts' (2007) study noted that females had to acquiesce with the male-biased working conditions to avoid team disharmony.

Sexual harassment is scored lowest both in the industry perceptions and the barriers list unlike the study findings of Watts (2007) and Kaeswri (2011) where their respondents clearly complained of sexual harassment. It is suggested that sexual harassment has low rankings due to the majority of the respondents being Malay Muslim women. The conservative social norms of the Malay Muslims strongly frown upon disrespectful overtures by men to women. The very high power distance and medium masculinity cultural dimensions attributed to Malaysians (Hofstede, 2010) may also indicate a tendency to respect the more highly educated regardless of gender. However, the top ranked need for a harassment-free work environment suggests that the harassment is not necessarily sexual but may related to work pressures.

6 CONCLUSION

A survey was conducted on a convenience sample of female technical workers who are university graduates with construction-related degrees regarding their perceptions of the working conditions in the construction industry, the barriers to remain in the construction industry and the possible solutions to the problem of non-entry and attrition from the industry. The top negative perceptions are the 'harsh' working conditions, male-oriented working culture and the 'glass ceiling' to job advancement. The top barriers are long working hours, lack of childcare facilities and work conflicting with family obligations. The top three solutions perceived by respondents for retaining females in the construction industry are the provision of a harassment-free work environment, training for career enhancement and equal opportunity policy.

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ARTICLE

Sustainable Historical Government Building Assessment Via Post Occupancy Evaluation (POE)

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ABSTRACT

Post Occupancy Evaluation (POE) is a diagnostic tool for facility managers or building managers to identify and evaluate critical aspects of building performance systematically. This system enables identification of problem areas in existing buildings and development of design guidance and criteria for future building and facilities. The historical buildings in Malaysia are unique and are valuable assets to the country for their historical values and tourism potential. However, most of these buildings have generally deteriorated and not functioning the way they were intended to. Refurbishment works done will facilitate the keeping of the buildings to their original characteristics and fulfil their functions. Post Occupancy Evaluation is vitally needed to ensure that overall building performance is sustained. This study is aimed to review the POE concept towards refurbished historical government buildings by highlighting the building performance in areas of functional and technical performance. Secondly, it is to determine the performance satisfaction level from the building occupants' perspectives. Methods adopted in this study are semi-structured interviews to related professionals and organisations, questionnaires to the building management teams, the users and the public, and site investigations on seven (7) selected historical government buildings in the metropolitan city of Kuala Lumpur. The findings revealed that building performance criteria highly correlated with the occupants' satisfaction.

Keywords: *Post Occupancy Evaluation, Historical Government Buildings, Functional and Technical Performance, Occupants' Satisfaction*

1. INTRODUCTION

Historical buildings create the city-sense of wonder which makes people eager to know more on the people and its culture (Feilden, B.M., 1994). Such buildings have architectural, aesthetic, historic, documentary, archaeological, economic, social, and even political and spiritual or symbolic values.

The historical buildings in Malaysia are unique and valuable assets to the country for their historical values and tourism potential. They can be found in most urban areas and some even in rural areas. Kuala Lumpur, the country's capital city has many architectural landmarks built over the last 200 years (The Star, 2009). Among them are Sultan Abdul Samad Building, Kuala Lumpur Memorial Library, National Museum, Kuala Lumpur Railway Station, and Kuala Lumpur Textile Museum to name few.

Most of the historical buildings are dilapidated, and generally susceptible to deterioration and poorly maintained. These buildings need to be upgraded, renovated and refurbished.

According to Burden, E. (2004), refurbishment means to bring an existing building up to standard, or to make it suitable for a new use by renovations, installing new equipments, fixtures and finishes. Refurbishment is considered as a minimal repair in order to enable the building to be fit for its purpose. The Post Occupancy Evaluation (POE) process can be carried out once the refurbishment work has been completed. POE can be defined as a process in evaluating buildings performance in a systematic and technically rigorous manner after the buildings have been occupied (Isaac, A. M. et al., 2009). It involves a comprehensive finding on how to improve the occupants' comfort by taking into the current building conditions whether a building meets the user's requirement (Khalil, N. et. al., 2008).

Refurbishment construction projects have become one of the important sectors in the Malaysian construction industry. There are several issues and challenges in dealing with the refurbishment work in historical public buildings project. Among the issues are the inherent complexity and uncertainty in nature of work (Ali, A. S. et al., 2009), the difficulties in matching new construction materials with the present original materials as the required materials are no longer in production and the aging factor (Ahmad, A.E. et al., 2009b). Other issues are that the industry is regulated by heritage regulations and restrictions (Ahmad, A.E. et al., 2009a) and that the buildings were also built with minimum passive fire fighting requirements (Kamal, K.S. et al., 2004). These constraints will affect new functional performance in areas of space design, security and safety, comfort, strategic value and operational cost.

The issues identified above warrant a study on sustainable historical government buildings evaluation via Post Occupancy Evaluation in order to review the POE concept towards refurbished historical government buildings, highlighting the building performance in areas of functional and technical performance, and at the same time to determine the performance satisfaction level from the perspectives of the building occupants.

2. LITERATURE REVIEW

2.1 Background of Post Occupancy Evaluation(POE)

POE is defined by Preiser, W. et al. (1988) as the process of systematically evaluating the extent to which facility, once occupied for a period of time, meets the intended organisational goals and occupant needs. POE is a platform for the systematic study of buildings once occupied, that will improve their current conditions and guide the design of future buildings. POE focuses on building occupants and their needs. They provide insights into the consequences of past design decisions and the resulting building performance. POE serves as a way of providing both subjective and objective feedback on planning and practice throughout the building life cycle from the initial design to occupation and post occupation stage (Isaac A. M. et al., 2009).

POE is typically performed between 4 and 24 months following occupancy of a new or renovated facility and is performed only once for an individual building (Khalil, N. et al., 2009b). On other hand, Watson (2003) states that POE can be conducted at any post phase of a building and it is not necessary to conduct between the time frames. According to Preiser, W. et al., (1998), there are three (3) phases and steps involved in conducting POE. The phases of the POE process are planning, conducting and applying. POE will bring impact over the short, medium and long terms such as identification of and solutions to problems in facilities, accountability for building performance by design professionals and owners and also long-term improvements in building performance.

2.2 Background of refurbishment

Egbu, C.O. et al., (1996) defines refurbishment as rehabilitation, alteration, adaptation, extension, improvement, modernisation, fitting out and repair work. Such activity is carried out on an existing building to permit re-use for specific reasons. It does not include maintenance work which is normally carried out on a routine basis, periodic painting, daily cleaning and emergency maintenance work. According to Burden, E. (2004), refurbishment means to bring an existing building up to standard, or to make it suitable for a new use by renovations, or by installing new equipments, fixtures, furnishing and finishes. They are considered as the minimal repairs to enable the building to be fit for its purpose of use. Ali, A.S. et al. (2009) pointed out that the aspect of technological, social, location, legal, aesthetics image and environmental changes have contributed to building obsolescence. For instance, technological changes shorten the functional life of buildings at an increasing rate, which requires building modernisation. Generally, the physical quality of historical public buildings in Malaysia is slowly declining and deteriorated.

2.3 Criteria of building performance evaluation

Functional performance evaluation addresses how well the building supports the organisation's goals and aspirations (Blyth, A. et al., 2006). It also deals with how well the user needs are supported. The areas covered in a functional performance evaluation are Strategic Value, Aesthetic and Image, Space, Comfort, Amenity, Serviceability, Safety, Operational Cost, Life-cycle Cost and Operational Management. The technical performance review involves measuring how the physical systems perform, for example lighting, energy use, ventilation and acoustics. The areas covered in a technical performance evaluation are Physical Systems, Environmental Systems, Adaptability and Durability.

2.4 Historical buildings in Malaysia

Ahmad. A.D. 2001) states that building can survive the hazards of 100 years of usefulness. Historical buildings give a sense of wonder and make us want to know more on the people and the culture. In the past years, many historical buildings have been preserved and conserved while others have been refurbished and converted to bank, restaurant, information centre and office. Malaysia is one fortunate country that has many historical buildings which are of immense architectural and historical value.

An inventory study undertaken between 1992 and 1993 on the government's request by the Heritage Trust of Malaysia in conjunction with the National Museum, the Ministry of Housing and Local Government and the Faculty of Built Environment, University of Technology Malaysia (UTM) revealed that there are near 39,000 historical buildings built between years 1800 and 1948 throughout the country. Buildings built within these periods are classified as pre-war buildings due to their year of build, ranging from 1800 to 1948 (Idid, S.Z.A., 1995).

With the spurring of the construction spree in the late 19th and early 20th centuries, Malaysia has inherited hundreds of heritage buildings from the past including the Indians, the Chinese and the Colonials era apart from the indigenous traditional buildings. Some examples of historical buildings in Malaysia are mosque, churches, palaces, clock towers, prisons, government offices, institutional and commercials, residential, schools, railway stations, hotels, forts and monuments (Ahmad, A.G., 2001).

2.5 Refurbished historical government buildings in Kuala Lumpur

Kuala Lumpur was founded in 1857 at the confluence of the Gombak and Klang rivers. The historical government buildings and sites of Kuala Lumpur are a testimony of the physical legacy inherited from the different eras of colonisation. They are unique and irreplaceable, and its preservation for the future is a vital part of the culture. The importance of historical government buildings is not only on its function as past administration institution but it also gives the picture of the lifestyle of the past generation. However, these historical buildings have deteriorated over time. Basically, the interaction of building material with the environment element cannot be avoided. The quality of the building material declines rapidly (Kayan, B., 2003). These buildings are more prone to building decays or defects such as cracks, termite attacks, dampness, harmful growth and peeling of paint.

The architecture of historical government buildings is mostly a blend of old colonial influences. These government buildings are mostly built with the Moorish (Mughal) architecture, a combination of the European elements with the Islamic and Indian architecture, for example the KTM (Keretapi Tanah Melayu) Railway Station and the KTM (Keretapi Tanah Melayu) Administration Office and the Kuala Lumpur Museum Textile. Other styles of architecture are the Tudor and Victorian and the Grecian-Spanish. The redevelopment of the sites which include refurbishment, repair and renovation works on historical government buildings must comply with the gazette guidelines and regulations. Bodies and organisations like the Ministry of Information, Communication and Cultural through the Department of National Heritage, the Kuala Lumpur City Hall through Urban Design and Heritage Unit, and also the Malaysia Heritage Trust (Badan Warisan Malaysia), are the responsible parties involved in implementing the conservation programmes and activities.

3. METHODOLOGY

The methodology used in this study is based on the needs to achieve the study objectives. The essential stages of methodology involve the following:

a) Stage 1 : Preliminary Study

This stage includes the process of identifying the research topic, issues and also determining the title and scope of research. This is done by doing preliminary literature reviews based on books, articles, journals and internet that revolve on the POE towards refurbished historical government buildings. These act as sources to judge the whole idea of POE towards refurbished historical government buildings. The aims and objectives of the study are identified before the literature review is conducted.

b) Stage 2 : Collection of Data

Collection of data is carried out after the preliminary study stage is done. It involves two types of data i.e. primary and secondary data. The primary data is gathered by conducting semi-structured interviews, questionnaires, and site observations. The questionnaire is based on three study samples namely, the building management team, the user and the public. On-site observations are one of the most effective tools where the researcher personally goes to the site and discovers the real situation and condition. For data collection, out of the total number of eight case studies, seven are selected. The selection criterion is that these buildings have to be located in a historical, cultural and architectural significance. They are considered as the important landmarks in the historical development in Kuala Lumpur and have undergone refurbishment works so as to keep their functions. Meanwhile, the secondary data is gathered by conducting literature review from books, articles, journals, conference papers and others.

c) Stage 3 : Analysis of Data and Report Writing

The correlation analysis between building performance and building occupants' satisfaction and perception scores was taken using Kendall's tau correlation. The analysis of Correlation is conducted by using the statistical software programme SPSS (Statistical Packages for Social Sciences, version 17.0).

4. RESULT AND ANALYSIS

The score for building performance ranks from poor, good, very good and finally to excellent. The overall score for building performance observed is within the good and very good scale. The most significant problems related to building performance criteria in areas of functional and technical performance are space and comfort. The value of each performance criteria has been calculated based on the Average Index method. The correlation analysis shows that these two criteria have very high correlation compared with other criteria. Meanwhile, the occupants' satisfaction and perception also ranks from poor, good, very good and finally to excellent. The value of each performance criteria has been calculated based on the Average Index method. The overall satisfaction and perception of building occupants observed is within the good and very good scale. All these criteria adhere to the occupants' satisfaction.

The summary of correlation analysis between building performance and occupant's satisfaction and perception is presented in Table 1.

Table 1: Summary of Correlation Analysis

No.	Criteria	Correlation Coefficient “Excellent” if 0.80$<$*Correlation Coefficients*$\leq$1.00 “Very Good” if 0.65$<$ *Correlation Coefficients*$<$0.80 “Good” if 0.50$<$ *Correlation Coefficients*$<$0.65 “Poor” if 0.00$\leq$ *Correlation Coefficients*$<$0.50			Average	Region
		Building Management Team	**User**	**Public**		
1	Strategic Value	0.400	0.454	0.427	0.427	Low Correlation
2	Aesthetic and Image Value	0.807	0.735	0.637	0.726	High Correlation
3	Space	0.845	0.874	0.818	0.846	Very High Correlation
4	Comfort	0.867	0.840	0.817	0.841	Very High Correlation
5	Amenity	0.725	0.788	0.797	0.770	High Correlation
6	Serviceability	0.903	0.746	NA	0.825	Very High Correlation
7	Safety	0.895	0.776	0.779	0.817	Very High Correlation
8	Operational Cost	0.679	NA	NA	0.679	High Correlation
9	Life-cycle Cost	0.607	NA	NA	0.607	High Correlation
10	Operational Management	0.480	0.455	0.558	0.498	Low Correlation
11	Physical System	0.683	0.636	0.456	0.592	High Correlation
12	Environmental System	0.320	0.425	NA	0.388	Low Correlation
13	Adaptability	0.762	0.841	NA	0.802	Very High Correlation
14	Durability	0.789	0.636	NA	0.713	High Correlation

Legend: NA - Not Addressed

The graph depicted in Figure 1 illustrates the correlation between score for building performance and occupants' satisfaction and perception.

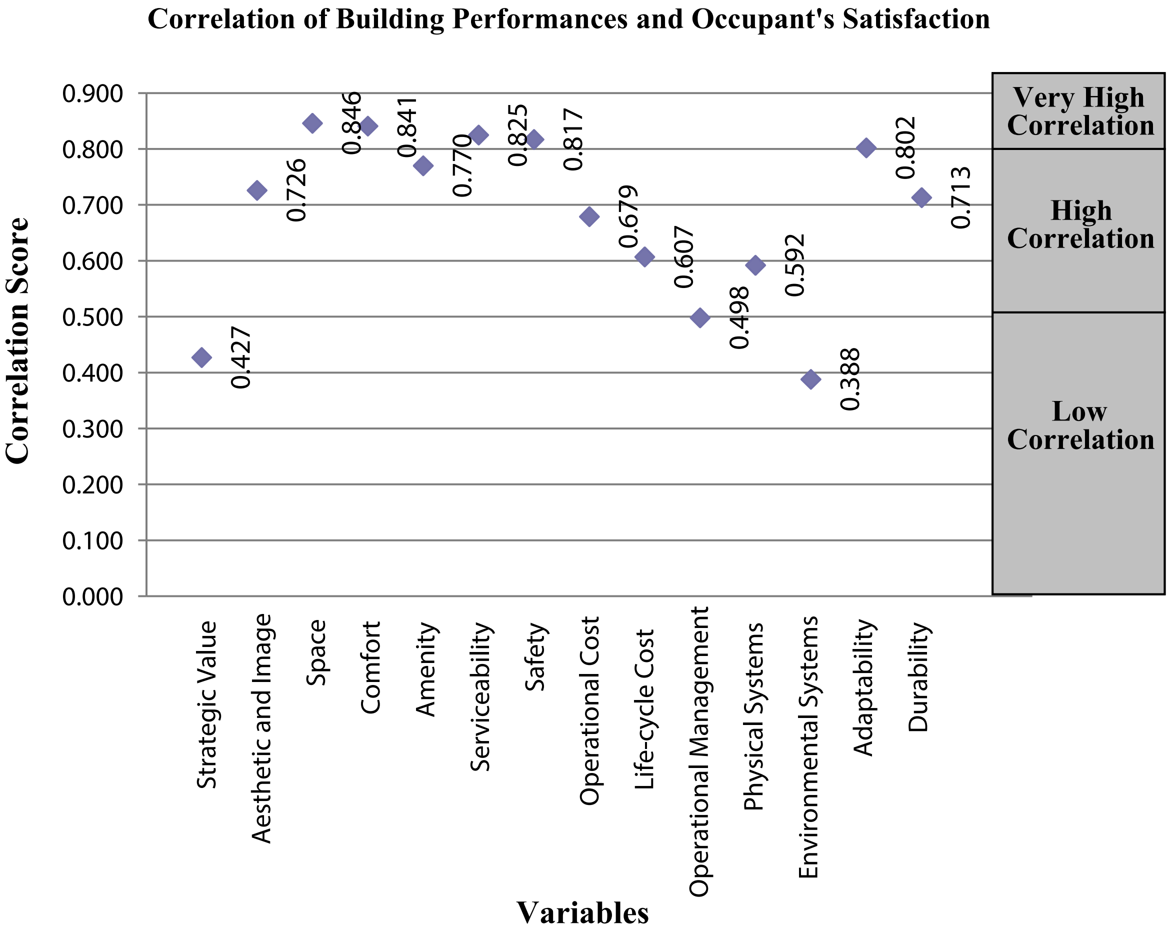

Figure 1: Correlation of Building Performance and Occupants' Satisfaction and Perception

As the summary shows, majority of the correlation coefficients for building performance criteria in areas of functional and technical performance have very high correlation and high correlation with the correlation score for building occupant's satisfaction and perception. The correlations show that 79% of the criteria or variables are in the region of very high correlation and high correlation between building performance scores and occupant's satisfaction scores.

Meanwhile, data collected from the seven buildings and the analysis that has been done before were analysed and presented in text as summaries. Semi-structured interviews and surveys were also carried out to obtain the details. The findings are more focused to highlight the issues and problems which arise based on POE conducted; as presented below:

a) Strategic Value

The issue found is changes done to timber flooring after refurbishment works at Sultan Abdul Samad Building. It was found that the original timber floor finishes have been replaced with modern floor finishes.

b) Aesthetic and Image Value

The issue identified is mixed style of architecture. Refurbishment works change the design originality. From the case study, it was found that extension works done at the Kuala Lumpur Railway Station Building affect the aesthetic and the originality of the building's style and gothic architecture.

c) Space

The issues found are weaknesses in space management planning in respect to end user needs. These should be addressed as highlighted by Khalil, N. et al., (2008a). It needs a comprehensive planning due to time constrain and high financial implication.

d) Comfort

The findings show that internal comfort environment is not conducive with poor air condition performance. A study by Nur Khairul, F.M. et al., (2009) found one of the main factors is due to aging of building.

e) Amenity

Facilities and amenities provided for disabled persons after refurbishment works are still not user friendly and need to be improved (Khalil, N. et al., and 2008a).

f) Serviceability

Lacking in providing plan maintenance programme. Maintenance system is generally based on ad-hoc basis and is generally difficult in determining the quality and maintenance work specifications. Other issues of concern are the limited access and working space to conduct maintenance works (Chohan, et al., 2008) and the inadequate security services system such as CCTV, electronic security access, locks, grills, telecommunication and night lighting (Khalil, N. et al., 2008b).

g) Safety

Issues identified are non-compliance with the Local Authority requirements and lack of safety personnel training (Nur Khairul, F.M. et al., 2009). Training conducted is only limited to selected officer or person in charge.

h) Operational Cost

The issues found are the frequent cleaning, repair and maintenance for salt contamination and rising damp treatment. High salt concentrations in masonry walls cause extensive fretting and crumbling of the lower parts of walls (Ahmad, A.G. et al., 2010). The treatment works need to be done frequently and involves high cost. It also involves cost to maintain and repair damages.

i) Life-Cycle Cost

The issues identified are frequent Maintenance and repair for Salt Contamination and Rising Damp Treatment. High salt concentrations in masonry walls cause extensive fretting and crumbling of the lower parts of walls (Ahmad, A.G. et al., 2010). Frequent treatment works need to be carried out, general maintenance need to be done and the damages and/or defects need to be repaired; all these involve high cost.

j) Operational Management

The issue which arises is incomplete operational management system. Operational management is an area of management concerned with overseeing, designing, and redesigning business operations in the production of goods and/or services. It involves booking and space allocation systems, user support systems, help desks and also manuals. Generally, building management provides quite sufficient operational management systems but improvement and upgrading towards the operational system must be done continually in order to satisfy the end user.

k) Physical System

On these criteria, the issue of concern is installing modern air-conditioning system in the building which was not constructed for it originally (Ahmad, A.G. et al., 1994). Other issues include the upgrading of the existing systems within the given spaces without destroying the integrity of the interior, the amount of energy, running costs and maintenance needed, and also the possibilities of causing structural disturbances to existing walls and ceilings.

l) Environmental System

The findings identified issues on design boundaries. As stated in Clause 46 of the National Heritage Act, 2005, the Department of National Heritage is responsible for ensuring the proper management of a heritage site including the use and development of all buildings and lands in the heritage site. There is also the issue on design boundaries where no alterations of the building's design can be made to minimise the energy or water consumption without getting prior approval.

m) Adaptability

The issues arise in respect of additional staff size and limitation area to support the building's function. Adaptability of historical government buildings can be defined as the ability of the building to adapt to changes, for example the building's function and staff size (Ahmad E.H., 1994). There is the issue in which the building cannot cope and support the additional staff size and therefore needs either some major or minor upgrading works. There is the issue on limitation area to support the building's function; such an issue will lead to building occupants not comfortable occupying the building. The arrangement of office equipment and/or assets in an improper manner is another issue of concern.

n) Durability

The findings raise the issue on the integrity and performances of fittings, building materials, installations and equipments from the aspect of strength, and aesthetic appearance. Regular or scheduled inspections should be planned to ensure that the integrity of building fittings, materials, installations and equipments are in good condition.

5. CONCLUSION

The research concludes that POE, provides a valuable approach in analysing the performance of historical government buildings. Analyses and findings confirm that the application of POE towards historical government buildings is relevant and effective as it can provide recommendations to improve the building performance. Generally, most of the historical buildings in Malaysia have deteriorated; the physical quality of the building is slowly declining and not performing the way it was intended. The development of refurbishment projects on historical government buildings in Kuala Lumpur will help to generate benefits to the city in terms of economy, physical outlook and even boosting tourism. The refurbishment works done will give an assured guarantee that heritage will not be diminished but instead to raise benefit awareness and a sense of sensitivity towards the past. Proper planning and strict monitoring by the relevant authorities such as the Department of National Heritage and the Kuala Lumpur City Hall on the refurbishment works are essentially vital factors in ensuring the compliance to the conservation guidelines.

The overall score for building performance observed is within the good and very good scale. The most significant problems on building performance criteria in areas of functional and technical performance are space and comfort. The value of each performance criteria has been calculated based on the Average Index method. The correlation analysis shows that these two (2) criteria have very high correlation compared with other criteria. The overall satisfaction and perception of building occupants observed is within the good and very good scale. All these criteria adhere to the occupants' satisfaction.

Based on the issues and problems identified from the case studies, it is recommended that the specific standards regarding maintenance works carried out at the historical government buildings should be set up in order to establish a standard and uniform maintenance practice. Technical training should be conducted for all building management staff on technical matters related to maintenance of historical government buildings. Technical training should also be conducted by the Department of National Heritage or any related relevant parties to all involved in refurbishment projects, for example the contractor, the consultant, the private conservator and other related interested parties. The usage of the buildings should not be too excessive to maintain the performance, integrity and also the architectural value. Proper planning and management of staff size should be organised to preserve these buildings. The legal and comprehensive refurbishment guidelines should be consolidated, further enhanced and strictly adhered to.

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PRACTICE BRIEFING

Utility Survey in Hong Kong

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ABSTRACT

Hong Kong is a small state with a land area of about 1100 sq. km. and a short history of 150 years. It was a colony of the U.K. between 1898 and 1997 and was taken over by China on the 1st July, 1997 after the expiry of the tenancy of 99 years. During the colonial period, there was the World War II, rapid infrastructural construction in the 70s and 80s and other crises which have caused the utility records, especially those underground, to be incomplete. Before the Kwun Lung Lau Event on 23rd July, 1994, there had been few professional assignments that asked for a utility survey before work commenced. Even when assignments were asked for, there was no standards being set relating to utility survey/mapping at all.

Keywords: *Utility Survey, Utility Mapping, Utility specialists, pipe/cable locator (PCL), Regulation, Standard, Code of Practice*

1. INTRODUCTION

There are many excavation works carried out every year in Hong Kong and as utility survey is required before digging, there is a huge demand of utility specialists for the work to be completed in time and with quality. Utility survey aims to identify conditions, location, durability of utilities and their related features in order to provide sufficient information before excavation or construction works. They can also be used to identify unchartered objects, such as boulders, concrete blocks, and tanks by specific survey methods such as Ground Penetrating Radar (GPR) survey.

In order to obtain accurate survey results, different measures can be taken, including data management, personnel training, quality control and standardization of requirements. In sum, Location, Condition and Management are the major components of utility survey.

There are around 200 utility specialists (qualified members of HKIUS) in Hong Kong, and 600 Competent Persons (CP) registered under CAP406h and there are about 450,000 cases of cable detection annually (refer Table 1). By simple calculation, there are around 750 cases per CP in each year. However, a CP may at most complete two cases in quality each day. For a 200 working days year, the maximum number of cases a CP may complete is 400. In addition, there are also other types of surveys which require at least 3 more times of manpower.

The first formal training course was conducted in Hong Kong in 2000 by Utility Training Institute (UTI), the supply of utility specialists has still been insufficient as of today.

Table 1: Summary of No. of Excavation vs Cases of survey

No. of XP annually	Average no. of pit/XP	Visits by CP for a complete case (passive, supervision, active)	Total no. of cases annually
30,000	5	3	450,000

The underground utility system of Hong Kong is extremely complicated. There are electric and telecommunication cables, water, sewage and gas pipes, with many other private cables/pipes buried underground at high density level. Hong Kong is small in area and congested with buildings on the limited usable land areas. The constructions and facilities are therefore built closely to each other. More importantly, many construction, repair and maintenance works of the utilities often involve excavation which may cause damage to underground utilities, particularly when digging is carried out carelessly or survey results are inaccurate. In those situations, the cost of evacuation is extremely high. In addition, apart from inconvenience, accidents related to buried pipes and cables can cause injuries and even fatalities.

2. METHODS OF UTILITY SURVEY

Electromagnetic induction method using pipe/cable locator (PCL) and the use of ground penetrating radar (GPR) are two common non-destructive methods to locate the position and depth of the buried utilities. PCL has existed for more than 50 years and is widely used in the recent decades. The phenomenon of electromagnetic induction was discovered by a British, Michael Faraday, in 1831. Portable locators were made later in the 1960s.

There are other methods applying different theories for utility surveys (location, condition and management) such as CCTV, Sonar, Seismic, Resistivity, and Pipe Current Mapper. They will be used when required and their use depends on funds, skilful operators and availability of time, tools, equipment and **4R**, which will be discussed in below paragraph.

3. REGULATIONS IN HONG KONG

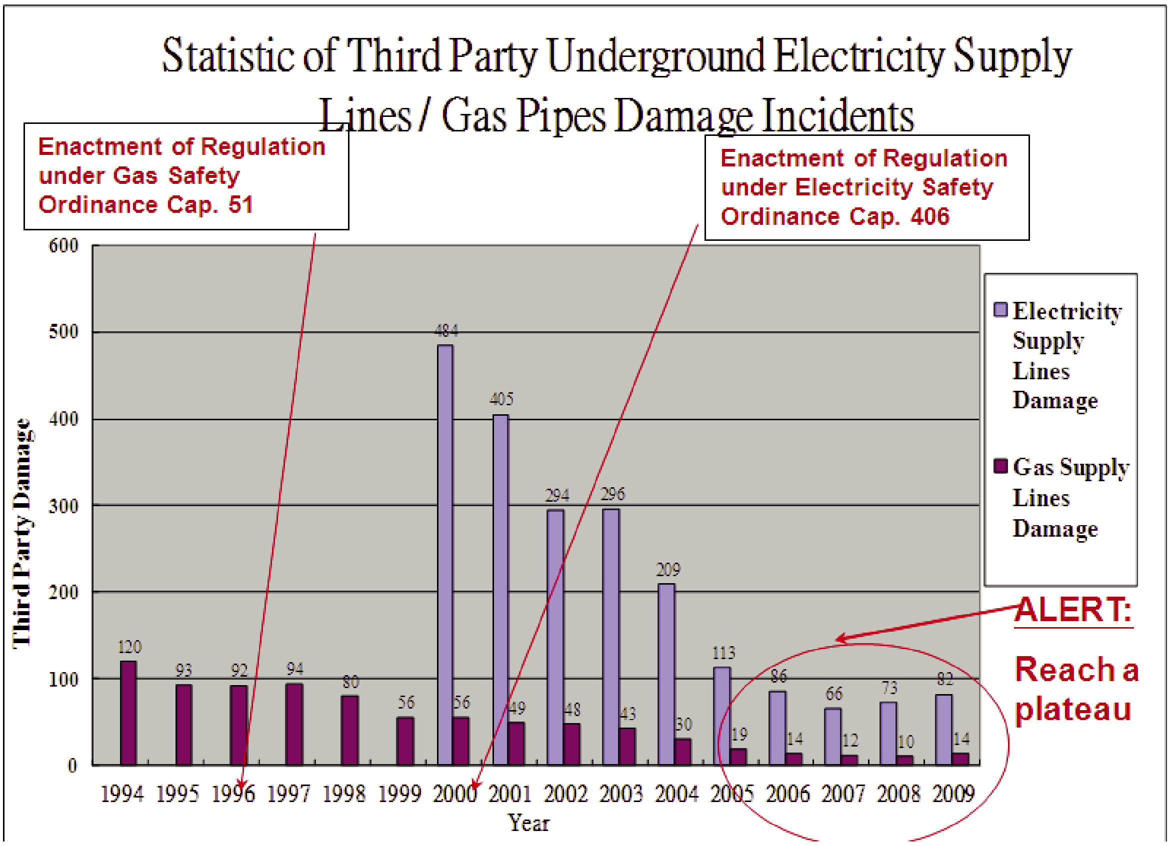
There are four regulations/ordinances directly related to utility survey in Hong Kong, namely, Electricity Ordinance, Gas Safety Ordinance, Water Ordinance and Telecommunication Ordinance. There also other related requirements by means of guidelines/Code of Practice (COP), technical circulars and contract requirements.

3.1 Cap. 406H Electricity Supply Lines (Protection) Regulation

In April 2001, Cap. 406H Electricity Supply Lines (Protection) Regulation was enacted and it states that works in the vicinity of electricity supply lines require that “reasonable steps shall be regarded as having been taken unless a Competent Person (CP) has undertaken an investigation for the purpose of ascertaining the existence within the proposed works site and its vicinity of any such underground electricity cable and its alignment and depth and has provided a written report of his findings as to those matters”.

3.2 Cap. 51B Gas Safety (Gas Supply) Regulation

Cap. 51B Gas Safety (Gas Supply) Regulations Section 23A was enacted in 1997 which states that “No person shall carry out, or permit to be carried out, any works in the vicinity of a gas pipe unless he or the person carrying out the works has, before commencing the works, taken all reasonable steps to ascertain the location and position of the gas pipe.” Also, the COP states that “A person who carries out, or permits to be carried out, any works



(Source: Hong Kong Electrical and Mechanical Services Department)

Figure 1 : Incident Rates

in the vicinity of a gas pipe shall ensure that all reasonable measures are taken to protect the gas pipe from damage arising out of the works that would be likely to prejudice safety".

3.3 Water Ordinance

Under the Guidelines for excavation near water mains published by Water Supplies Department (WSD), it states that professionals should "make use of suitable pipe detector to ascertain as accurately as possible the alignment and depth of buried water mains near the work, before digging trial holes".

3.4 Telecommunication Ordinance

Under the Office of the Communications Authority in 2012, relevant guidelines state that "When a telecommunication/broadcasting network operator prepares any road opening plan, it should check with the other operators regarding the availability of capacity on existing ducts along the planned route or any alternative route to meet its requirement".

3.5 Contract requirement

Utility Undertakers (UU) and government departments have a higher set of requirements laid down on contracts for utility location and protection. Consultants of construction project will emphasis the considerations on the requirements of highly qualified utility specialists and companies in terms of reputation, track records, equipment and staff, especially for operators to carry out survey works. Quality operation by qualified Utility Specialist (O/MHKIUS) which will then be checked by Professional Utility Specialists (M/FHKIUS) and eventually endorsed by the Recognized Professional Utility Specialist (RPUS) is an essential key for success.

4. IMPORTANCE OF UTILITY SURVEY AND ITS ACCURACY

There are three reasons causing damage incidents to utility, namely failure of people (including false/incorrect information), ground settlement, and aging of utility. Through legislation since the late 1990s, the number of utility damage incidents has decreased dramatically as shown in Fig.1. It is noted that safety performance reached a plateau started in 2005. It represents no further improvement. No doubt, enhancing the quality of utility survey result is a further step to reduce utility damage incidents.

Today, with the huge amount of infrastructure works in progress, it is not difficult to find news about utilities-related excavation accidents in Hong Kong. Carelessness during excavation may be the reason for why these accidents happen. Moreover, accidents may also be caused by inaccurate utility survey results. To minimize the risks of accidental damage of the existing utilities and minimize undesirable consequences due to utility damage, professional utility surveying is vital. It is meaningless to gain inaccurate survey results. There are many consequences resulted from utility incidents as summarized in Table 2.

Table 2 : Summary of consequences resulting from utility incidents

Impact on	Due to	Details
Utility Specialists (Contractor)	**Time loss**	◆ Operational efficiency decreased ◆ Works idling ◆ Work force re-arrangement or introduction of new workers ◆ Rescue operations and equipment ◆ Profit lost due to injured workers' reduced productivity and idling plants ◆ Investigation of incident cause ◆ Compensation for damaged plants or other properties ◆ Interference with productions ◆ Payment of employee welfare and benefit systems ◆ Mediation
	Cost	◆ Cost of insurance and compensation ◆ Cost of law-suit ◆ Cost of repair
	Others	◆ Loss of reputation ◆ Loss of lives
Employer (Government/ Developer/ Consultant)	◆ Project delay ◆ Cost of insurance and compensation ◆ Cost of law-suit ◆ Loss of property	
The Society	◆ Losses in human resources, productivity and gross domestic product (GDP) ◆ Huge social cost due to expenses on specialists, engineers and technicians from government departments involving in the investigation of incidents ◆ Vast amount of medical care expenses ◆ Shoulder up the responsibility to the victim families by providing financial, physical and psychological assistance	

5. ENHANCING QUALITY OF SURVEY RESULT

In order to enhance the quality of survey results, cooperation of all parties is necessary. The process and key points of achieving good survey results may be summarized as **"Project 348"** which involved three parts, **3T**, **4R** and **8P**.

3T stands for "Trail", "Trust" and "Trade". In the utility specialists' profession, Trail is needed for utility specialists to test their ability. Trust follows after utility specialists have passed the test and business trade can be carried. In the project, **4R** plays an important role to pursue quality of survey results. **4R** stands for "Right person", "Right equipment", "Right preparation", and "Right price". **8P** stands for "Proactive", "Positive" in the planning stage, "Professional", "Progress" and "Patience" in implementation/operation during the project period, and then "Promise" and "Profit" in the checking stage.

Figure 2 : Project "348"

5.1 Role of Utility specialists

As a professional utility specialist, he must have had proper education and training to equip him with adequate knowledge related to utility surveying and communication skills. Also, as the demand of skill is high for utility specialists, one who just possesses theories is not adequate enough. Practitioners must have practiced utility surveying work, and have experience of using different surveying tools and management programs. They should also have a logical mind to do their works step by step, so as to reduce the occurrence of mistakes and help producing a more accurate surveying result. Being ethical is essential for utility specialists. Those without ethics, though possess experiences and skills, may supply false information to attain the best interest of them. This may not only affect their own future, but also the reputation of the industry. The industry must set up monitoring measures to ensure the quality of its practitioners. In addition, all practitioners of utility specialists must also obey industry regulations and labour guidelines. If such standards are not followed strictly, clients' trust as well as workers' safety will be affected.

To ensure the quality of information collected from utility surveying, methods of Quality Assurance (QA)/Quality Control (QC) for accuracy must be unified and conform to both international and local standards. Technical reports should also be written and endorsed by members of Hong Kong Institute of Utility Specialists (HKIUS)/Recognized Professional Utility Specialist (RPUS). Such utility specialists should possess 5-10 years of related practical experience and be a member of Hong Kong Institute of Utility Specialists to maintain quality of service preferably. The training and experience requirements for personnel carrying out inspection from HKIUS standard in 2011 is shown in Table 3. Furthermore, the Government's Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes of 2006 is also one of leading guideline for utility specialists.

Table 3 : Training and experience requirements for personnel carrying out inspection

Type of Personnel	Role	Minimum Training Requirement	Minimum Years of Experience
Project Leader (RPUS, MHKIUS)	Contractual arrangement, check and certify reports	Training courses for utility survey/detection methods and data management	10 years in contract administration, preferably in utility survey
Team Leader (O/MHKIUS)	Works arrangement, check data quality and consistency	Training courses for utility survey/detection methods and data management	5 years in works of utility survey
Crew Leader (OMHKIUS)	Supervision of field works and site safety	Training course and valid training certificate for utility survey	3 years in works of utility survey
Operator A/OMHKIUS)	On-site inspection and operation of equipment	Training course and valid training certificate for utility survey	2 years in works of utility survey

5.2 Role of Utility specialist companies

Apart from the quality of staff, the quality of utility specialist companies shall also be stressed. As a company's management quality will affect the working style of its staff, Hong Kong Institute of Utility Specialists will assess its members from time to time to monitor its company members. HKIUS has also established various regulations and required its members and companies to comply with them. Specialist companies should not compete for contracts at a low price but provide quality works with the right price. Service quality should be of paramount importance to strive for long-term benefits of the whole industry.

Following the standards in the utility survey guidelines is essential for enhancing the service quality and to ensure survey accuracy. In order to address these issues, HKIUS has targeted the promotion of knowledge and good practice in the utility profession, collaborated with Hong Kong Utility Research Centre (HKURC) and supported by the funding from the Professional Services Development Assistance Scheme (PSDAS) of HKSAR, published a series of guide books and pamphlets in twelve disciplines of the utility professions in order to set standards for the practitioners to follow. It is the intention of the series that the quality of the survey can be raised and that utility related incidents can be minimized by performing high quality utility practices. On the other hand, with the enhanced social status of utility specialists, the incoming personnel are becoming better which will be good for further improvement.

One of the routes to professionalism is training. There are training courses (both introductory and qualifying), offered in Hong Kong, China and overseas, that meet the international standards of the same and recognized by HKIUS. These courses aim to provide the industrial undertakers up-to-date knowledge and skills development in the field. For those who take qualifying training courses, they need to attain competence levels for both written and practical examinations to be eligible to apply for professional qualifications in HKIUS. Such training courses can equip professionals with the advances in the industry standards and issues, which helps in attaining accurate utility survey results. Continuing Professional Development (CPD) courses are also becoming increasingly prevalent in the industry for its practitioners so as to maintain their professional standards. To equip practitioners with sufficient and updated knowledge, CPD courses are offered by various qualified parties, the industry's research institutes, and also some universities. As one of the continuing professional development requirements, members of the HKIUS are required to take part in a minimum of 35 hours of training/CPD per year or 70 hours of training/CPD every 2 years. It is hoped that, through such CPD/training, professionals in the industry can obtain correct and updated knowledge in utility services when they work in this profession.

5.3 Role of Client

Clients' knowledge of utility survey can affect our profession to a great extent. If clients understand the professional standards, they can make more informed decisions when they choose service providers. By organizing seminars, workshops, sharing sessions, competitions, and site visits for clients, clients' knowledge will be broadened so that they can understand better the importance of utility surveying.

Hong Kong Institute of Utility Specialists also has a membership list for clients. The list aims to include only companies with high professionalism and ethical backgrounds. Other companies in the profession are also encouraged to raise their level of service in order to be included in the list.

6. CONCLUSION

Monitoring good result of utility survey enables data to be Trustable, Useable and being Shared. By following **"Project 348"** step by step, the profession will be established. It takes time, efforts and dignity to be successful, it is worthwhile as professionalism can bring huge benefits to all parties.

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Notes for Contributors

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Full paper should not be more than 20 pages, including all text, graphs, tables, diagrams, maps, pictures, illustrations, and appendices.

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Must be in English

Abstract in bold, full caps, 12 point size, and centered. On the next line, type the content of the Abstract in 10-point size, indent 3cm on margins, left and right justified.

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