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International Conference on Language, Communication and Education (LANCOMME)

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THE STABILISATION OF COMPRESSED EARTH BLOCK USING LATERITE SOIL

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ABSTRACT

This research essentially focused on studying the performance and strength improvement of compressed stabilised earth block (laterite block) to reduce cost of conventional block production. The laterite soil used was from Infrastructure University of Kuala Lumpur (IUKL) and mixed with fine and coarse aggregates stabilised with Cement and Lime in percentages of 5, 10 and 15 with four different mix ratios. C(i) 50%: 40%: 10%, C(ii) 50%: 35%: 15%, C(iii) 50%: 30%: 20%, C(iv) 50%: 25%: 25%, (C represents Category); these ratios were employed to keep laterite constant up to 50% to determine that which will yield the best sustainable strength. Soil test and classification was done with the following, dry sieving and hydrometer analysis, plastic limit, liquid limit and moisture content - were conducted to classify the type of soil and its content for the benefit of producing building blocks. The results from those tests show that the soil was a laterite soil and clay of intermediate plasticity, fine grained and an inorganic soil. Comparison of compressive strength was carried out with the result from this study and the findings from past researches. Durability test was conducted using abrasive test and the result proved that the percentage of soil particles that were abraded from the resultant block samples after striking with wire brush was low. The compressive strength result shows that cement stabilised sample had higher compressive strength than the lime stabilised and that the strength increased as the curing age increases, also compressive strength increases as the content of stabiliser increased. Category (iii) had the highest strength among the other mix categories.

Keywords:
Compressed Stabilised Earth Block, Laterite Soil, Earth Block, Infrastructure University Kuala Lumpur

INTRODUCTION

Every human deserve a comfortable shelter, as a matter of fact the provision of housing is the duty of both privet and government housing authority, and even at that both developing and developed country still have problem of both affordability and availability of houses in their society [1], this demand affect the cost of building, though demand is not the only factor that affect the cost of building but other factors like cost of building materials for example the building blocks (conventional blocks) which depends wholly on excessive use of cement at the same time making this building blocks expensive for most population (citizens) with a very low income [2]. As population increases so does the demand for housing increases in both the developed and the underdeveloped countries, studies have been done on how to provide

affordable shelter for the citizens. In Malaysia housing have been observed to be a big problem due to population increase caused by immigration of people from the undeveloped rural to the urban centres and these people are those with low income group (Bumiputera) that came in search of greener pastures and most of them cannot afford good shelter due to the cost of the houses in the urban region [3]. According to the "Third Malaysian Plan (TMP)" which was created in aim of eradicating poverty by providing affordable housing to the citizens, there is thus the very need to address such challenge through the proper implementation of affordable housing programmes with a more cheaper but durable material due to its link to income level.

In effect it has come to the notice of both the government and individual housing developers to find an alternative to the conventional materials and this quest brought most researchers to the idea of using laterite in making building blocks [4]. However laterite which have been neglected by many building professionals and the public as a whole due to its intensive maintenance because of high absorption rate when in contact with water, this process of excessive water intake will make the wall made with laterite soil to detorate within a short period of time leaving it soft and with time the walls will start to crack [5], also unawareness of the general public to know the economic benefits of building with laterite because of low acceptance by majority of the social group is also a big challenge of its own. Another setback in using laterite block for walling is due to its low strength when used as a building block. Notwithstanding the studies on laterite block that have been done to improve its strength, although the outcome have been a gradual success but there is still a need to improve it so that it would be generally utilised in all part of the world to minimise high cost of housing having known the economic benefits of laterite block.

The aim of this study is to use laterite soil, mixed with fine aggregate and coarse aggregate stabilised with lime and cement to improve the strength of compressed earth block to minimise the cost of materials used for building and block production.

i. Comparing the compressive strength between compressed earth block stabilised with cement and lime after 7, 21 and 28 days of curing with equal proportion of material used.

ii. To determine the compressive strength when laterite is kept constant in all mix up to 50% and to know the mix that will yield the best compressive strength result.

iii. Comparing the result of compressive strength from this study with the result of compressive strength from other study.

Laterite block have been in use for years ago starting from the ancient days until now. In some rural areas they are seen as the only affordable material around the environment and believed to be dependable for building of houses, though its maintenance is high but its availability and very low cost have made it the only material for building in these area. In most developing area it is used extensively for construction purposes. It was stated that housing is very important in everyone's life but up to 50 of the world population in the rural areas still lives in shack houses. Furthermore, there have been several attempts made to develop walling units that will serve as alternative to the modern and more expensive fire bricks and concrete blocks. The use of laterite (cheap and durable material) was supported and introduced by the United Nations [6]. Notwithstanding its low strength and durability, laterite is still an environmental friendly material for building because the materials that are used for the building are all natural materials and its production does not require a special skill or techniques in building the traditional houses.

A. Laterite

Laterite soil from the past studies have been ranked as one of the historical building materials and its use have already made history in most countries, building like Temple of Ankor Wat in Cambodia, the Pyramid in Egypt which still stand tall for the admiration of our present day and at same time bring revenue to the country through tourism. Laterite soil is of great important when it comes to building and construction among the other soil that are in the tropical and non-tropical regions. It is said to be a high weathering soil that is made of a high proportion of iron and aluminium oxides and some other minerals. "Laterite soil if found in subtropical and tropical region below the surface of wide grassland that have high rainfall and that it is also produced by an in-situ (laterite) weathering process of a basement rock, such process occur mostly under a tropical climate conditions" [7]. The rate of laterite dark appearance determines how much resistance to moisture [8]. Laterite is defined as a "high weathering soil that occurs by the concentration of hydrated oxide of iron and aluminium" [9]. Some Asian countries have known laterite as a building material for more than 1,000 years. But when traced back its use where extensive and where the soil cohesion and its concentration of carbonates are high, such process is commonly found in tropical region where laterite soil gives a durable building material. While in some region laterite soil appears harden when exposed to air and sunlight due to a chemical reaction with the soil and air and this reaction is called carbonation reaction and such occurrence is known as induration, these kind of soil is found mostly in west coast of India. In India moist soft soil is cut directly into blocks or brick size and dried under intensive heat of the sun and allows hardening and after that it will be used for building as a building block, such soil is characterised as been practically irreversible and impermeable after drying [10].

B. The Occurrence of Laterite

Laterite soil occurs under a hot and wet climate condition in the tropic and subtropics region with three different stages in-situ, decomposition and weathering process [11]. Some researches have been done on classification of laterite to be able to differentiate laterite from other soil. Laterite is classified as soil that has a "reddish to yellowish colour, and the colour appearance is based on the water region during origin and its mineralogical composition of the parent rock" [12]. But unfortunately, the term reddish tropical soil still refers as laterite and laterite clay by some engineers. Some soil may appear like laterite but will not have the entire engineering properties requirement as laterite but fortunately, for engineering purpose, it does not matter if the classification is right or wrong, what matters is that the engineering properties of the soil would be classified and derived from testing that is reliable [13].

C. Laterite Soil Composition

With the view of laterite soil characteristics, there are factors that affect soil suitability for blocks production, and these factors are the moisture content of the soil, soil composition and the soil plasticity. A suitable laterite soil would be composed of clay (15-20%), contain silt roughly 25-40 percent by volume and roughly 40-70 percent by volume of sharp sand. The soil plasticity are said to depend primarily on the function of the clay content soil with plasticity index up to 20-30 which is suitable to apply for the production of building blocks [14]. When an accurate soil mix design and the optimum moisture content are established, blocks can then be ready for production. Proper compaction of the soil and a stabiliser like cement or lime can still

be used to enhance the performance of the block. It should be highlighted out that different laterite soils may be seen in such a form that might be unsuitable for block production, for example, soil that was collected from borrow pit might be containing lumps which will require crushing for a more homogenous mix [15].

D. Compressed Earth

Compressed earth can be defined as the process of improving soil mechanically by pressing the earth particles in a very tight contact, and expelling air that is in the soil mass. This process increases strength properties of the soil at the same time making the soil to be less permeable and increases its stability. The effect of compressing a soil in a block form differs from each other and they are affected by different variables. One of these effects is the effort used to compress the block - higher effort used to compress the block results in higher or greater density [16]. Another effect is the elapse time between mixing and the period of compressing which has a negative effect on the strength of the laterite soil that is being stabilised with lime or cement; that is to say that a soil mix that was compressed within 60 minutes immediately after mixing will have more strength than the sample compressed after one day of mixing [17, 18]. This means that delay after mixing soil with the stabilising agent affects the strength and development of the mix. However, earth soil was formerly compacted with wooden tamps, which was the first form of compressing an earth block in some parts of the world. The machine that was used for compressing this soil was developed around the 18th century in France by Francious Cointeraux, an advocate of "new pise" (rammed block). Then latter a manual compressing machine was introduced around 70's and 80's, and this machine made the production of compressed earth block more energy saving and economical to produce [19]. Compressing block (CB) is a recent form of earth block manufacturing which came into use all over the world about 30 years ago. Thereafter a more modern compressing machine was manufactured in 1952 by "Engineer Raul Ramirez" of the CINVA in Bogota.

E. Soil Stabilisation

Soil stabilisation is simply the addition of a chemical treatment in a soil mix to improve its stability and its engineering properties, this process can take place when a stabilising agent like cement, fly ash or lime is administered to the soil mix, the pozzolanic reaction between the stabiliser and the soil develops a bind between the soil molecules and make soil durable for engineering purposes [9]. Soil stabilisation has numerous effects on soil, it reduces plasticity index; this makes it change from its sticky nature to a crumbly or grainy and this makes the soil easy to compact. This process help to make soil which was known to be unstable for most engineering work turn out to have useful values. McNally highlighted stabilisation to be a way of improving soil strength, stiffness, durability and reducing water absorption. Soil can be stabilised in three ways by mechanical, physical and chemical [20].

Physical stabilisation which is the alteration of properties of a soil by bringing together the missing size fractions, the soil texture in this manner can be altered by calculation and mixing of different fractions of soil together, after which most of the void that existed earlier are closed because of the close-packing of the grains, and this process limits the movement of the grains in the soil [21]. Mechanical stabilisation is done by a physical process of changing the physical nature of the soil by compacting or vibrating the soil and changing its density and reducing porosity. The procedure of compaction is what brings the soil particles closer in a way that the air is eliminated from the soil void. The application of method of stabilisation alone is

not permanent because it can be easily reversed when the soil is in contact with water. The water will cause the soil grain to move within, and in this method the need for binder is highly imperative to override the reversible effect when in contact with water [22]. Chemical stabilisation occurs when a stabilising agent (cement, fly ash, lime, bitumen or a combination of these stabiliser s) is mixed with a soil, to improve the soil strength, lower permeability and lower compressibility that the natural state of the soil or the native soil cannot provide [23].

F. Compressed Stabilised Earth Block

Compressed stabilised earth block (CSEB) is a construction material which contains earth (laterite) mixed homogenously with a stabilising agent, be it cement or lime, into a compressed block. It has been revealed in pass literatures that the use of compressed stabilised earth block has been of rising interest in the provision of low cost houses, and stabilised earth building materials shall be of immense value as society progresses with respect to ecological design imperatives in building. This means that a proper use of mix with high amount of stabiliser content (lime or cement) produces a very good building material with an outstanding chemical behaviour, while well planned application of mixture with low content of those stabilisers will be used to achieve an economical and efficient solution to earth building and construction [24]. Building with earth is the cheapest material and practically more economical due to its local availability and abundance in the environment and some analyses have been carried out to prove that earth as a building material is cheaper and it is proven by comparing cost of wall made with CSEB and the wall made of fired bricks in India [25]. This comparison proved that CSEB is more economical than the country fired brick and it is also more environmental friendly than the country fired brick because no fire is required but only curing. Another comparison on compressed earth block, concrete block and adobe for thermal test by "Biology Department of Southwest Texas Junior College, Del Rio Texas " [26], and the result proved that the internal temperature of compressed earth block was lower than the adobe and concrete block which gives CSEB advantage over others.

G. Stabilising Earth Soil with Cement

Cement in in the field of building and construction work is a very important material and it could be divided into different types namely: Portland cement (ordinary Portland cement) Stag cement, Pozzolonic cement and High Alumina cement. Furthermore, each of the cement types differs from one another in respect of their rate of strength, rate of heat evolution, resistance to sulphate attack, and dry shrinkage. However in all the different types of cement the one most widely used in building is the Portland cement (ordinary Portland cement). The major purpose of the OPC is to bind the soil particles together in a strong, dense, dimensionally durable and stable form. There are still some other binders that are commonly used which include, Lime Gypsum, Pozzolans, Resins and Bitumen. Superior, unique and faster binding capacity was why OPC was selected as one of the stabilising agent in this study, and secondly its availability in all parts of the world. OPC is unique in comparison with other binders because of its binding ability to gain maximum strength in about 28 days unlike most other binders [27, 28]. It is stated that "stabilising block varies in OPC quantity and amount and that can drastically affect its properties and behaviour" [29].

H. Stabilising Earth Soil with Lime

Lime has been one of the oldest stabilisers that were used to treat soil to improve its engineering properties; workability and load bearing features. Many literatures have revealed that lime reacts with medium fine soil or fine-grained soil to have an increased workability, decreased plasticity and increased strength. The strength gaining is practically based on the chemical reaction due to the involvement of immediate change in the soil visual property caused by cation interchange. Calcium in the lime exchanges with the cation of the soil that was absorbed, which will cause the water layer around the soil particles to reduce in size and the process allows the soil particles to come in close contact with each other, causing agglomeration of the soil particles [30]. Furthermore another chemical reaction in lime Stabilisation is the pozzolanic reaction within the lime and soil mixture, which results in gaining strength [31]. It is good to underline here that the amount of lime that will be used for stabilisation depends on the type of soil to be stabilised and the quantity of lime is based on the analysis of effect that different lime percentages have on the reduction of plasticity and high increase in its strength on that soil [32]. That is to say that a proper laboratory test should be conducted on the soil to know the properties of the soil, the right quantity of stabiliser and the right stabiliser to use.

I. Compressive Strength of CSEB

The result of compressive strength of CSEB have been very encouraging to understand the benefits of using laterite to make blocks, not only for the economic benefits of low cost housing but also the environmental benefits as a walling materials. In a study, a maximum compressive strength of 1.2, 1.9 and 2.4 N/mm² for cement content of 5%, 8% and 10% were achieved respectively [33]. The result of the compressive strength did not meet the Malaysian Standard [34], but advised that additional 13% of cement should be added to achieve the standard strength required by the Malaysian Standard. It was reported that bricks made of laterite, admixture with 45% sand and 6% cement gained a compressive strength of 2.12 N/mm² with increase in cement content after 28 days of curing [35]. Six percent (6%) cement content is economical for the production of laterite bricks for low cost housing and that such strength of bricks could be used best for one storey building [36].

Table 1: Result of Compressive Strength [36]

Cement Content (%)	**0**	**3**	**6**	**9**
0% Sand Content				
Weight of Bricks (kg)	11.40	12.42	12.67	12.82
Density of Bricks (kg/m^3)	1534.3	1671.6	1705.2	1725.4
Load at Failure (kN)	12.4	35.0	63.0	82.0
Compressive Strength (N/mm²)	0.25	0.70	1.27	1.66
45% Sand Content				
Weight of Bricks (kg)	11.33	13.48	13.59	13.74
Density of Bricks (kg/m^3)	1524.9	1814.3	1829.1	1849.3
Load at Failure (kN)	10	41.0	105.0	164.0
Compressive Strength (N/mm²)	0.20	0.83	2.12	3.31

It was reported a compressive strength of 2.5 N/mm² and 1.8 N/mm² according to Nigerian Industrial Standard NIS: 87:2004 [37]. The results proves that laterite cement mix is an economical building material due to less cement content, and also that the cost of block depends so much on cement content.

J. Water Absorption of CSEB

Every mass of absorbed water is different in mass between saturated surface-dry (SSD) in CSEB after being placed in water for 24 hours. This process is always expressed in percentage [38]. However, the absorption of water is greatly influenced by the porosity and surface texture of that particular material. Water absorption of interlocking block decreases with increase in percentage of cement stabiliser. The result proved that the cement binds the laterite particles together and reduced the size of pores where water will flow into the block. The block without stabiliser (control sample) disintegrated in the water [39].

Table 2: Water Absorbtion of Cement Stabilised Interlocking Blocks [40]

Cement Stabilisation (%)	Dry Mass (kg)	Wet Mass (kg)	Water Absorbed (%)	Av. of Water Absorbed (%)
0	-	-	-	-
5	14.440 14.530	15.530 15.648	7.55 7.69	7.62
10	14.092 13.871	14.987 14.675	6.35 5.79	6.07
15	14.120 14.333	14.842 15.098	5.11 5.34	5.23

K. Effect of External Water on CSEB

Many traditional walls suffer from deterioration and there have been so many ways whereby water has effect on an earth block or walls made of laterite. Notable type of water with this effect is rain water and rising dampness from the ground. Water also has a negative effect on blocks, for it erodes the base of the walls of earth buildings making them to crumble and fall apart easily [40, 41]. However observations have been made on how earth blocks deteriorate and it occurs in different forms, such as solvent, abrasive and swelling of earth blocks. This will leave the block to be weak and cause it to fall apart [42, 43]. Solvent is seen as a common failure that occurs in earth blocks [44].

Abrasion of the block or walls of a building in some cases is caused by constant rain water drop on the surface of the block with a force [45]. It is stated that abrasion, which is caused by rain water has been identified by many as one of the common deterioration agent. The only place that really feels the impact of the surface erosion is mostly the region that experience frequent rainfall such as the Tropical areas [46]. The process and the rate at which rainfall drops with force on the block and removes the loose particles of the block that was not properly stabilised, and with water splashing on the surface of the block, the impact will cause the block particles that are not properly bonded with a stabiliser to fall apart and leave the block surface to get wet [47, 48]. It is stated “the rate of the rain drop on the blocks as the drop size, wind speed, fall and impact velocity energy which can impact on the surface of the block and

cause the soil particles that are not stabilised to fall apart (removing the particles on the block that are not stabilised)" [49].

METHODOLOGY

Soil from IUKL was classified using atterberg limit, moisture content, particle size distribution [50] and moisture content [51].

A. Compaction test (Standard Proctor test)

Compaction test was carried out by the use of standard proctor test method for the purpose of achieving the moisture content of the laterite soil or water content on each of the laterite mix that will be administered when molding the cubes for compressive strength test, a laterite soil passing through number 4 sieve that was air dried was used, the compaction test was carried out [52].

B. Mix proportion

Before the moulding took place, the moisture content that was derived from the compaction test was employed in all the mix with the percentages of the stabilisers when casting. The proportion of the materials with water that was derived from the moisture content test was used throughout the molding process. To ensure uniformity in the production of compressed stabilised earth block, the weight or volume of each material used in making the block was measured at the same physical state for all batches of the blocks.

Table 3: Total Percentage for each Category

Sample Number	Laterite soil	Fine Agg.	Coarse Agg.
C(i)	50%	40%	10%
C (ii)	50%	35%	15%
C(iii)	50%	30%	20%
C(iv)	50%	25%	25%

252 cubes were moulded (including the control), nine laterite block was produced for each batch mix that will be tested for compressive strength at 7, 21 and 28 days. Mixing was done repeatedly for lime and cement stabilisation with same percentage of stabiliser cement and lime in increase at 5, 10 and 15% respectively to be able to compare their strength in same curing age. The letter C in the sample number represents Category.

C. Batching and Mixing

Batching was done in a bone dry condition for all the materials. Mixing was done thoroughly to ensure consistence and a mechanical tilting mixer was used to mix the soil. The mixer was emptied and cleaned to ensure there was no foreign materials left in the mixer, and the mixed materials was then added to start the mixing proper. 252 number of 150 mm^3 cubes were cast

after mixing for compressive strength test for a curing duration of 7, 21 and 28 days for cement and lime stabiliser to compare the strength of lime with cement of same curing age.

The laterite cube sample was removed from the mould immediately after casting and kept to dry in a shade on a wooden pallet leaving it to air dry for 24 hours. It was then covered with a polythene sheet for curing to start properly. Thereafter, curing took place by the means of sprinkling (sprinkling water on the specimen). Covering was necessary to avoid the laterite sample from having a rapid drying, which will cause the blocks to start shrinking and cracking.

D. Water Absorption

Cold water absorption was conducted according to British Standard [53]. Water absorption was done to determine the amount of water that the sample will absorb within 24 hours, and this test was performed by a random selection of 72 specimens that was moulded for compressive strength that attended 28 days curing age.

E. Abrasive Test

Another durability test was also conducted by abrasive test method. 56 numbers of specimens were collected for abrasive test, two samples from each category after attending 28 days of curing in all percentages of cement and lime. The test was conducted to know the percentage of the soil particle that will be abraded away from the specimens. The specimens were weighed with a balance and the weight was recorded, however this was done so as to obtain the initial weight of the specimens before abrasion takes place. The specimens were then placed on a wooden surface, having the specimens balanced on the wooden surface, thereafter a wired brush was stroke 50 times through the surface of the specimens backward and forward motion, the backward and forward motion was seen as one stroke. After brushing through, the specimens were weighed on a balance and the weight after abrasion was taking.

RESULTS AND DISCUSSION

A. Summary of Preliminary Test Result

Table 4: Summary of Test Result

Test	Result
Liquid limit %	49.7
Plastic limit %	24.32
Plasticity index %	25.38
Specific gravity	2.65
Natural moisture content %	25.15

From Table 4, the result of plastic limit of laterite soil from IUKL had a PL of 24.32%, an LL of 49.7% with PI of 25.38%, these tests were helpful in classifying the laterite soil used in this study.

B. Sedimentation by Hydrometer and Sieve Analysis method

The laterite soil from IUKL satisfies the requirement of fine aggregate with 92.44% passing 2 mm sieve to 68.26% passing through 63 µm sieve which satisfy that the laterite is fine according to [54].

IKRAM CENTRAL GEOTECHNICAL LABORATORY

GRADING TEST (SEDIMENTATION BY HYDROMETER METHOD)

PROJECT:	The Stabilization of Compressed Earth Block Using Laterite	PROJECT NO.:	
SAMPLE	Laterite soil from IUKL	SAMPLE NO.:	**MXM**

SIEVES (MM)	WT RETAINED (g)	% RETAINED	% PASSING
10.000	0	-	100.00
6.300	0.86	1.72	98.28
5.000	0.13	0.26	98.02
3.350	0.93	1.86	96.16
2.000	1.86	3.72	92.44
1.180	1.53	3.06	89.38
0.600	1.62	3.24	86.14
0.425	1.06	2.12	84.02
0.300	1.51	3.02	81.00
0.212	1.46	2.92	78.08
0.150	2.08	4.16	73.92
0.063	2.83	5.66	68.26
0.046		-	58.08
0.033		-	55.65
0.025		-	38.66
0.010		-	16.82
0.007		-	8.74
0.005		-	7.93
PAN	34.13	68.26	-
TOTAL	50	100.00	

Remarks:		Tested by:	ODIMEGWU TEMPLE
		Date:	2/18/2013

Figure 1: Sieve Analysis and Hydrometer Analysis Chart

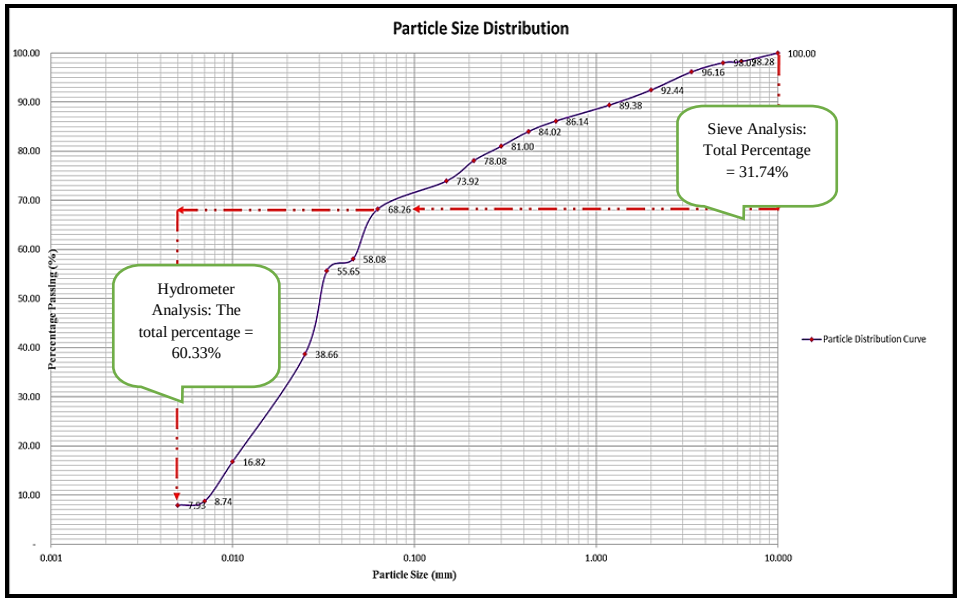

Figure 2: Particle Size Distribution Curve of Laterite from IUKL

The laterite soil from IUKL ranged from 6.3 mm to clay size with a large percentage of fine particles, the result of the test shows that the soil is distributed from medium gravel up to clay as shown in Figure 2. From the particle size distribution curve; Having 68.2% passing 63 µm sieve, the soil is considered as "fine – grained" [50].

According to "A line" classification chart for fine soil, is clearly shown that the soil from IUKL falls above the "A line" with a segment symbol CI with the soil being Clay of Intermediate Plasticity (CI) and more than 35% of the material is finer than 0.06 mm, hence the soil falls under fine – grained soil according to British soil classification system for engineering purposes. The soil is not a coarse grained soil or an organic soil [55].

C. Compaction Test

Table 5: Compaction Test Result

Mix proportion	MDD	OMC
C(i)	1.9 Mg/ m³	12.95%
C(ii)	1.86 Mg/ m³	12.25%
C (iii)	1.85 Mg/ m³	14%
C (iv)	1.85 mg/ m³	12.5%

The graph presented in Figures 3 to 6 indicates that C(i) had an MDD of 1.9 with the best OMC of 12.95, C(ii) MDD of 1.86 with an OMC of 12.25, C(iii) MDD of 1.85 with an OMC of 14 and C(iv) MDD of 1.85 and OMC of 12.5. respectively. It was observed that the slight increase

in water helped the soil particle mix to compact tightly giving rise to a maximum dry density and optimum moisture content. However, this behaviour was observed in all the mix.

D. Water Absorption

The results of water absorption test are presented in table 6 to 11 for cement and lime stabilised samples.

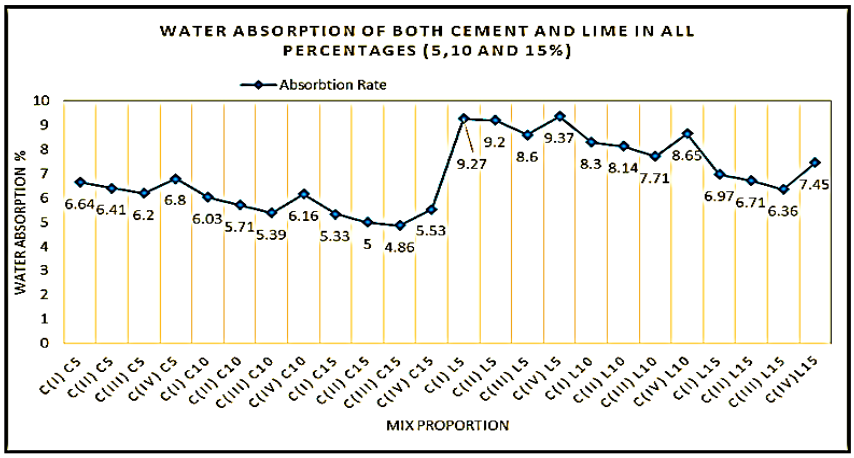

Figure 3: Water Absorption for Cement and Lime Samples in all Pecentage

The result shows that the water absorption decreases with increase in percentage of stabilisation in both cement and lime respectively, the behaviour was expected because the stabilising agent (cement or lime) binds the soil particles together and then reduces the size of pores where water could penetrate through to the sample. There was no result for the control sample because the sample breaks apart inside the water after 24 hours. The cement stabilisation and lime stabilisation in all percentages 5, 10 and of C(iii)C and C(iii)L (meaning category(iii) Cement 5, 10, 15% and category(iii) Lime 5, 10, 15%) had the lowest absorption rate among the other mix ratio. This low rate of absorption might be because of the percentage increase in coarse aggregate and decrease in fine aggregate.

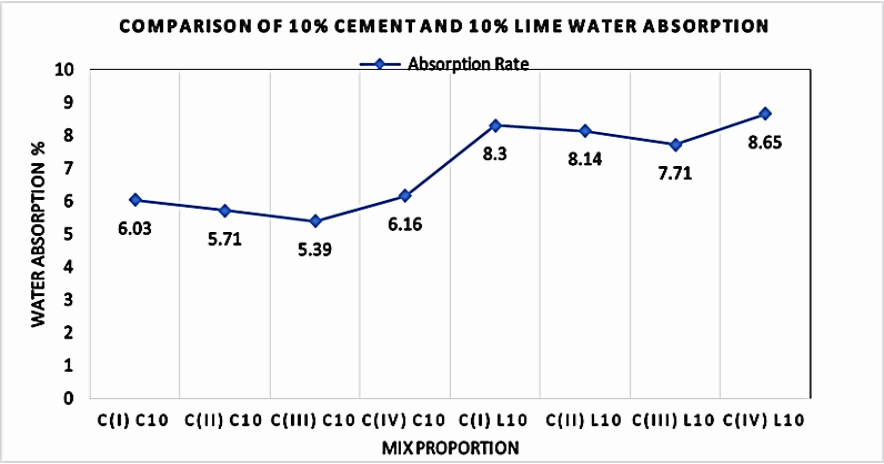

Figure 4: Water Absorption of 10% Cement and Lime Stabilised Sample

Figure 4 show 10 % comparison of lime and cement stabilised sample and from the graph it shows that lime in all percentages was more permeable than the cement stabilised specimen of same percentage of stabiliser. However the maximum water absorption of 7%, in category of Engineering Bricks [53] was satisfied by cement stabilised sample in all percentages but lime stabilised specimens did not meet the specification, although for load and non-load bearing walls there is no specific requirement for its water absorption.

E. Compressive Strength

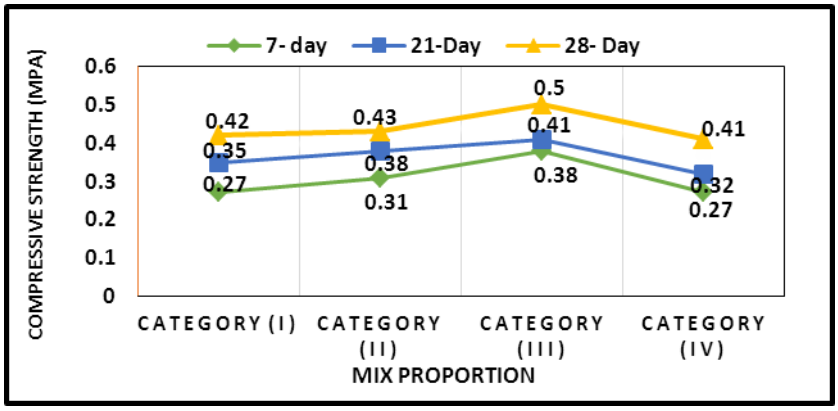

Figure 5: Compressive Strength Test of Control Sample

This behavior of the compressive strength shows that the strength increases with increase in curing age in all categories of both the stabilised and unstabilised sample (control sample) and 28 days curing age achieved the highest strength in all percentages as shown in Figure 5 to 8.

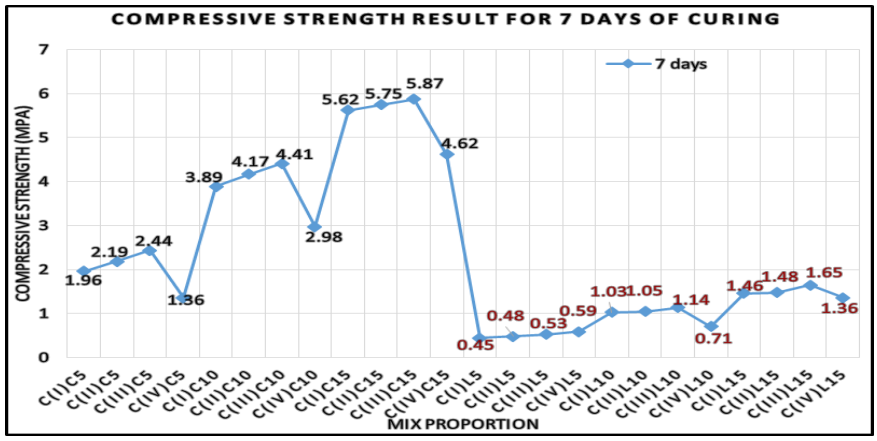

Figure 6: Compressive Strength of 7 days Curing for Cement and Lime Stabilised Specimen in all Percentages

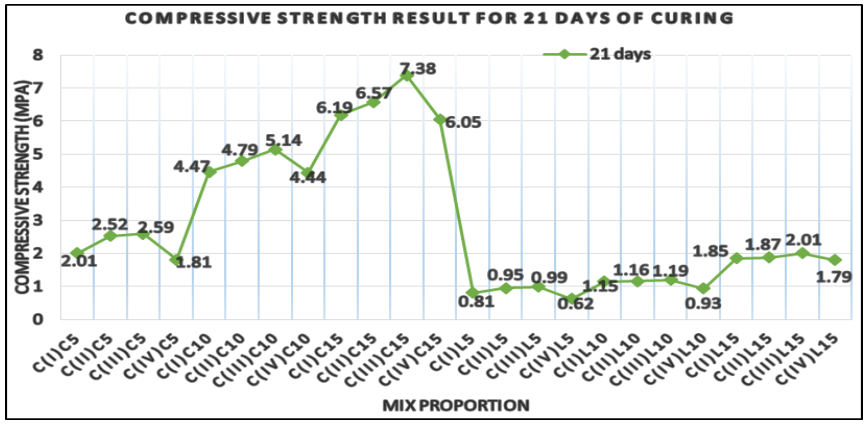

Figure 7: Compressive Strength of 21 days Curing for Cement and Lime Stabilised Specimen in all Percentages

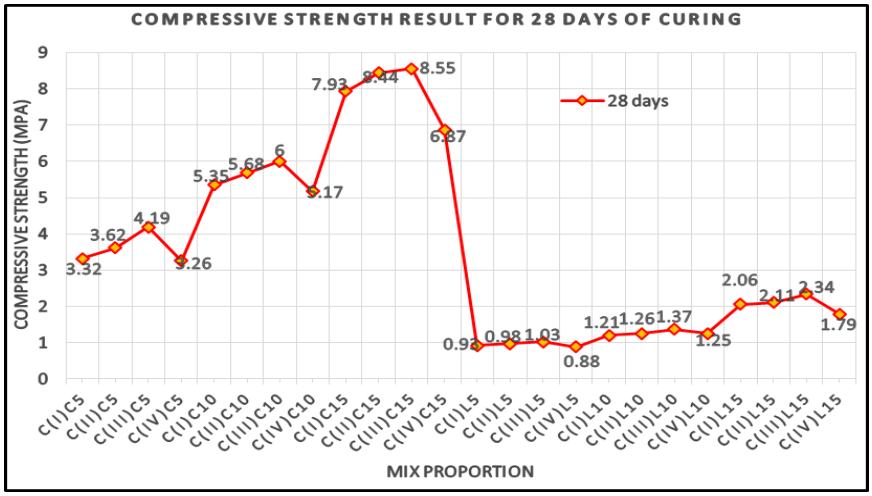

Figure 8: Compressive Strength of 28 days Curing for Cement and Lime Stabilised Specimen in all Percentages

In both cement and lime stabilisation it was observed that the compressive strength increases as the percentage of stabilisation increases. From Figure 6 to 8 it shows that the strengths of lime specimens were far lower than their counterparts in cement stabilised specimen. Eg, 10% cement specimen of the third category C(iii), which is 50%: 30%: 20%, was 6.0 MPa at 28 days curing while that of 10% lime was 1.37 MPa which was lower with a difference in percentage above 100%. In the case of lime stabilisation, the compressive strength achieved could not satisfy the minimum strength requirement of 5.2 MPa set by Malaysia Standard [34].

Cement stabilised specimens showed higher compressive strength than the lime in all percentages and curing age, and this might be because lime being pozzolanic, due to lime was not left beyond 28 days curing age to achieve its maximum strength [31]. When compared with result from other studies, a research work has shown an achievement of a maximum compressive strength of 2.78 MPa for 28 days curing age with 10% cement stabilisation [56], meanwhile in a different research work using laterite soil and fine sand to produce interlocking bricks, the researcher had achieved a maximum compressive strength of 3.31 MPa for 28 days curing age with 9% cement stabilisation [35]. Lastly a maximum compressive strength of 2.5 MPa result was reported in a study for 28 day with 10% cement stabilisation which also had a lower strength when compared with the result of 10% cement stabilisation achieved in this study.

A. Abrasive Test

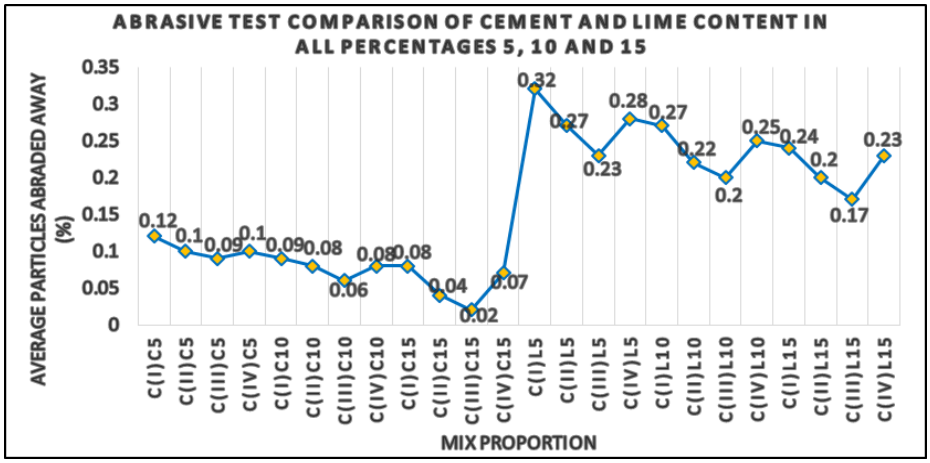

Figure 9: Abrasive Test of Specimen without Stabiliser

Figure 9, presented above proves that the rate of the sample to resist abrasion increases with an increase in percentage of stabilised content. However when compared between cement and lime from the chart it was seen that cement in all percentages showed a higher resistance to abrasion than the lime stabilised specimen which means that cement stabilised specimen is more durable than the lime stabilised specimen. Among the mix proportion category (iii) in all percentages show a higher resistance to abrasion than the other mix which means it is a more durable mix.

CONCLUSION AND RECOMMENDATION

A. Conclusion

The compressive strength of the specimen increases with increase in percentages of cement and lime stabilisation and curing age. Coarse aggregate should be used in production of CSEB, the addition of coarse aggregate to laterite mix up to 20 percent increased the compressive strength but reduces the strength with increase in coarse aggregate above 20 percent. The stabilisation of CSEB with cement is more efficient than stabilising with lime and 10% cement stabilised compressed earth block is an economical building block because little percentage of stabiliser still gave an adequate strength. Abrasive test shows that cement is more durable than lime for the production of blocks because little soil particles abraded away when the specimens stabilised by cement were subjected to abrasive test.

B. Recommendations

Compressing machine should be used for future test in molding and compressing the soil particle mix into block rather than compacting machine. Block stabilised with lime should be extended beyond 28 days of curing age because of its pozzolanic reaction and it needs longer time to achieve its maximum strength, and that of cement should also be extended beyond 28 days to

compare with lime stabilised sample. Atterbeg limits, sieve and hydrometer analysis should be conducted on laterite soil to assist in classifying the soil before using it.

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REUSE OF ALUM SLUDGE IN CONSTRUCTION MATERIALS AND CONCRETE WORKS: A GENERAL OVERVIEW

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ABSTRACT

One of the global problems that is associated with production of potable water is alum sludge when aluminum sulfate (Al_2SO_4 .$18H_2O$) is used as a coagulant. The quantities of over 2.0 million tons of water treatment sludge or residue (WTS) is produced annually by the water operators across Malaysia [1]. It is important to realize that the generation of alum sludge may remain unavoidable in the current processing of drinking water treatment technologies. To comply of disposal of waste standards set by the local/federal authority makes researchers looking for alternative construction materials as a substitute to traditional materials likes cement, ceramic, bricks, tiles and aggregates in manner of reducing the impact of these waste on environment. Series of researches aimed to beneficial reuse in an effort to close the gap between enormous amounts of alum sludge and relieve pollution. However, the most common methods of disposal still depend on land application, reuse for agricultural purposes and attempts to reuse it as a coagulant in the primary treatment of sewage. One of the possibilities for the alum sludge is reuse it in the construction sector. The construction sector consumes huge volume of materials every year which gives construction sector potential to reuse alum sludge in making constructional material and concrete works. Thus, there is a need to do more laboratory experiments to determine maximum percentage that could be used as substitution on construction material. Thereby, the growing problem of alum sludge disposal can be alleviated if new disposal options other than of landfill can be found. This paper presents a review of available literature on attempts at beneficial reuses of drinking water treatment sludge as building and construction materials and concrete works and also studied the behavior at fresh and hardened state.

Keywords:
Alum sludge, Construction, Materials, Brick, Disposal

INTRODUCTION

Aluminum sulfate (Al_2SO_4. $18H_2O$) is the most commonly used coagulant in drinking water treatment plants and as a result, tons of aluminum hydroxide –containing sludge is unsafely disposed to the open environment daily. Alum sludge as waste materials are mostly sent to landfill. WTS refers to water treatment sludge. It also refers to water treatment residual [2], drinking water sludge [3], waterworks sludge [4] and alum derived water treatment sludge [5]. Figure 1 shows process of potable water treatment and process of sludge, starting with raw water, ending with drinking water and dry sludge.

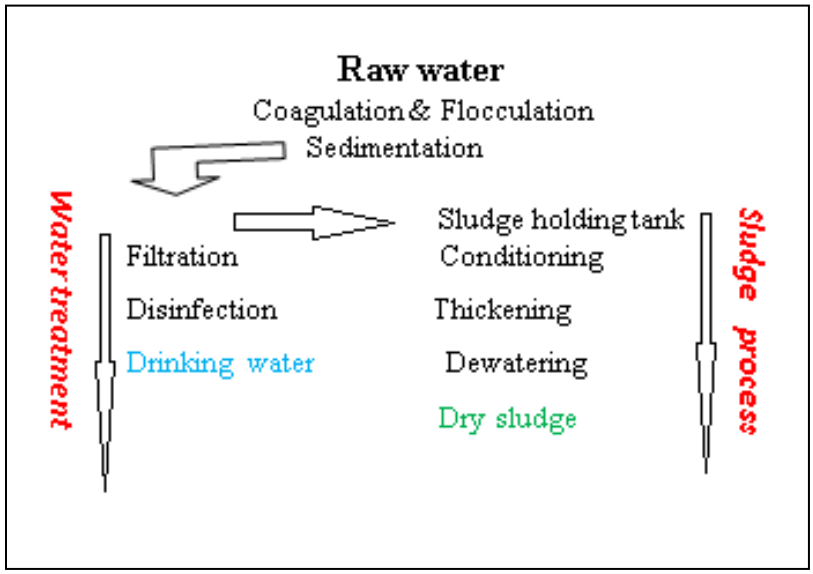

Figure 1: Process of Potable Water Treatment and Process of Sludge

The quantities of over 2.0 million tons of water treatment sludge or residue (WTS) is produced annually by the water operators across Malaysia. Due to the cost of finding new landfill (scarcity land) and the needs for sustainable best practices, sludge disposal becomes a global problem; it is a necessity to look for alternative reuse of sludge. However, the main concern lies in reuse of physical and chemical composition and toxicity. Aluminum can be toxic in aquatic system, but only when the pH of sludge is low enough that the solubility of aluminum hydroxide is high. There are so many potentially harmful substances found in alum sludge particularly heavy metals. Many are known to cause cancer and other diseases. For example Table 1 shows the main component of alum sludge derived from different drinking water treatment plants.

Table 1: Chemical composition and physical test of different samples from different plants of alum sludge by X-ray fluorescence (XRF)

CHEMICAL ANALYSIS %						PHYSICAL TEST					
SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Na_2O_3	K_2O	P_2O_3	LiO	Specific gravity	Moisture content
42.32	35.03	4.94	0.13	0.30	0.14	0.10	1.87	0.26	11.80	2.34	0.85
29.63	17.57	5.18	11.85	2.15	0.34	6.09	2.85	0.92	22.70	-	-
54.70	24.10	6.90	0.50	1.30	0.60	0.60	3.20	-	-	-	0.13
64.30	21.20	10.40	2.05	1.06	-	0.17	0.79	-	08.04	-	-
29.60	28.02	8.05	1.48	0.38	-	-	0.84	-	22.6O	-	19.97
43.12	9	5.26	5.56	0.85	1.49	0.52	0.26	-	26.79	-	-
33.23	15.97	4.94	0.64	0.63	-	0.42	0.43	0.40	26.10	-	-
22.3	31.98	4.70	38.3	2.70	0.70	0.50	1.00	-	-	-	0.75
9.30	26.00	23.3	27.2	1.31	0.33	-	-	-	38.00	-	-
27.6	0.26	26.4	33.06	0,53	-	-	0.33	-	-	-	76.43
	6.50										

These results of chemical composition and physical test vary from country to country depending on water treatment plant resource. Dry alum sludge have been utilised as a component in the manufacture of several materials such as concrete, cement mortars, clay materials and fired ceramic products (e.g. bricks, pipes and tiles), as geotechnical works material, as a potential material for use in fertilizing the forest and agriculture and for phosphorus (P) removal from aqueous solutions [6].

ALUM SLUDGE, HEALTH AND ENVIRONMENTALS EFFECTS

Influences of alum sludge resulting from the water treatment on environment can also leads to damage to human health. There are some studies that confirm this correlation presence of sludge with Alzheimer's disease. Some of these effects may occur immediately and others may take some time to impact (with a cumulative effect), therefore, health effects generally associated with environmental pollution that includes the use of chemicals should be examined and tested for the potential contamination of the environment. Alum sludge is a by- product of the treatment plants that use aluminum as a coagulant. AS is as scheduled waste material governed by stringent regulations on waste management by the department of environment (DOE) [7], and must be disposed accordingly. In Malaysia, more than 2.0 million tons of water treatment sludge is produced annually by the water operators throughout the country. The increasing cost of landfill (limited available land), the needs for sustainable best practices, and the increasing demand for high quality of drinking water causes the daily vast amount production of alum sludge that may remain unavoidable. Thus, the research that involves using alum sludge in construction and concrete works contribute to reduce the environmental impact. Increasing amount of alum sludge as a waste is not only difficult to dispose but they also cause serious health hazards. Therefore, efforts are to be made for controlling pollution arising out of the disposal of alum sludge by conversion of these unwanted wastes into utilizable raw materials in construction sector in beneficial uses.

RESEARCH ON REUSE SLUDGE TO PRODUCE BRICKS

Due to the demand of bricks as building material, studies have investigated the mixing incinerated sludge ash into fired clay bricks. It is important to realize that the compressive strength and shrinkage of new made brick from alum sludge are the most two properties. Several experiments using alum sludge in brick making had been reported in many countries. Patricia et al. conducted ceramic brick manufacturing from drinking water treatment plants [8]. They carried out experiments to get a sand replacement by 10% of sludge and this percentage is considered appropriate for ceramic brick. It indicated an interesting potential for reuse alum sludge as construction material. Elangovan and Subramanian produced a publication that deals with reuse of alum sludge in clay brick manufacturing. Alum sludge with commercial local clay were blended in various proportions and sintered at different temperature to produce clay-sludge brick. Their result indicated that alum sludge could be used as partial substitute in commercial clay bricks to maximum of 20% without compromising the strength of brick [9]. Dunster and Wilson conducted experiments on water treatment residues as a clay replacement and colorant in facing bricks. They also found that the results from laboratory trials demonstrated that water treatment residue could be used as a colorant and partial clay replacement in brick [10]. Badr El-Din et al. presented some results from brick manufacturing by mixing water treatment sludge with rice husk ash. They were able to measure the optimum sludge addition to produce brick from sludge which was 75%. Their results based on the

experimental program and the produced brick obeyed the required values of compressive strength, water absorption and efflorescence assigned by the standard specifications [11]. Chiang et al. investigated experimentally light weight bricks manufactured from water treatment plant sludge and evaluated the environmental safety of sintered leaching produce concentration [12]. Mohammed et al. indicated that sludge could be mix as partial substitute for clay in brick manufacturing and they also found the best of replacement proportion of sludge from clay is 50% to produce sludge- brick-mixture [13]. Babatunde and Zhao produced a publication that deals with a comprehensive review of available literature on attempts at beneficial reuses of water treatment plants. The study investigated the percentage of incorporation when the sludge is substitute into the brick at different levels by many studies that studies that were reported [14]. Quesada et al. carried out ceramic brick manufacturing from various industrial such as urban sewage sludge, bagasse, sludge from the brewing industry, olive mill wastewater and coffee grained residues. There wastes were blended with clay to produce bricks. Because of the compressive strength of ceramic materials is the most important engineering quality index for using as building materials. The results indicated that the waste addition decreased the compressive strength of the clay but still at range of standard specifications [15]. Cusido produced paper that showed some leach ability and toxicity test (outgassing and off gassing) which demonstrated the environmental compatibility of these ceramic products to be used in building construction and for this case their results showed the sludge addition ranging from 5% to 25% in weight content of sludge included in structural ceramics seems to have no influence on the environmental characteristics of these products [16]. Vicenza et al. produced a publication on evaluation of alum sludge as raw material for ceramic products. The percentage (10 – 30) % weight of alum sludge was added to clay and the results showed properties comparable to similar commercial products. The findings lead to potential for reusing alum sludge as raw material for ceramic products [17]. Kung et al. tried to reduce the density of the brick by sintering mixes of dewatered treatment sludge with rice husk with 0, 5, 10, 20, 25% by weight. The samples produced from sintering up to 11000C low bulk density and obeyed to the standards specifications [18]. Raut et al. presented some results from many researchers that used various waste materials in different proportions and also adopted various methodologies to produce bricks and showed the results in table which contained design and development of waste- create bricks [19]. Liew et al. had undertaken the study on production of bricks from sewage sludge. They indicated that the sludge proportion is a key factor in determining the brick quality which depends on brick shrinkage, bulk density, compressive strength and loss on ignition. The percentage replacement of dried sludge was 10 to 40%. Their results complied with standard specification of bricks. The percentage up to 40% demonstrated that sludge can be constructively and successfully incorporated into brick. According to findings, percentage of sludge up to 40 wt. % in clay follows the specified requirements for clay brick could be used for general wall construction [20]. Lianyang tried to present a state – of the – art review of research on utilization of waste materials to produce bricks. The different methods to produce bricks from different waste including sludge lead the researcher to make study into three categories based on the method (firing, cementing and geopolynerization) [21]. Kevin et al. investigated the potential for reusing desalination sludge by using it as a partial replacement material in clay bricks. They focused on compressive strength and initial rate of absorption as well as the potential to efflorescence and lime pitting. The bricks were made by mixing incinerated sludge ash into clay at different ratios corresponding to 0%, 10%, 20%, 30% and 40% dried desalination sludge content by weight. The results showed that the compressive strength decreased with increasing dried desalination sludge could be produced, but the produced bricks were very fragile. It is possible to use in non-

load-bearing walls [22]. Silva and Fungaro tried to evaluate the feasibility of the use of the sludge from water treatment plant in Brazil with coal ashes produced by burning of coal in coal-fired power station. They found that none of the bricks produced in the studies conditions has obeyed Brazilian Standard Specification for quality of compressive strength [23]. Krishna et al. identified the possibilities of using the sludge obtained from different plant in India as a brick material. They were studies on the engineering properties by conducting tests on brick specimens of different percentage of changing clay by sludge. The results showed that the absorption increased by 18% when percentage of sludge increased beyond 60%. At the same time the compressive strength of bricks decreased by 10.85%. The researcher tried to solve this decreasing in compressive strength by addition of cement, fly ash and sisal fibers, the compressive strength increased by 30% and the properties of the bricks improved. This manner can open an appropriate technology to use sludge without losing the original engineering properties of bricks [24]. Anyakora conducted a laboratory experiment for the use sludge generated from purification process. The results demonstrated that the sludge could be used as a colorant and clay supplement in brick making. The percentage of exchanging clay by sludge was 0, 5, 10, 15, and 20 of the total weight of sludge. Brick was fired in a heat controlled furnace at evaluated temperature of 850 ^{o}C, 900 ^{o}C, 950 ^{o}C, 1000 ^{o}C, and 1050 ^{o}C. The percentage up to 20% can be applied into brick without losing its plastic behavior and environmental sustainability [25].

RESEARCH ON REUSE SLUDGE IN CEMENT MORTAR AND CONCRETE WORKS

The increased importance of the reuse of different types of wastes becomes very useful to reduce the environmental impact. Alum sludge as a waste material can be used in cement manufacture by the reuse sludge as cement partial.

Haider et al. studied on high performance concrete using alum sludge in concrete mixes. They investigated using alum sludge from 0 to 15% by weight of cement. Viscocrete-2044 as supperplasticizer was used to improve the workability at constant w/c ratio. Compressive strength of concrete with 6% alum sludge increases with all ages. Density of alum sludge concrete mix decreases as the replacement levels increases but it was opposite with workability [26]. Hanim and Abdull here conducted various tests on sludge produced from drinking water treatment plant had been performed in term of structural identity, leach ability of heavy metals, chemical composition and other properties that are important for its potential reuse and safe disposal into the environment. They were able to get their results of its physical and chemical properties [27].

Ing published a paper that addresses the recovery of alum sludge in the water treatment plant. He mentioned that alum sludge can also be used as secondary raw materials [28]. For brevity, only statement is given here, while full details were given by Arlindo et al. incorporation of sludge from a water treatment plant to produce cement mortar. Mortar were prepared with 5%,10% and 20% replacement of the mass cement by dewatered sludge and by sludge after thermal treatment at 105 ^{o}C, 45 ^{o}C and 85 ^{o}C. Tests conducted on these concrete demonstrated that only with temperature at least 450 ^{o}C and above can incorporate alum sludge with mortar [29]. Maha et al. recommended the percentage replacement up to 50% of of water treatment sludge to replace cement in production of paving tiles for external use. The replacement of sludge was 10% to 50% from cement by weight. All the results obtained showed breaking strength of 2.8 MPA above of the minimum breaking strength required of the standard specification [30]. Yen et al. studied the replacement of clay, lime stone, sand and iron slag by drinking water treatment plant sludge, marble sludge and basic oxygen furnace sludge

respectively, as a raw material for the production of cement in order to produce eco-cement. There is considerable replacement up to 50% of lime stone as well as other materials. Uses of three wastes sludge succeed in the consideration of benefits for conventional cement raw materials. Likewise, a considerable increase in the hydration of eco-cement paste due to the mass amount of $Ca(OH)_2$ [31].

Zamora evaluated of using drinking water treatment sludge as a supplementary cementations and sand substitute. The maximum replacement of sludge was as 90% by weight. They aimed to study the mechanical performance when using sludge of water treatment plant in USA also [32]; Rodríguez et al. investigated the reuse of drinking water treatment plant sludge as an addition for the cement industry. They found that the drinking water treatment plant sludge has a chemical composition and a particle size similar to Portland cement. The mortars that were made with 10 to 30% atomized sludge showed lower mechanical strength than the control cement and decline in slump. The results indicated that the properties of drinking water treatment in majority depend on chemical compositions that are important for its potential reuse [33].

Sahu et al. investigated the feasibility of using drinking water treatment plant residue with fly ash to prepare mortar. Testing on compressive strength of the cement mortar made by sludge from drinking water treatment plant, fly ash from the thermal power plant and cement with or without admixture was carried out. The results showed, the highest strength was 0.47 kN/mm^2 at 1% gypsum content due to the influence of gypsum on the strength of mortar. The higher strength of 2.84 kN $/mm^2$ and 2.05 kN/mm^2 was observed for hot curing and lime water curing, respectively. The lower strength was detected by decreasing the content of sludge and increasing the fly ash content [34]. Reis and Cordeiro proposed a solution for sludge generated by chemical, physical and biological steps to treat water for public supply. A solution for this sludge is used after removing its water, recycling the water removed and using the dried sludge in other activities. Possible uses as a raw material in construction sector were studied. They could be developing a natural system of dewatering. In this technology the sludge is stored in large unit which are shaped as a big bag. It is made of geotextile woven high strength polypropylene. By filling this unit and decreasing the percentage of liquid of the sludge it is considered as a natural thermal drying which may be open. This suggests possibilities for novel investigative studies with natural thermal drying. Finally, the dewatering sludge can be used [35].

Varela et al. studied the utilization of several industrial wastes to be reused in different stages of cement making. They examined wastes from a drinking water treatment plant sludge (DWTP), sewage sludge (SS) and a spent activated carbon. Both DWTP sludge and sewage can be used as a raw material in cement making. They noted that the unsuitability of atomized DWTP sludge and SS as components of blended cements has been demonstrated [36]. Haider et al. used nondestructive testing of concrete to estimate compressive strength of high performance concrete with thermally curing sludge multiple blended high performance concrete (HPC). The wastes used for HPC were AAS, silica fume (SF), ground granulated blast furnace slag (GGBF) and palm oil fuel ash (POFA). The results indicated a very positive exponential relationship between compressive strength and ultrasonic pulse velocity for binary and ternary blends of HPC mixture, with coefficient correlation (R2) equal to 0.889. Concrete quality is generally assessed by measuring its cube (or cylinder) crushing strength. Instead of expressing the strength in terms of cube strength; it is preferable to obtain a direct relation between the strength of a structural member and the pulse velocity, whenever this is possible [37].

Choa tried to produce self-consolidating light weight concrete by manufacturing light weight aggregate from municipal solid waste incinerator fly ash. The results showed that the

maximum content of municipal solid waste incinerator fly ash should be less than 30% light weight specific gravity in the range of 0.88-1.69 g/cm^3 and crushing strength as high as 13.43 MPa can be produced [38]. Thniya Kaaosol examined experimentally reuse water treatment sludge from water treatment plant as fine aggregates. 10% and 20% of water treatment sludge ratio in a mixture to make a hollow load bearing concrete block can reduce the cost and 50% of water treatment sludge ratio in mixture to make a hollow non-load bearing concrete block and also to reduce the cost. This could be a profitable disposal alternative in the future and will be of the highest value possible for the foreseeable future [39].

David indicates that when aluminum water treatment plants sludge is dried, they form essentially insoluble rocks and are inert (like gravel, though not strong / hard). With these qualities, dried aluminum sludge has been used as road fill or road grade or aggregate. Dried aluminum sludge can also be poured, and so have use for back-filling beneath fiberglass swimming pools [40]. Kazberuk discussed the incineration of the sludge from water treatment plants. He considered that incineration of sludge is not a final solution since it generates ash that must be disposal of and proposed to use the ash derived from sludge as light weight aggregate. By studying the influence on mechanical and physical properties of concrete with ash can determine the maximum acceptable replacement which was 25% of natural aggregate volume. These results confirmed the feasibility of using sludge light weight aggregate to produce light weight aggregate concrete and creating a go towards new studies to get commercial sludge [41].

Lee et al. studied on nature of particle size of dried sludge and the effects of these ultrafine particles (smaller than 3.2 μm) on concrete performance. the reasons that motivated them to find alternative for the reuse are the limited land available for sludge disposal and environmental impact to overcome the effects of too many fine of particles on workability, water demand, compressive strength and drying shrinkage. They tried to use solidification agents and they succeeded in that by choosing a suitable quantity of solidification agent. They contributed to reduce the problem associated with high water demand of sludge and also involved in the hardening process. By this way, the use of sludge in concrete mix could be considered a trend to the solution and needs more future studies [42]. Seco et al. reviewed the main available pozzolanic wastes useful as binder materials that was (fly ash, ground granulate blast-furnace slag, silica fume, rice husk, phosphogypsum, ceramic wastes and sewage sludge). The review included the most interesting construction materials created from pozzolanic waste such as bricks, blocks and masonry mortars. They aimed to improve knowledge on the application of different industrial wastes in the construction sector. This type of studies contributes in acceptance of using waste [44].

Chen et al. had undertaken the study on production of light weight aggregates (LWA) from reservoir sediments. The proposed manner of the manufacturing process which included the dredging, depositing and dewatering, air drying, crushing, graining, heating, conveying, stock piles and packing, respectively. A rotary kiln is used in making the synthetic aggregates. According to the carried out test, the reservoir sediments can be used as primary resource materials at a range of density (1.01 g/cm^3 to 1.38 g/cm^3). The produced aggregates obey the requirement of ASTM C330 with bulk density less than 880 kg/m^3 for coarse aggregates and engineering properties of concrete of structural light weight concrete [45]. Also Haung et al. proposed a way to produce light weight aggregates from water treatment sludge (WTs) which is generated during the water treatment process of chemical coagulant. They were able to get light weight aggregates that comply with ASTM C330 by laboratory experiments, including two phases. The first phase assessed the feasibility of manufacturing LWA from LWs and thermal cycle and the second phase investigated the particle density of aggregates. The engineering properties of concrete made from LWA comply with ASTM C330 [46].

Khalid et al. encouraged through the publication of a research under title of behavior of self-compacting concrete using different sludge and waste materials. They focused on review of researches on reusing of alum sludge in concrete and the feasibility of use in accordance to its chemical composition in self-compacting concrete [47]. Faris and Earn carried out an experiment on reuse alum sludge which is a by- product from drinking water treatment process for pottery manufacturing. They were able to get an ideal ratio by incorporate 85%of alum sludge with 15% silicon dioxide without any deformation during modeling under thermal curing of 110 ^{o}C and 110 ^{o}C [48].

CONCLUSION

For all studies on sludge generated from water treatment plants. It could be concluded that sludge can be used in manufacture of bricks and the result, the quantity of sludge generated will be minimise d. It must be studied the different engineering properties about water treatment sludge which depend mainly on the quality of raw water and the type of treatment chemical used in the treatment processes. The aluminum content in the sludge is high due to use of aluminum –based coagulants. Other compositions are insignificant amount. The percentage of sludge in the mixture and the temperature of the fire are the main factors that the effect on final product. On other hand, the potential reusing of alum sludge as a substitute material in construction sector can be a promising solution. Thus, there is a need to do more laboratory experiments to determine maximum percentage that could be used as substitution on construction material. This paper will also encourage the utilization of alum sludge derived from drinking water treatment plants. Finally, all researchers strive to make their works more environmentally friendly.

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NOMOGRAPH OF DIFFERENT SOIL MATRIX WITH RESPECT TO ERODIBILITY AND EROSIVITY COEFFICIENTS

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ABSTRACT

Soil erosion is a serious problem commonly happen on sloping area and inadequate vegetative cover. At construction site, soil erosion and sedimentation runoff can be worst if they are not managed and mitigated properly. Soil loss studies commonly related with soil behaviors and rainstorm characteristics. The equation that commonly used to predict the soil loss is known as Universal Soil Loss Equation (USLE). This study was carried out to achieve three objectives which were to estimate soil erodibility and rainfall erosivity coefficients with respect to the different soil matrix, to estimate the soil loss for different soil matrix on a bare plot and to establish a nomograph of different soil matrix with respect to soil erodibility and rainfall erosivity. The method of this study is carried out by laboratory works. This study has the limitations which are the soil particles only contain of sand and silt. There are nine soil matrix that have been tested on slope of 30 and 90. There are several procedures done which are sieve analysis, depth of rainfall experiments and soil loss experiments. By completing this study, the amount of soil loss have been collected using rainfall simulator equipment, rainfall erosivity coefficient have been analysed from IDF curve and calculated using the appropriate formula, length, steepness, crop management and practice erosion control factor has been analysed by the appropriate formula. The nomograph has been produced by analysing the data that have been collected through the study.

Keywords:
USLE, Nomograph, Soil Erodibility, Rainfall Erosivity

INTRODUCTION

Water and wind are the main factors that influence soil erosion. However, there are some factors for controlling soil erosion which are the erosivity of rainfall, the erodibility of soil, the slope of the land, the nature of plant cover and the land management. These factors can be estimated using Universal Soil Loss Equation, (USLE). This equation is widely used in water management and geotechnical study as it can be used to predict long time average of soil losses and runoff from specific areas in specified cropping and management systems. This study has been carried out to achieve three objectives as follows (i) to estimate the soil loss for different soil matrixes on a bare plot (ii) to estimate soil erodibility and rainfall erosivity coefficient with respect to the different soil matrixes (iii) to establish a nomograph of different soil matrixes with respect to soil erodibility and rainfall erosivity. The rainfall erosivity index and soil erodibility index is determined by rainfall simulator equipment.

LITERATURE REVIEW

USLE equation denoted as A = R x K x L x S x C x P, where; A = Annual soil loss per unit area (t / ha), R = rainfall erosivity factor (MJ cm / ha hr), K = Soil erodibility factor (t ha hr / ha MJ cm), L = Slope length factor (dimensionless), S = Slope gradient factor (dimensionless), C = Cropping management factor (dimensionless), P = Erosion control management factor (dimensionless). All these factors depend on their specific condition. Rainfall factor R is the sum of all erosion indices (EI) of single storms for a given period. Panahi (2007), mentioned that EI (MJ cm / ha hr) index for an event is the product of total storm energy, E (MJ / ha) and maximum intensity in 30 minutes, I30 (cm / hr). The equations are as follow:

$$R = E \times I_{30} \quad (1)$$

$$E = 916 + 331\log_{10} I \quad (2)$$

Where, R = Rainfall Erosivity Factor (MJ cm / ha hr), E = Kinetic Energy of Rainfall (ft tonne / acre), I = Rainfall Intensity (inch / hr). IDF curve can be used to derive rainfall intensities. Soil erodibility is a measure of a soil's inherent susceptibility to erosive forces, and is a function of aggregate stability which is generally determined by properties such as clay content, Fe and Al Oxides, and organic C that serve as cementing agents which bind individual soil particles into water stable structural units. Soil erodibility can be determined by several approaches but the commonly used are in situ erosion plot, simulated rainstorm and using regression equations. In this study researcher focused on simulated rainstorm to get the soil erodibility value. K value is calculated using Equation 3.

$$K = \frac{A}{R \times L \times S \times C \times P} \quad (3)$$

Where: K = Soil erodibility coefficients (t ha hr / ha MJ cm), A = Amount of soil loss (t / ha), R = Rainfall erosivity coefficients (MJ cm / ha hr), L = Length factor (dimensionless), S = Slope factor (dimensionless), C = Cropping management factor (dimensionless), P = Practice erosion control management factor (dimensionless). Slope length and steepness factor, LS is an estimate of the soil loss factor from a field slope, based on research from a unit plot as defined previously. It can be determined using Equation 4.

$$LS = \left(\frac{\lambda}{72.6}\right)^{m} (65.41\sin^2\theta + 4.56\sin\theta + 0.065) \quad (4)$$

Where: λ = Slope length in feet, m = 0.2 for gradients < 1%, 0.3 for 1 to 3% slopes, 0.4 for 3.5 to 4.5 % slopes, 0.5 for $\geq$ 5 % slopes, θ = Angle of slope. Cropping management factor, C in USLE estimates the reduction of soil loss from land cropped under specified vegetative, residue, and management conditions as compared to clean tilled, continuous fallow conditions. For bare plot or land surface without any vegetative cover can be considered as 1.0.

METHODOLOGY OF STUDY

The sample was taken from quarry site and the sizes of sand ranges in between 2.0 mm to 0.15 mm while the size of silt ranges in between 0.1 mm to 0.075 mm. These types of soil were found under cohesiveless categories. The sand and silt then was mixed in a given ratio to produce various matrixes of soils. Total samples produced are 18 samples containing of different percentage of silt and sand. The samples then will run on 3^o of slope and 9^o of slope. All this samples were run for sieve analysis experiments and moisture contains experiments to get the properties of each samples. The simulated rainfall presented rainfall intensities, rain drop diameters distribution and kinetic energy. Before begin the work, it is important to make sure that values used in measurement remain at standard point to get more accurate result. This can be done by calibrating rainfall simulator. The two model plot with dimension 0.6 m width x 2.17 m length and 0.1m height. The model plot is placed under the rain nozzles. Filters with sizes of 0.3 mm and 0.063 mm were provided at the outlet pipe to entrapped sediments. A collective structure is placed at the end of the slope to gather runoff.

DATA ANALYSIS AND RESULT

The properties of samples have been carried out as in the Table 1.

Table 1: Soil Samples Characteristics

Sample (slope = 3^o)	Sample (slope = 9^o)	Mixed Ratio (Sand:Silt)	Type of Soil
A	P	90:10	Well Graded Sand (SW)
B	Q	80:20	Well Graded Sand (SW)
C	R	70:30	Well Graded Sand (SW)
D	S	60:40	Well Graded Silty Sand (SWM)
E	T	50:50	Well Graded Silty Sand (SWM)
F	U	40:60	Well Graded Silty Sand (SWM)
G	V	30:70	Poor Graded Silty Sand (SPM)
H	W	20:80	Poor Graded Silty Sand (SPM)
I	X	10:90	Poor Graded Silty Sand (SPM)

Rainfall erodibility has been carried out by producing Intensity-Duration-Frequency (IDF) curve for the rainfall simulator as shown in Figure 1. I_{30} = 0.0018 inch / hr getting from the IDF curve. By using Equation 1 and 2, R is determined as 2.260 MJ cm/ha hr. Table 2 shows the amount of soil loss collecting from the outlet of rainfall simulator. Soil erodibility factor has been determined by using Equation 3. LS factor has been determined by Equation 4.

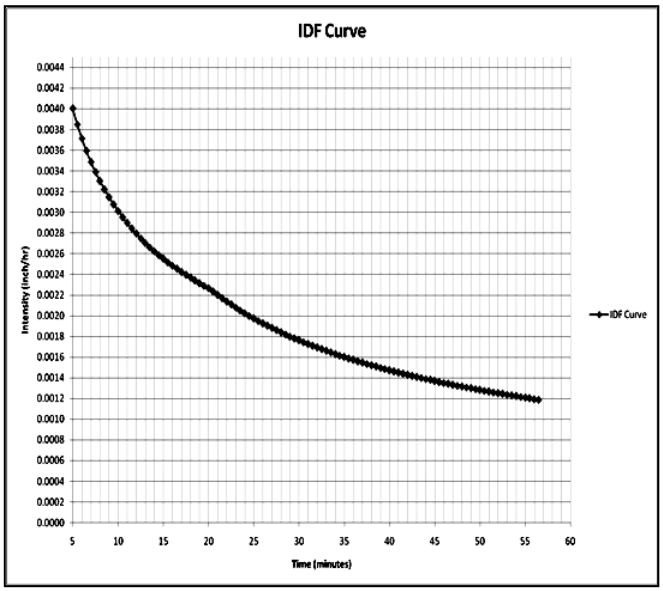

Figure 1: Intensity-Duration-Frequency Curve

Table 2: Amount of Soil Loss

Sample (slope = 3º)	Amount of dry soil loss (t/ha)	Soil Erodibility Factor, K (t ha hr / ha MJ cm)	Sample (slope = 9º)	Amount of dry soil loss (t/ha)	Soil Erodibility Factor, K (t ha hr / ha MJ cm)
A	0.00046	0.00084	P	0.13881	0.08245
B	0.00251	0.00461	Q	0.40518	0.24065
C	0.00266	0.00489	R	0.50396	0.29932
D	0.00764	0.01397	S	0.54863	0.32585
E	0.03135	0.05757	T	0.88196	0.52382
F	0.04178	0.07671	U	1.34894	0.80117
G	0.05616	0.10312	V	1.94521	1.15532
H	0.08349	0.15328	W	2.77055	1.64551
I	0.10586	0.19436	X	4.07413	2.41975

Note: R = 2.260 MJ cm / ha hr, LS (3º) = 0.241, LS (9º) = 0.745, CP = 1.0

Nomograph is a chart representing numerical relationship. It consists of three coplanar curves, each graduated for a different variable so that a straight line cutting all three curves intersects the related values of each variables. Figure 2 is the established nomograph of different soil matrix with respect to soil erodibility and rainfall erosivity coefficients.

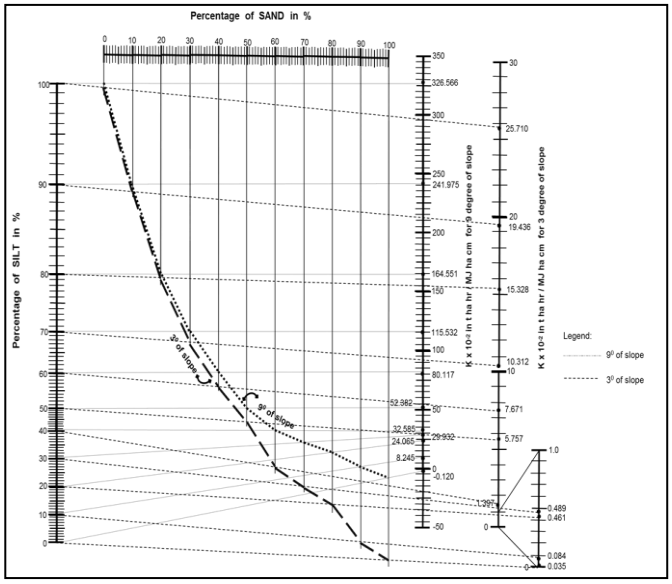

Figure 2: Nomograph of Different Soil Matrix with Respect to Soil Erodibility and Rainfall Erosivity Coefficients

CONCLUSION AND RECOMMENDATION

The conclusion of this study can be summarized as follow. Soil erodibility coefficients are increased as percentage of finer soil in the mixed. The energy of rainfall that hit on bare soil is sufficient to detach and move the soil particles in a short distance. The more of finer soil, the more of soil detach and move from the origins. The amount of collected soil loss shows that when the finer particles are more in the mixed of soil, it also increase the amount of soil loss. The slope angle also shows the same criteria which is when the angle of slope increase, the amount of soil loss also increases. The nomograph of different soil matrixes with respect to soil erodibility and rainfall erosivity coefficients is produced. The data was obtained from the study and the value of soil erodibility can be read directly from the nomograph. The nomograph is only applicable for rainfall intensity, I_{30} = 0.0018 inch / hr.

There are several recommendations for improvement in soil loss study which are as follow (i) to focus on soil loss factor for different rainfall intensity because the impact of rainfall also important in producing the amount of soil loss, (ii) to do research on soil loss factor with adding clay ratio instead of silt and sand, (iii) to study on the pattern of soil surface after hitting by rainfall.

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EVALUATING RISKS IN CONSTRUCTION PROJECTS BASED ON INTERNATIONAL RISK MANAGEMENT STANDARD AS/NZS ISO 31000:2009

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ABSTRACT

Risk management nowadays has significant important role in ensuring the project implemented successfully, so it is extremely necessary process during undertaking project. In the case of construction projects, they are risky venture, in which implementing risk management framework to mitigate uncertainties and unexpected situations has been received great care recently by most construction companies. There are variety tools and techniques used for managing risks but among them the international risk management standard AS/NZS ISO 3100:2009 is seen as the most feasible framework which can be applied to all kinds of organisations regardless differences related to size, industries and products. This paper aims to introduce AS/NZS ISO 3100:2009 through illustrating identification, analysis and evaluation risks for Hanoi Urban Railway Construction Project, Line 1 (HURC-1) in Vietnam as a case study. Based on qualitative and quantitative method, there are eight events including scope changes, selecting contractors that do not have appropriate skills and experiences to carry out their work, uncertainties concerning the data, applying new technology which has not been sufficiently tested, difficulties in integration vendors, financial problems, government policy changes, the bad weather and political problems. These events are considered as high risk level which required involving parties have appropriate and particular plans to minimizing negative impacts caused by them during project period.

Keywords:
Risk Analysis, Risk Evaluation, AS/NZS ISO 3100:2009, Risk Management, Hanoi Urban Railway Construction Project

INTRODUCTION

Many organisations with their own projects of all types and sizes have faced uncertain events which have an influence on their objectives, which entail risk. Especially, in the case of construction projects with their own unique characteristics, there are a large number of complex and diverse risks **(**Zhao, Hwang & Low 2013), which requires project teams to continuously improve their capacities for identifying, analysing, evaluating and treating risks effectively in order to minimise negative impacts caused by risks on project objectives.

It is the fact that a number of studies related to project risk management in the construction area are conducted in developed countries in which risk management is widely used in most organisations and projects, while some developing countries including Vietnam, risk management is still in infancy stage and lacks of implementation frameworks (Ling 2012). In the case of Vietnam, recently, risk management process has not been concerned by

authorized people and it is seen a complementary aspect of project management areas. This leads to the fact that project team lacks overview picture relating to using appropriate tools and techniques for managing risk, especially in the case of construction projects in which uncertain events can cause huge negative impacts on the project success such as delaying schedule, over budget, out of scope and unsatisfied quality.

Therefore, the paper aims to expand existing literature to establish risk management framework for Vietnamese construction projects by introducing a risk management process based on AS/NZS ISO 3100:2009 - a Joint Australian/New Zealand Standard prepared by Joint Technical Committee OB-007 including seven steps which are context establishment, risk identification, risk analysis, risk evaluation, risk treatment, communication & consultation and monitoring & review. This paper, therefore, is significant as a guide for Vietnamese construction project in risk management.

Moreover, through identifying, analysing and evaluating some critical risks which often happen in the technical, economic, commercial, organisational and political aspects of the construction projects, the paper intends to analyse the Hanoi Urban Railway Construction Project, Line 1 (HURC-1) as a case study. Based on the project's information provided, both the quantitative and qualitative methods will be applied in risk management process. As a result, some suggestions will be presented to manage risks effectively in Vietnamese construction projects.

The objectives of this paper are introducing the principles of International Risk Management Standard **AS/NZS ISO 31000: 2009**, outlining the framework for risk management process based on this standard, defining, analysing and evaluating general risks occurring during implementing the construction project as an example and providing several recommendations that organisations must pay more attention before designing and implementing the risk management framework.

BACKGROUND

According to Rosa (1988), risk is defined as an event where the outcome is uncertain. Another new risk definition that "risk refers to uncertainty about severity of the evens on consequences (or outcomes) of an activity with respect to something that human value (Aven & O 2010). Adrian, R, Malcolm, R & Julia, H (2001) states that risk management is a group process referring to the architecture including principles, framework and process so as to manage risk effectively.

AS/NZS ISO 31000: 2009

ISO 31000 is a standard involving risk management created by the International Organisation for Standardization. ISO 3100:2009 is one of the members in the ISO 31000 family; its purpose is to provide principles, framework and the process for risk management to practitioners and organisations regardless of size, major or activities. AS/NZS ISO 31000-2009 Risk Management – Principles and Guidelines replaces AS/NZS 4360-2004 revised in 2004 by the Joint Australian/New Zealand Committee OB-007 and became revision in 2009, which is seen as the top level executives and others responsible for managing an organisation's risks and achieving objectives.

This standard can be applied to manage risks happening throughout the project life from the beginning to ending with seven process including communication, establish the context,

identification, analysis, valuation, treatment and monitoring & review, which are illustrated below.

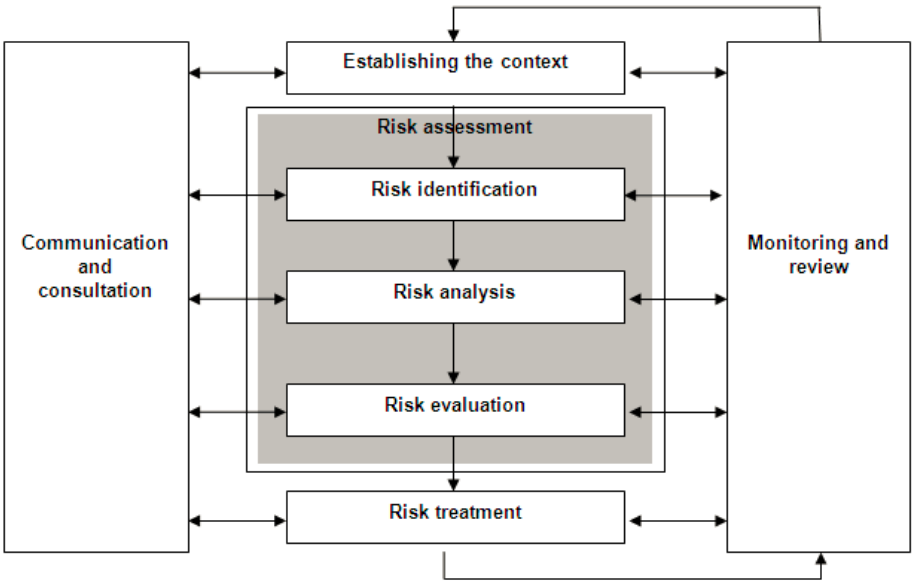

Figure 1: The Risk Management Process
(Adopted from AS/NZ/ISO 31000:2009)

Establish the Context

Establishing the context for risk management seems to be critical due to the reason that this process will identify the objectives, set up scope for the risk assessment process. This process is going to analyse the current risk level of the company by answering the Inherent risk assessment questions as well as discover the internal and external environment by using SWOT matrix to know which are the strengths, the weaknesses, opportunities and threats impacting on the company activities. To be more clear, to establish the internal context for the risk management process, the company should concern some issues relating to the organisation's culture, processes, structure and strategy impacting on the particular way used to manage risk. Regarding external environment, it is very important aspect needed to have deep understanding because it can provides information relating to identify who are stakeholders and what do they expect, which tends to be the objectives of the risk management process. The external context may include analysis involving the social and cultural, political, legal, regulatory, financial, technological and economic issue surrounding the company.

Risk Identification

Risk identification is very important when providing the comprehensive list of risks which probability takes place in all activities during the project period. In this stage, the organisation

tends to identify the risks by creating scenarios happening in different circumstances. They will then discover the causes of risks as well as the potential consequences impacting on the project whether the causes are under organisation control or not. In order to identify risks comprehensively, the organisation should assign the staff who have appropriate knowledge involved in identifying risk and use suitable tools and techniques such as brainstorming, interviews, questionnaires, workshops, feedback, and so on.

Risk Analysis

Risk analysis is a process aiming to identify the causes and sources of risks based on the risk identification. Risk analysis involves discovering the likelihood of the risks as well as multiple consequences impacting on the project objective.

The risk management team can use the qualitative, quantitative or combining of these approaches to analyse risk effectively, which are illustrated in the explanation of qualitative and quantitative assessment (Mike 2013).

Risk Evaluation

After using qualitative and quantitative approach to analyse risk criteria, the project risk management team will calculate the sum up of risk and then define the variances of the objective in comparison with accepted target to identify which risks needed to be considered.

Risk Treatment

The aim of this activity is reducing the likelihood and improving the consequences, which can create positive outcomes for the project activities. After identifying the risks that need to be taken into account, the manager will define options for risk treatment including avoid, accept, reduce or transfer after evaluating the strengths and weaknesses of each option based on the existing resources of the organisation including humans, materials, equipment, management ability and so on. Next, the project team will establish risk treatment plans to provide information about who have responsibilities to treat risks, what they need to do as well as when they will finish.

METHODOLOGY

In order to manage risks effectively, both qualitative and quantitative approach are used.

Quantitative Assessment

Quantitative risk assessment can be applied across whole project period from the starting to the ending point, by identifying the likelihood and potential consequences based on the judgments method using the historical data and other variables combined with expert experience to calculate an estimate for activity parameters.

There are three steps needed to be carried out to assess the risks.

The first step: deciding objectives, KPI's (key performance indexes) /measures, designed target, worst-tolerated outcomes, tolerance value for each component.

The second step: Identify the risk and analyse in term of likelihood, impact and risk level. In other words, the risk management team will estimate the likelihood of each objective together with consequences impacting on the project and then calculate the risk level by multiplying likelihood and consequences.

Risk Level = Likelihood x consequences

The third step: Calculate the risk exposure for every objective such as cost, time, operation capacity and so on by summing up the risk level for each objective.
The fourth step: Make the comparison between the risk exposure of each objective and its tolerance to identify which objectives are under greatest threat or not acceptable (for the case of objectives that their risk level is higher than tolerance).

Qualitative Assessment

Quality risk assessment technique is a form of using words or descriptive scales to identify the likelihood and potential consequences of risk in each activity during the project period. The likelihood and consequences are usually presented as a risk matrix.
The first step is that the scales of likelihood are ranked as a list such as rare, unlikely, possible, likely, almost certain.

The second step is regarding consequences, these rates are listed as insignificant, minor, moderate, major and catastrophic.

The third step is that the project risks management team will then calculate the risk level by combining the likelihood and consequence of each event which shown in the Heat Matrix and recognize the Acceptance Line.

Based on the position of the activity in the Risk level matrix, the project risk management team will identify risks which display high or extreme risk level before analysing and treating risks

Table 1: Likelihood (Adopted from AS/NZS 4360)

Scale	Description	Range
Almost certain	This situation expected to occur in most circumstances	>75%
Likely	This situation is likely to occur in most circumstances	60-75%
Moderate	This situation can occur in moderate	40-60%
Unlikely	This situation can occur in sometime	20-40%
Rare	This situation can rarely	<20%

	occur in sometime	

Table 2: Consequence Scale
(Adopted from AS/NZ/ISO 31000:2009)

Rating	**Consequence Description**
Insignificant	Impact can be easily absorbed without requiring management effort
Minor	Impact can be readily absorbed but some management effort is required
Moderate	Impact cannot be managed under normal operating conditions; requiring moderate level of resource and management input
High	Impact requires a high level of management attention / effort and resources to rectify
Extreme	Disaster with potential to lead to business collapse and requiring almost total management attention / effort to rectify

Table 3: Risk Matrix (Adopted from AS/NZ/ISO 31000:2009)

Likelihood	Impact				
	I[1]	L[2]	M[3]	H[4]	E[5]
Almost certain	H	H	E	E	E
Likely	M	H	H	E	E
Moderate	L	M	H	E	E
Unlikely	L	L	M	H	E
Rare	L	L	M	H	H

CASE STUDY

The case study in this research paper is Hanoi Urban Railway Construction Project, Line 1 (HURC-1), phase 1. The project owner is Corporation of Vietnam Railways. The Management Board of the rail project (RPMU) plays the role as representing Investors. The project has been going through seven districts of Thanh Tri, Hoang Mai, Thanh Xuan, Dong Da, Hoan Kiem, Ba Dinh and Long Bien. The elevated railway line, 15.36 km of total length, will run south-north

[1] I: Insignificant
[2] L: Low
[3] M: Moderate
[4] H: High
[5] E: Extreme

from Giap Bat to Gia Lam together with Ngoc Hoi station, including many elevated stations, viaducts, depots, and the Red River Railway bridge, which have constructed during 114 months from July 2008 to December 2017 within the estimated budget up to VND 19,553 billion (Hanoi Metropolitan Rail Transport Project Board (HRB) (Board 2011).

This project aims to respond to the increasing demands for transport, making the traffic in Hanoi smoother and alleviating the atmospheric pollution, thus contributing to urban development and environment improvement. This will be achieved through the construction of the urban railway from Gia Lam and Giap Bat Stations (approximately 11 km) and around Ngoc Hoi Station (approximately 4 km), through Hanoi Station (Board 2011).

The entire project is being carried out by Hanoi Metropolitan Rail Transport Project Board (HRB), formerly known as the Hanoi Authority for Tram and Public Transport Development Management (HATD).

Within the research scope, our team will concentrate on risk definition, risk analysis and evaluation process as examples of applying the framework from AS/NZS ISO 31000:2009 Risk identification.

According to Wang, Dulaimi and Aguria (2004), there are numerous ways for categorizing risks occurring during construction projects. For example, some risks are defined based on external risks and internal risks whereas others are categorized in more detail level such as political, financial and market social risks. In the case of Railway construction project in Vietnam, we prefer to identify risks following external and internal categorization.

There are variety of internal risks being identified, based on research of Munier (2014). He also states that high-technology industries such as construction, energy and so on seem to face the same challenges related to uncertainty, complexity and potential risks. Based on this, potential risks relating to technical and organisational elements are chosen to illustrate applying ISO 31000:2009 into this project.

Table 4: Risk Scenarios

Risk ID	Risk scenarios
Internal risks	
1.1	The scope of the project is not very well defined, which lead to scope changes when implementing the project
1.2	The selected contractors do not have appropriate skills and experiences to carry out their work
1.3	There are uncertainties concerning the data; unreliable data related to geographical survey are collected
1.4	Applying new technology which has not been sufficiently tested
1.5	There are many vendors coming from other countries, creating difficulties in integration among them
1.6	The contractors and consultant do not have the adequate structure for the project
1.7	Financial problems related to documented delays by the sponsors
1.8	Relationship among owners and contractors/consultants is considered problematic
1.9	The project jobsite is in an isolated area, which will complicate logistics and personnel movement
1.10	There are some changes related to sending human resources

External risks	
2.1	Government policy changes impacting on the project such as inflation, salaries, negotiation with foreign governments supporting financial resources
2.2	The bad weather which can delay or stop the working process
2.3	Supplier and vendor delays
2.4	Inflation in both the countries including Vietnam and foreign countries supporting ODA
2.5	Political problems or factions fighting on the jobsite
2.6	Religion and culture beliefs in region where the project takes place
2.7	Differing site conditions

Risk Analysis

Risk analysis involves discovering the likelihood of the risks and multiple consequences impacting on the project objectives for both qualitative and quantitative method. Regarding qualitative method, based on professional views in metro construction projects, the risk level of each risk scenario will be defined, following particular steps mentioned in the methodology.

In terms of quantitative method, the impacts of each risk scenario on the project budget, duration and operating capacity will be measured by numeric data.

Table 5: Risk Objectives Adopted by Board (2011)

Objectives	**Type 1**	
KPI's	**Cost**	**Duration**
	VND Billions	Months
Designed target	19,553	114
Tolerance value	5,866	34.2
Worst acceptable target	25,419	148.2

The detail result of risk analysis used both quantitative and qualitative method showed in the Risk Register.

Risk Evaluation

Qualitative Method

After analysing all risk scenarios, the risk management team has concrete evidence to recognize high risk scenarios needed to be pay more concentration, which extracted from Risk register.

Table 6: High Risk Level Events

Risk ID	Risk scenarios	Risk Level
1.1	The scope of the project is not very well defined, which lead to scope changes when implementing the project	H
1.2	The selected contractors do not have appropriate skills and experiences to carry out their work	E
1.3	There are uncertainties concerning the data; unreliable data related to geographical survey are collected	H
1.4	Applying new technology which has not been familiar and sufficiently tested	H
1.5	There are many vendors coming from other countries, creating difficulties in integration among them	H
1.7	Financial problems related to documented delays by the sponsors	H
2.1	Government policy changes impacting on the project such as inflation, salaries, negotiation with foreign governments supporting financial resources	H
2.2	The bad weather which can delay or stop the working process	H

Quantitative Method

(1) Calculating the risk exposure for each objective including cost, time and operation capacity by summing up the risk level for each objective from the Risk register.

(2) Making the comparison between the risk exposure of each KPI and its tolerance to identify whether objectives are under greatest threat or not.

Table 7: The Risk Variance

KPI's	**Behind Schedule** (Months)	**Over Budget** (VND Billion)
Tolerance	34.2	5,866
Total risk level	32.376	4,096
Variance	95%	70%

RESEARCH DISCUSSION

After following the three stages consisting of identifying, analysing and evaluating risks, based on AS/NZS ISO 31000:2009 framework, the team members can have an overview relating to the project risk status. Particularly, identified risks can make the project over the budget up to 4,096 Billion VND and 32 months late in comparison with the established plan. Based on the Risk register summary and following table about the likelihood and consequences of risks, it is clear that conducting the Hanoi Urban Railway Construction Project, Line 1 (HURC-1) has faced extreme level of risks regarding duration and high risk level in terms of budget.

Table 8: The Level of Risk

KPI	**Likelihood**	**Consequences**	
		Duration (Months)	**Cost (VND Million)**
Tolerance value		34.2	5,838.0
E-Extreme	>75%	> 25.65	> 4,399.4
H-High	60-75%	20.52 - 25.65	4,399.4 - 3,519.5
M-Medium	40-60%	13.68 -20.52	3.502.8 -2,335.2
L-Low	20-40%	6.84 -13.68	3.502.8 -2,346.4
I-Insignificant	<20%	<6.84	<1,173.2

By focusing on some risk scenario examples in terms of internal and external aspects, there are eight potential events with abilities to create the project's failure due to high level of risks, through qualitative and quantitative analyse.

The first high risk event relates changes when the scope of the project is not very well defined. This metro system has not been built in Vietnam previously, so there is lack of required skills for development and implementation. This can create a number of mistakes when defining scope of the project. Therefore, changes of scope such as emergence of new task, design changes, new technology equipment replaced and so on during implementing the project can lead to the project failure. Particularly, with the 10% of happening probability, this event can lead to 2 months behind schedule and 2,933 billion over budget.

The second high risk event is that selected contractors do not have appropriate skills and experiences to carry out their work. Besides Japanese consultant organisations, Korean companies including Dealim, Posco E & C and Vietnamese construction company – Hancorp

are contractors of the project. It is possible that some of contractors do not have enough capacities to finish their work, negatively influenced on the project quality, scope, time and cost. As a results from the risk register, the probability of this event is unlikely or 20%, creating nearly 6 months late and 977 billion cost over runs.

There are several uncertainties concerning the data; unreliable data related to geographical survey collected. It is the fact that the soil and ground in which the project takes place exist a numerous of risks causing schedule delays, cost increase and dangerous working condition or invalidate designs (Munier 2014). Therefore, if the assessment of site surface is not accurate enough, unexpected situations may occur and have significantly negative impacts on the project objectives. Through quantitative analysis, if this event occurs during carrying this project, the project schedule will extent more than 11 months and extra 1,564 million will be required to finish the project. The next uncertainty comes from applying new technology which has not been familiar and sufficiently tested. Particular, Dr Hosomi (2012) asserts that the latest technology will be used to build up this project while Vietnam is building such kind of systems for the first time. This can lead to high level of risks during implementing project period. In this case, even though the probability is unlikely with 15% of likelihood, if this situation occurs, it will create significantly negative impacts on the project duration and budget. To be more specific, nearly 23 months behind schedule and 1,759.8 million required are seen as the consequences caused by risks.

There are many vendors coming from other countries, creating difficulties in integration among them. Based on announcement of JICA Vietnam Office, several Japanese organisations have participated in carrying the projects as a roles of consulting engineering services such as Association of Japan Transportation Consultants, Inc.; Japan Railway Technical Service; JR East Consultants Company; Japan Electrical Consulting Co. Ltd; Koken Architects, Inc; Transport Investment and Construction Consultants, Jsc.; Transport Engineering Design Inc. and Transport Engineering Design Inc. South, JSC. Moreover, some companies coming from Germany (DOSRCH), Korea and Vietnam also work together in this project. Due to difficulties related to language, communication, techniques as well as experience and skills of each vendor, the integration among them sometimes create problems. The extraction from risk register illustrates that with 30% of likelihood, problems related to vendor integration can lead to closely 6 months late and 586,59 billion needed to expend.

Financial problems related to documented delays by the sponsors. According to research of Global Mass Transit (Hanoi Metro: Vietnam's first metro rail project on track 2013), JICA Vietnam Office and Vietnamese transportation ministry report, the Hanoi Urban Railway Construction Project, Line 1 (HURC-1) is financed by the ODA loan from Japan International Cooperation Agency. It means that required budget for carrying out the project significantly depends on budget allocation plan from the Japan International Co-operation Agency (JICA), which may lead to time delays to finish the project. It is clear from the Risk register that this event can make the project over budget more than 977.65 and behind schedule up to 11 months. Government policy changes impact on the project such as inflation, salaries, negotiation with foreign governments supporting financial resources. The project has been supported by Japanese government with an ODA loan up to JPY 106,053 million. This can make the project duration extend up to 17 months and the project cost requires more than 1,759.8 billion.

The bad weather can delay or stop the working process. It is the fact that the north of Vietnam has 4 different seasons per year, in which raining season will be from May to end of July, so heavy rain and flood can lead to schedule delay and the increasing of cost. During that moment, project cannot be carried out continuously, leading to more than 9 months behind planned duration and economic loss up to 977 million.

From these results, appropriate suggestions and particular strategies must be created to treat risks proactively as well as monitor and review the risk management process effectively so as to minimise the negative influences generated by identified risks on the project outcomes.

CONCLUSION AND RECOMMENDATION

By introducing AS/NZ/ISO 31000:2009, this paper is significant as a guide for Vietnamese Construction projects in risk management. It provides framework and principles for managing risks, which helps project team and involving people have background knowledge and increase awareness related to how to manage risk by using effective tools and techniques. The risk identification, analysis and evaluation based on AS/NZ/ISO 31000:2009 for the case of the Hanoi Urban Railway Construction Project, Line 1 (HURC-1), phase 1- Ngoc Hoi are illustrated as a case study. However, this research paper also have some limitations regarding providing the project information, collecting data, generating risk scenarios related to the Hanoi Urban Railway Construction Project, Line 1 (HURC-1). Nevertheless, these general materials may be seen as basic background knowledge for further research and application in terms of risk management in developing context including Vietnamese projects and organisations.

There are several recommendations to be concerned when implementing the risk management framework. Firstly, before starting the design and implementation of the frame work for managing risk, it is extremely important to evaluate and understand both the external and internal context of the organisation and the carried project (Adrian, R, Malcolm & Julia 2001). Secondly, organisations should clearly state the organisation's objectives and commitment for risk management. They should ensure that there is accountability, authority and appropriate competence for managing risk. Thirdly, risk management should be integrated with all the organisation's practices and processes in the way that it is relevant, effective and efficient. Fourthly, the organisation must allocate appropriate resources for managing risks, which may include some considerations such as people, skills, experience, training programs, methods & tools used to manage risk.

Furthermore, in order to ensure the results of activities are accurate and reliable; several activities must be carried out. First, workshops or meetings celebrated to generate potential risk scenarios should be taken part in by experts coming from different areas to guarantee that all aspects of the project relating to technical, economic, organisational and political are discussed. Additionally, several valuable methods and techniques such as Expert Judgement methods which are based on the expert experience and historical data collected from previous projects or events to evaluated risk likelihood and consequences efficiently; Monte-Carlo simulation which is seen as the quantitative model to provide a variety of possible outcomes which may occur for any given scenarios should be used to make the risk analysis and evaluation activities become more reliable.

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RUMOUR PROPAGATION ON TWITTER: A CASE OF MALAYSIAN CRITICAL NATIONAL INFORMATION INFRASTRUCTURE (CNII) ORGANISATIONS

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ABSTRACT

There are many rumours that have been spread on Twitter during a time of crisis and mass convergence events in Malaysia. Malicious rumours can affect national economy, politic and social impacts which can lead to possible threats especially to the Malaysian Critical National Information Infrastructure (CNII) organisations. Therefore, this paper takes several case studies that were reported in Malaysian news sources and relates them to the national economy, politic and social impacts later highlight the possible threats to CNII organisations. As a result, the findings of this paper can help to raise awareness on malicious rumours attack among the scholars and the CNII stakeholders.

Keywords:

Social Media, Rumour, Twitter, Critical National Information Infrastructure (CNII)

INTRODUCTION

Lately, the spread of rumours on social media sites, particularly Twitter are becoming more common in Malaysia. The increasing of internet penetration and the highly trusted on the online information was seen as one of contributing factors to more widespread of rumours [4]. With 140 characters long text-based messages in Twitter, known as tweets, users can stay close to everything they care with simpler and faster way to communicate with each other [18]. It has also been used as a tool of communications during the emergency and mass convergence events [5, 7].

Several cases of the spreading of malicious rumours on CNII organisations in Malaysia through Twitter, have been identified over the last few years. In the Malaysian context, CNII sectors are national defence and security, banking and finance, information and communications, energy, transportation, water, health services, government, emergency services, food and agriculture [3]. CNII assets in real and virtual form should be protected as their incapacity or destruction assets would have a devastating impact on national economic strength, image, defence and security, government capability to functions and public health and safety [14]. Therefore, this paper reviews three case studies on rumours that spread on the Twitter which can lead to a crucial impact on the national economy, politic and social and its threat to the CNII organisations.

We have proposed a conceptual framework (Figure 1) to assist us in reviewing the propagation of rumours on CNII organisations in Malaysia through Twitter and its implications. First, we reviewed newspaper articles which report the rumours propagation on Twitter and monitor the trending topics on Twitter based on the articles report. An analysis performed to determine implications from the rumours that has been propagated on Twitter so the potential threat and affected CNII organisations can be drawn.

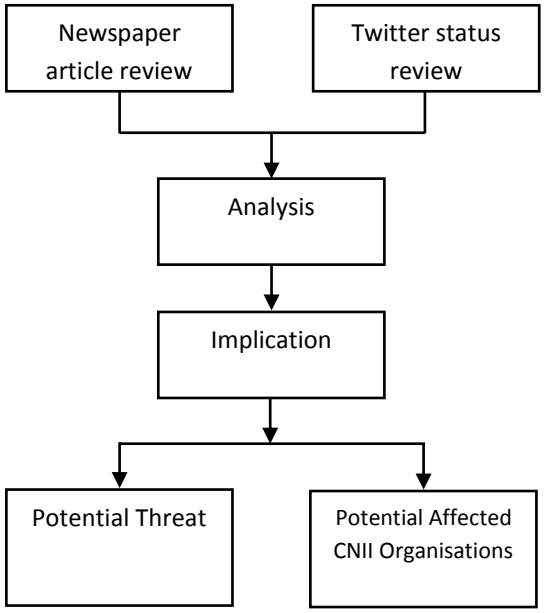

Figure 1: Conceptual Framework for Reviewing the Propagation of Rumour on CNII Organisations in Malaysia through Twitter and Its Implications

THREE CASE STUDIES

Since the advent of Twitter, the network of Twitter makes the dissemination of the information faster to large mass of people [7, 13]. There were few cases reported regards to the rumours circulated on Twitter that can be seen as threats to the CNII organisations.

In this paper, three incidents of rumours are selected as the case studies such as Sabah invasion, phantom voters during the general election and racial clashes in Sungai Petani, Kedah. The following excerpts drawn from various Malaysian news sources highlight the concerns within the CNII sectors that were affected by the spreading of rumours on Twitter:

A. Sabah Invasion by Sulu Terrorist

In March 2013, a rumour circulating in the social media and via short messaging services (SMS) that 700 more Sulu militants would enter Sabah through Kota Kinabalu and Tawau to create havoc was reported during the Lahad Datu intrusion [15].

B. Bangladeshi Phantom Voters during 13th General Election

During the 13th general elections, rumours have been circulated on social media by the opposition pact that 40,000 Bangladeshis had came to Malaysia within a week to vote [10].

C. Racial Clashes in Sungai Petani

Rumours on racial clashes involving killings or burning of houses of worship in Sungai Petani had been circulated through postings on Facebook and Twitter by the police on December 2012. Another rumours circulated that an emergency had been declared due to the racial clashes [8].

The next section explains the impact of the three above mentioned cases in term of its implications to Malaysia.

IMPLICATIONS

Our initial review found that the rumours spread on Twitter have implications to the social, economic and political, directly and indirectly. The following subsections will explain these implications based on the rumours that have been selected in the previous section.

A. Social Impact

The rumours highlight that another 700 more Sulu militants would be entering Sabah through Kota Kinabalu and Tawau have inflamed tensions and panic among the public. It will also cause anxiety among the people especially in Sabah. In addition, local people who are not from Sulu origin will have a wrong perception on Sabahan Sulu which may lead to racial discrimination and xenophobia.

On the spreading claims of phantom voters from Bangladeshi, the rumours have created ‘foreigner phobia’ to the community and some voters from the opposition pact took on vigilante roles to "monitor" polling centres and checking people's identity cards at polling centres [16]. A bus of 54 foreigners consisting of Myanmar, Nepal and Bangladesh nationals factory workers who were returning home from a trip into town on their day off pelted with rocks and all windows were smashed by a group of political supporters. Some of them were beaten while trying to escape. There are few cases that were reported relates to the harassed of voters. In Rawang Selangor, a Malaysian citizen who looks like foreigner has been confronted and beaten while trying to cast a vote [17].

B. Economy Impact

The rumours on the Sabah security situation had caused the decline in tourist arrivals in the state [2] and many warehouses and shops reported have run out of stocks due to the panic buying of essential items [9]. Until mid of May 2013, most of the foreign countries still issued the travel warnings regarding the situation in Malaysia [19]. Consequently, the travel warning can influence the confidence among international tourist on Malaysia particularly Sabah.

C. Political Impact

Up to this moment, the rumours on Sabah invasion by the Sulu terrorist and Sungai Petani racial clashes have not given any significant impact on political matters. However, the rumours of 40,000 Bangladeshis had been flown into Malaysia for voting in the 13th general election (GE13) can be a threat to the relationship between Malaysia and Bangladesh. The rumour can lead to a serious case of xenophobia and put Bangladeshi workers at a greater risk of abuse by the locals. The Bangladeshi High Commissioner to Malaysia mentioned that portraying

Bangladeshis as phantom voters may cause their citizens in Malaysia feel insecure as well as giving Bangladesh a negative image [10].

In the next section, this paper will discuss on how these impacts can lead to potential threats to CNII organisations in Malaysia.

THREATS TO THE MALAYSIAN CNII

Although the malicious rumours that have been spread on Twitter not only give incorrect allegation to the nation's social, economy and politic in general, the rumours also pose threats to the CNII organisations. For instance, the potential threats from rumours are panic, racial tension, investor confidence, xenophobia and foreign relation. As a result, these threats would give crucial impacts to the Malaysia's image, economy and the government capability to functions. Finally, we have summarized the potential threats to the potential CNII organisations which is illustrated on Table 1.

Table 1: The Summary of Potential Threats to the Potential Affected CNII Organisations

Rumour	Potential Threat	Potential Affected CNII Organisations
Sabah Invasion by Sulu terrorist	Panic buying, investor confidence, tourist confidence	Malaysian Government, Royal Malaysian Police, Malaysian Armed Forces, Ministry of Home Affairs
Racial Clashes in Sungai Petani	Racial tensions, racial discrimination, panic buying, xenophobia	Malaysian Government, Ministry of Home Affairs, Royal Malaysian Police
Bangladeshi Phantom Voters during 13th General Election	Racial tensions, foreigner phobia, foreign relation, xenophobia	Malaysian Government, Election Commission (EC), Royal Malaysian Police, Ministry of Foreign Affairs, Ministry of Home Affairs

The potential threats and affected CNII organisations has been extracted by reviewing news articles from various sources. As a result, a list of potential threats and organisations has been identified. A list of affected organisations subsequently revised with a list of organisations that have been defined by CyberSecurity Malaysia, agency responsible for the protection of CNII in Malaysia as a CNII Organisation.

This study is the first to review the spreading of rumours against the Malaysia's CNII organisations on Twitter and its implications. Study on the implications of the spread of rumours on Twitter will be improved to allow more in-depth analysis and the mechanism of rumours identification on Twitter will be developed. It is very important to allow the CNII organisations to take any protection from the rumours spread as soon as possible in order to minimise the impact of the spread of the rumours.

CONCLUSION

The propagation of rumours can be done easily through the Twitter network [12]. Based on the rumours on Twitter recently in Malaysia, we have found that incorrect information gave bad implication to the nation's social, economy and politic and it has also at least threatened the stability of the Malaysian CNII organisations. In our future works, development of a framework on controlling Twitter's rumour propagation especially to the CNII organisations will be studied and later developed.

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AN OVERVIEW OF IEEE 802.11AC FOR HD VIDEO GENERATION

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ABSTRACT

IEEE 802.11ac is the fifth generation in Wi-Fi Networking standards and will bring fast, high quality video streaming and nearly instantaneous data syncing and backup to the notebooks, tablets and mobile phones that have become our everyday companions. Improvements in transmission speeds will be dramatic. Entry-level IEEE 802.11ac products will provide a data rate of 433 Mbps (megabits per second), which is at least three times faster than that of the most common devices using the current wireless standard, which is IEEE 802.11n. Because the new standard gives manufacturers the flexibility to offer a range of products with different levels of performance, some high-speed IEEE 802.11ac devices will offer wireless transmission in excess of a Gigabit per second —remarkable speeds that put IEEE 802.11ac wireless networks ahead of most wired networks. In addition, there will be dramatic improvements in wireless reliability, range and coverage. Homes and apartments now plagued with "dead spots" will enjoy vastly improved reception. Faster file transfer also leads to longer battery life in mobile phones. Products based on IEEE 802.11ac will be fully backward compatible with current Wi-Fi devices. Older devices, however, won't be able to take advantage of the improved speeds offered by IEEE 802.11ac. I have reviewed many papers talking about IEEE.11AC. All the previous study are focusing only on 11ac, in my paper I tried to talk about 11ac the performance the speed and data rate. Furthermore I tried to compare 11ac with previous standards like 11g , 11n, etc.

Keywords:
IEEE 802.11ac, Fifth Generation in Wi-Fi, VHT.

INTRODUCTION

To fulfill the promise of increasing Wi-Fi performance, effectively supporting more client devices on a network and delivering multiple HD video streams simultaneously, the IEEE group has been working on 802.11ac, a new standard that is in its advanced stages of standardisation. The 802.11ac Draft 2.0 specification was released in February 2012 and leverages new technologies to provide improvements over.

802.11n. is also the first Wi-Fi standard to exceed the Gigabit–per-second throughput barrier. Wi-Fi is playing an increasingly important role in home networking as it has consumer familiarity and a low cost of installation. There is a growing trend in homes to distribute multiple HD video streams and other high-bandwidth content to devices like HD TVs, laptops, tablets and smart phones. Delivering multiple simultaneous HD video streams wirelessly requires a robust, low-latency, and high throughput Wi-Fi network [8].

Wi-Fi based on 802.11n improved the performance compared to previous 802.11a/b/g Standards. It increased the theoretical peak data rates to 600 Mbps compared to 54 Mbps. In

order to get to these high rates and coverage however, it relied on single user MIMO and beamforming. However, beamforming did not get widely adopted by the industry due to lack of a commonly specified mode. In addition, with multiple users, single-user MIMO relied on time-division multiplexing of the MIMO streams, which reduced overall throughput. 802.11ac overcomes the above limitations and achieves a maximum throughput of 6.93 Gbps in 160 MHz bandwidth mode in the 5 GHz band, using eight spatial streams and 256 QAM modulations [1]. 802.11ac has also specified multi-user MIMO (MUMIMO), which allows simultaneous transmission of MIMO streams to multiple client devices. In addition, 802.11ac has defined a single closed-loop method for transmit.

Beamforming is expected to be an optional feature of the Wi-Fi Alliance Certification plan. 802.11ac has also introduced dynamic bandwidth management to optimize the use of available bandwidth. These new features of 802.11ac deliver the next leap in performance, which also includes simultaneous streaming of multiple HD Video streams.

INCREASED NUMBER OF STREAMS

802.11ac allows support for up to 8 spatial streams – up from a maximum of 4 streams in 802.11n. Support for more than one spatial stream is optional, however. It is not clear whether a real-world, single-user MIMO channel can realistically support that many streams [2]. The increased number of streams may be most useful in combination with MU-MIMO as shown in Table 2 [8].

INCREASED BANDWIDTH

The most notable feature of 802.11ac is the extended bandwidth of the wireless channels. 802.11ac mandates support of 20, 40 and 80 MHz channels (versus 20 and 40 MHz in 802.11n) Optionally, the use of contiguous 160 MHz channels or non-contiguous 80+80 MHz channels is also allowed. The doubling of the channel bandwidth (from 40 to 80 MHz) is a very efficient way to increase performance in a cost-efficient way. Alternatively, an 80 MHz system can use a lower number of antennas to provide the same performance as a 40 MHz system. However, this approach should be weighed against other spectrally efficient techniques that provide performance increase [3]. In addition, in most realistic scenarios the performance is not only a function of the PHY rate, but will also be affected by interference from other networks in close proximity. Different bandwidth levels will be affected differently in interference scenario. Also, reducing the number of antennas eliminates diversity and reduces the robustness of the transmission. These aspects will be discussed further below [5].

Table 1: The Evolution of the 802.11 Standards

THE EVOLUTION OF THE 802.11 STANDARDS						
Protocol	*Year Introduced*	*Maximum Data Transfer Speed*	*Frequency*	*Highest Order Modulation*	*Channel Bandwidth*	*Antenna Configurations*
80.11a	1999	54 Mbps	5 GHz	64 QAM	20 MHZ	1x1 SISO
80.11b	1999	11 Mbps	2.4 GHz	11 CCK	20 MHZ	1x1 SISO
80.11g	2003	54 Mbps	2.4 GHz	64 QAM	20 MHZ	1x1 SISO
80.11n	2009	65 to 600 Mbps	2.4 or 5 GHz	64 QAM	20 and 40 MHZ	Up to 4x4 MIMo
80.11ac	2012	75 Mbps to 32 Gbps	5 GHz	256 QAM	20.40.80 and 160 MHZ	Up to 8x8 MIMO MU-MIMO

POWER CONSUMPTION OF INCREASED-BANDWIDTH SOLUTION

When enhanced bandwidth is used to deliver the same data rate with fewer RF chains, the power consumption of the device will be lower by virtue of the lower number of RF components. This gives an advantage to the 80 MHz system over a 40 MHz system with two streams from this perspective. However, one has to consider the fact that a single antenna will not suffice for certain services [7].

REQUIRED ANTENNA DIVERSITY

Increasing the bandwidth enhances the performance of a single stream. If the target is to improve the PHY rate or the maximum throughput of a system regardless of QoS considerations, this may be all that is needed. One has to recognize, however, that transmission of high-quality content such as video has more requirements than just increasing the maximum ideal PHY rate. To ensure stable delivery of video, the number of antennas should be higher than the number of spatial streams. Diversity is a critical part of stable data delivery with QoS. Therefore, even 80 MHz systems will have to be built using multiple antennas if they are going to be used in applications that require stable and reliable transmission of data (such as video). This narrows the cost and power advantage between a (single-stream) 80 MHz bandwidth system and a (two-stream) 40 MHz system [2].

PERFORMANCE IN INTERFERENCE ENVIRONMENT

The use of the 5 GHz band has significantly increased the amount of bandwidth available for wireless transmission. However, even this band is ultimately a limited resource, and ever-increasing competition for bandwidth share will be a reality for any 802.11 system operating in this band [8].

802.11ac specifies that 80 MHz channels consist of two adjacent 40 MHz channels, without any overlap between the 80 MHz channels.

RTS/CTS OPERATION FOR WIDER BANDWIDTH

Because of the wider bandwidth used in 802.11ac and the limited number of 80 MHz channels, hidden Nodes on the secondary channels are an important problem to address. The RTS/CTS mechanism has been updated to better detect whether any of the non-primary channels are occupied by a different transmission [6] To this end, both RTS and CTS (optionally) support a "dynamic bandwidth" mode. In this mode, CTS may be sent only on the primary channels that are available in case part of the bandwidth is occupied. The STA that sent the RTS can then fall back to a lower bandwidth mode. This helps to mitigate the effect of a hidden node. Note however that the final transmission bandwidth always has to include the primary channel [2].

Next-generation system would include some truly next-generation features (such As MU-MIMO) in addition to the channel bandwidth increases that are readily available in this new technology. The bandwidth increase of 11ac is currently a concern in situations with limited bandwidth resources. Frequency is a scarce resource that needs to be used as efficiently as possible. Exploiting channel diversity by using a higher number of spatial streams allows more efficient spectrum use than simply doubling the bandwidth of the transmission. Channel and antenna diversity, therefore, remain important requirements, even for systems that are capable of wider bandwidth. It is believed that a 4x4 system with a maximum number of spatial streams and MU-MIMO will be required, at a minimum, in order for 11ac to fully realize its potential [8]. Such a system would provide higher bandwidth in sparsely populated networks, while providing QoS, good performance and coexistence in denser network environments [4].

Table 2: 802.11ac Technical Specifications

Operation frequency	5-GHz unlicensed bond only
Bandwidth	20.40.and 80 MHz 160 and 80+80 MHz (optional)
Modulation schemes	BPSK,QPSK,160QAM,64QAM,256QAM (Optional)
Forward error correction coding	Convolutional or LDPC (optional) with a coding rate of 1/2.2/3.3/4 or 5/6
MIMO	Space time coding. Single-user MIMO. Multi-user MIMO (all optional)
Spatial streams	Up to eight (optional)
Beamfroming	Respond to transmit beamfroming sounding (optional)
Aggregated MPDU (A-MPDU)	1,048.575 octets (65.535 octets in 802.11n)
Guard interval	Normal guard interval short guard interval (optional)

MU-MIMO

Most wireless networks have multiple active clients that share the available bandwidth. If this sharing is done in time, then the overall throughput can only be increased by increasing the link rate for all clients. Many clients cannot transmit at the highest 802.11ac rates though because they only have one or two antennas. For such clients, MU-MIMO is the solution to get significant network throughput gains. A MU-MIMO capable transmitter can transmit multiple packets simultaneously to multiple clients. In 802.11ac, a MU-MIMO mode is defined with up to eight spatial streams divided across up to four different clients. For example, in 80 MHz mode it would be possible to send packets to four clients simultaneously at a data rate per client of 866.6 Mb/s, assuming all clients can receive two spatial streams. This means the total data rate of 3.46 GB/s is four times larger than it would have been without MU-MIMO. The data rate per client is also larger, because the MU-MIMO packets can be transmitted at the maximum data rate per client while without MU-MIMO, each client can only be transmitted to about a quarter of the time such that the effective per-user throughput is a quarter of its maximum. In practice, the throughput gain of MU-MIMO is reduced a bit by the fact that ACKNOWLEDGEMENTs are still sent sequentially in time. Also, depending on the signal-to-noise ratios for all clients, it may not be possible to maintain the maximum data rates in a MU-MIMO packet because a MU-MIMO link does as shown in Figure 1.

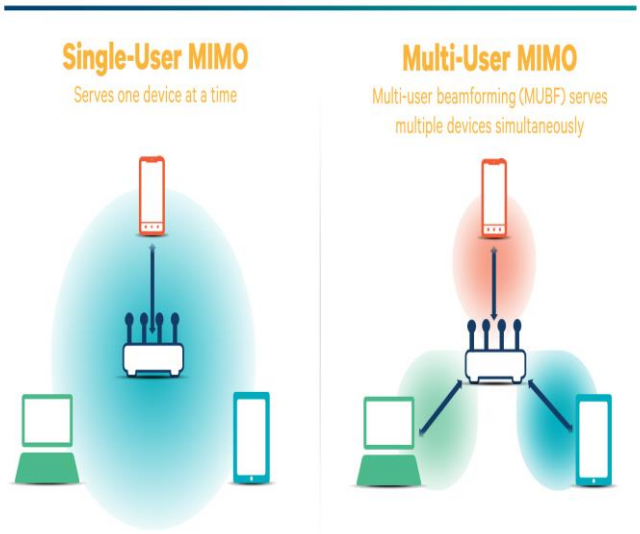

Figure 1: Multi-User MIMO

Table 3: 802.11n vs. 802.11ac

Frequency Band	2.4 GHz and 5 GHz	5 GHz Only
Channel Widths	20, 40 MHz	20, 40, 80, (160 optional) MHz
Spatial Streams	1 to 4	1 to 8 total Up to 4 per client
Multi-user MIMO	No	Yes
Single Stream (1x1) Maximum Client Data Rate	150 Mbps	450 Mbps
Three Stream (3x3) Maximum Client Data Rate	450 Mbps	1.3 Gbps

802.11AC PROVIDE A BETTER PERFORMANCE FOR HD VIDEO APPLICATION COMPARING TO 802.11N

802.11ac will boast several improvements over 802.11n. The new wireless flavour will offer speeds surpassing 1 Gigabit per second, almost three times that of 802.11n. It also promises to provide better coverage throughout an entire home with fewer dead spots. From a technical standpoint, the new standard will use such technologies as beamforming and higher amplitude modulation to send more data faster and more efficiently than 802.11n, NPD In-Stat analyst Gregory Potter told CNET. And 802.11ac will help smartphones and other mobile devices by providing higher bandwidth and a savings in power compared with 802.11n. As 802.11ac starts to hit a variety of gadgets, including laptops, smartphones, tablets, and TVs, Potter sees high-definition video as the major beneficiary.

Table 4: Comparison between 802.11 Standards

Standard	Year	Band	Bandwidth	Modulation	Antenna Technology	Data Rate
802.11b	1999	2.4 GHz	20 MHz	CCK	—	11 Mb/s
802.11a	1999	5 GHz	20 MHz	OFDM	—	54 Mb/s
802.11g	2003	2.4 GHz	20 MHz	CCK, OFDM	—	54 Mb/s
802.11n	2009	2.4 GHz, 5 GHz	20 MHz, 40 MHz	OFDM (up to 64-QAM)	MIMO with up to four spatial streams, beamforming	600 Mb/s
802.11ac	—	5 GHz	40 MHz, 80 MHz, 160 MHz	OFDM (up to 256-QAM)	MIMO, MU-MIMO with up to eight spatial streams, beamforming	6.93 Gb/s
802.11ad (WiGig)	—	2.4 GHz, 5 GHz, 60 GHz	2.16 GHz	SC/OFDM	Beamforming	6.76 Gb/s

CONCLUSION

802.11ac has the potential to provide the next generation in high throughput wireless systems. To fully realize this potential, 802.11ac systems will have to go beyond a minimal implementation that simply exploits the wider bandwidth channels available to this technology. Any new system will be measured against currently available 802.11n systems that already implement MIMO processing with space division Multiplexing, LDPC, and STBC, beamforming, multiple streams and a variety of other PHY, MAC and coexistence enhancements. First generation 802.11ac systems must be evaluated in light of this comparison. As a minimum, such systems would have to match the feature set that is already provided by current generation 802.11n. Preferably, any next generation system would include some truly next generation features (such as MU MIMO) in addition to the channel bandwidth increases that are readily available in this new technology. The bandwidth increase of 11ac is currently a concern in situations with limited bandwidth resources. Frequency is a scarce resource that needs to be used as efficiently as possible. Exploiting channel diversity by using a higher number of spatial streams allows more efficient spectrum use than simply doubling the bandwidth of the transmission. Channel and antenna diversity, therefore, remain important requirements, even for systems that are capable of wider bandwidth. It is believed that a 4x4 system with a maximum number of spatial streams and MU MIMO will be required, at a minimum, in order for 11ac to fully realize it's potential. Such a system would provide higher bandwidth in sparsely populated networks, while providing QoS, good performance and coexistence in denser network environments.

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SOFTWARE MAINTAINABILITY ASSESSMENT BASED ON COLLABORATIVE CMMI MODEL

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ABSTRACT

Software constantly needs new features or bug fixes. Maintainable software is simple to extend and fix which encourages the software's uptake and use. The Software Sustainability Institute can advise you on the design and development of maintainable software that will benefit both you and your users. Therefore, capability maturity model integration (CMMI) is a process improvement approach that provides organisations with the essential elements of effective processes that ultimately improve their performance. The propose maintainability assessment of cmmi based on multi-agent system (MAS) to identify the processes measurement of SM. in order to verify our proposed CMMI framework based on MAS architecture, pilot study is conducted using a questionnaire survey. Rasch model is used to analyse the pilot data. Items reliability is found strong correlation between measured and the model designed. The results shows that the person raw score-to-measure correlation is 0.51 (approximate due to missing data) and Cronbach Alpha (kr-20) person raw score reliability = .94.

Keywords:

Capability Maturity Model Integration, Software Maintenance, Software Maintenance Process, Multi Agent System and Rasch Model.

INTRODUCTION

Knowledge transfer of a large number of the best practices described in a maturity model has proved difficult (Abran et al., 2004). This is especially true during the training of an assessor or a new participant in a process improvement activity. Software measurement, in order to be effective, must be focused on specific goals; applied to all life-cycle products, process and resources; and interpreted based on characterisation and understanding of the organisational context, environment and goals (Basili et al., 1994). Software maintenance (SM), according to IEEE definition, is a modification of software product after delivery in order to correct faults, to improve performance or other attributes, to adapt a product to a changed environment, or to improve the product maintainability (Pigoski, 1997). A maturity level is a well-defined evolutionary Figureau toward achieving a mature software process. Each maturity level provides a layer in the foundation for continuous process improvement. In CMMI models with a staged representation, there are five maturity levels (CMMI Maturity Levels, 2002): Initial, Managed, Defined, Quantitatively Managed and Optimizing as illustrated in Table 1.

Maturity levels consist of a predefined set of process areas. The maturity levels are measured by the achievement of the specific and generic goals that apply to each predefined set of process areas. The following sections describe the characteristics of each maturity level April et al.

At maturity level 1 (Initial Level), processes are usually ad hoc and chaotic. The organisation usually does not provide a stable environment. Success in these organisations depends on the competence and heroics of the people in the organisation and not on the use of proven processes. Maturity level 1 organisations often produce products and services that work; however, they frequently exceed the budget and schedule of their projects. Maturity level 1 organisations are characterised by a tendency to over commit, abandon processes in the time of crisis, and not be able to repeat their past successes.

At maturity level 2 (Managed Level), an organisation has achieved all the specific and generic goals of the maturity level 2 process areas. In other words, the projects of the organisation have ensured that requirements are managed and that processes are planned, performed, measured, and controlled (CMMI Maturity Levels, 2002).

Table 1: CMMI Staged Representation- Maturity Levels

Level	Continuous Representation Capability Levels	Staged Representation Maturity Levels
Level 1	Performed	Initial
Level 2	Managed	Managed
Level 3	Defined	Defined
Level 4	Quantitatively Managed	Quantitatively Managed
Level 5	Optimizing	Optimizing

At maturity level 3 (Defined Level), an organisation has achieved all the specific and generic goals of the process areas assigned to maturity levels 2 and 3. At maturity level 3, processes are well characterised and understood, and are described in standards, procedures, tools and methods.

At maturity level 4 (Quantitatively Managed Level), an organisation has achieved all the specific goals of the process areas assigned to maturity levels 2, 3 and 4 and the generic goals assigned to maturity levels 2 and 3. At maturity level 4 Sub-processes are selected that significantly contribute to overall process performance. These selected sub-processes are controlled using statistical and other quantitative techniques.

At maturity level 5 (Optimizing Level), an organisation has achieved all the specific goals of the process areas assigned to maturity levels 2, 3, 4 and 5 and the generic goals assigned to maturity levels 2 and 3. Processes are continually improved based on a quantitative understanding of the common causes of variation inherent in processes. Maturity level 5 focuses

on continually improving process performance through both incremental and innovative technological improvements (April et al., 2006).

Multi Agent System (MAS) has attracted a great deal of attention in recent years because they have introduced a new paradigm for analysing, designing and implementing software systems. A lot of multi-agent methodologies have been born and improved since the presence of MAS. They have shown a great power in solving problems. MAS is designed and implemented as several interacting agents. MAS are ideally suited to representing problems that have multiple problem solving methods and multiple perspectives. MAS take initiative where appropriate, and socially interact, where appropriate, with other artificial agents and humans in order to complete their own problem solving and to help others with their activities (Talib et al, 2011a; Talib et al, 2011b).

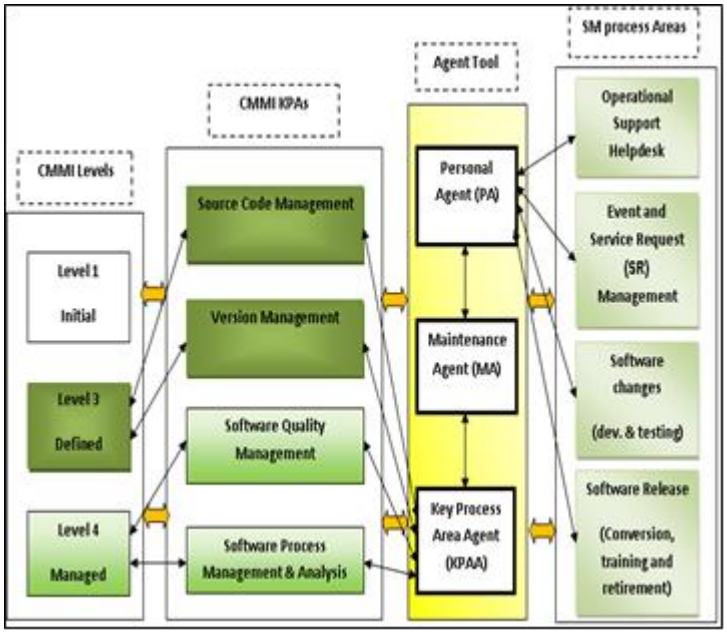

Figure 1: Research Methodology Framework

The methodology of this research as shown in Figure 1 is based on enhancement of the quality of software maintainability evaluation model via CMMI process which enables a better combining of multi-agent procedure in order to have a successful software maintainability system. The steps taken in this research starts with the identification of software maintenance (SM) key process areas (KPAs) in each of CMMI level. The KPAs identified are validated by industry expert in SM domain. Next step proposed by this research is aiding the identified KPAs for specific CMMI level with MAS agents. There are three agents developed to cope with the KPAs indicated. Results from the MAS execution for software maintenance key process areas in CMMI are then mapped to categories of SM activities. This research has categorised four major SM activities, tested them with MAS agents to prove that the quality has increased and SM activities accomplishment duration reduced.

There are four phases of the study in the form of a flow chart diagram, as specified method is needed to give details of the research flow based on collecting information, problem statement, objectives of the research and observations of the theory as stated in the literature review.

SOFTWARE MAINTENANCE FUNCTION

Software maintenance (SM) function suffers from a scarcity of management models that would facilitate its evaluation, management and continuous improvement. This paper is part of a series of papers that presents a Software Maintenance Capability Maturity Model (SMCMM). The contributions of this specific paper are: 1) to describe the key references of software maintenance; 2) to present the model update process conducted during 2003; and 3) to present, for the first time, the updated architecture of the model (April et al., 2004).

SM process is one of the most costly activities within information system practice. The purpose of this paper is to address some of the difficulties in this process, by proposing a framework for the development of maintenance model. Essential to the software maintenance process is an ability to understand not only the software but the required changes as well. This can only be achieved where the relevant knowledge is available. Based upon this primary requirement, the proposed framework has made the knowledge as its basis for modelling other requirements for software maintenance model development. The framework first identifies the three operational elements, i.e. function, static entity and dynamic entity, required for general software maintenance process. With respect to the knowledge (as part of the dynamic entity components), the framework shows how these three operational elements should behave and interact amongst themselves to deliver a successful software maintenance model (Deraman, 1998).

Holgeid et al. presents the main results from a survey investigation performed in Norwegian organisations within the area of software development and maintenance. The results are based on responses from 53 Norwegian organisations. Somewhat surprisingly, the amounts of both traditional and functional maintenance work are significantly higher than in the similar investigation done five years earlier. It is also significantly higher than in the USA and in other countries. Also too much of the scarce IT-personnel spent their time on tasks that do not add value for the users of the systems.

April et al. presents an overview of the measurement practices that are being introduced for level 3 and higher to the Software Maintenance Maturity Model (S3M). Software maintenance still does not receive a noticeable share of management attention and suffers from lack of planning, as often illustrated by its crisis management style. Part of the problem is that maintenance is typically perceived as being expensive and ineffective. Moreover, few proposals of best practices have been put forward which can readily be applied in industry. In general, the software engineering community expects that product quality will be enhanced if the maintenance process is improved.

Lovrek et al. deals with a method developed for software maintenance called Remote Maintenance Shell. It allows software installation, modification and verification on the remote target system without suspending its regular operation. The method is based on remote operations performed by mobile agents. The role of Remote Maintenance Shell in software maintenance is elaborated, as well as its architecture. A case study on version replacement of an object-oriented application is included.

Svensson and Host presented results of introducing an agile process based on extreme programming, XP, in an evolutionary and maintenance software development environment. The

agile process was introduced to a large software development organisation. The process was applied by a team during eight months. The conclusion indicated that it in this case is more difficult to introduce XP, in its original appearance, to the case environment than to less complex environments. The complexity of the organisation made it necessary to redesign many of the practices in order for them to fit the needs of the software development team.

RESULTS AND DISCUSSION

The pilot data were tabulated and analysed using Win Steps, a Rasch tool. The statistics and measures are tabulated in Figure 2 of the comparative study, the results summary shows of the questionnaire and model shows that the between the model and questionnaire outputs are highly correlated as shown in Figure 2. The results of the survey are analysed in three parts; data reliability, fitness of respondent and items data and determination of component groups cut-off points.

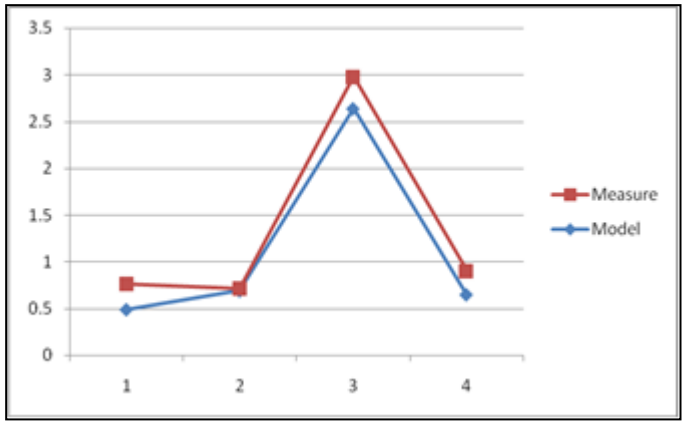

Figure 2: Data Correlation between Measured and Model

Data Reliability: Summary statistics for respondents (Questionnaire) and created model are depicted in Figure 3 respondents returned the survey questionnaire accordingly and compared with the model designed using Rasch software. Out of which, Rasch identified a significant correlation. The standard deviation were measured based on the observation from the questionnaire.

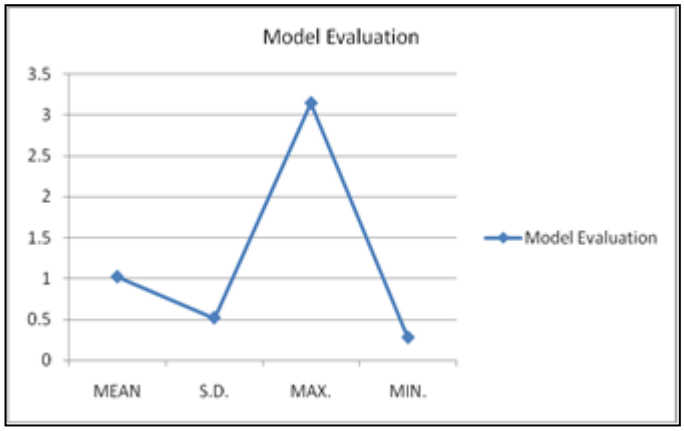

Figure 3: Model Evaluation

The spread of person responses is = 3.29 logit is fair. This is due to extreme responses by a participant. However, Reliability = 0.82 and Cronbach Alpha = 0.94 indicates high reliable data and hence the data could be used for further analyses. In the questionnaire items, the summary of 45 measured questionnaire items (see Table 2) reveals that the spread of data at 2.36 logit and reliability of 0.74 are good and fair, respectively. Details on measured items are listed in Table 1. The acceptable limits are 0.4 < Acceptable Point Measure Correlation < 0.8 and 0.5 < Outfit Mean Square < 1.5, and -2.0 < Outfit z-standardised value < 2.0) as shown in Table 2 below.

Table 2: Summary of Measured Items

	Raw Score	Count	Measure	Model Error	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD
MEAN	119.8	38.3	0.02	0.3	1	0	1	0.1
S.D.	16.7	3.2	0.64	0.08	0.12	0.6	0.15	0.7
MAX.	150	40	1.16	0.6	1.29	1.5	1.4	1.9
MIN.	88	29	-1.2	0.2	0.83	-1.3	0.74	-1.3

Real RMSE 0.32. Adj. SD 0.54. Separation 1.69
Item Reliability 0 .74. Model RMSE 0.27
Adj.SD S.E. of Person Mean = .09.

CONCLUSION

The CMMI based on MAS Framework components for collaborative SM environment was initially synthesised from the generic CMMI, MAS and SM frameworks. A questionnaire survey followed by expert opinion survey was conducted to ascertain the important components for the framework. The CMMI based on MAS framework consists of Knowledge Required for SM Activities, SM Governance Tools, CMMI Tools and Agent Tools. To formulate the CMMI

based on MAS framework for collaborative SM, the components on CMMI tools, SM governance tools, and agent tools are compiled from various literatures. An initial model of modified CMMI based on MAS components for collaborative SM is proposed. The relationships between these components are used to construct the questionnaire, which were tested in a pilot study. RUMM was used in analysing pilot questionnaire. Item reliability is found to be poor and a few respondents and items were identified as misfits with distorted measurements. Some problematic questions are revised and some predictably easy questions are excluded from the questionnaire.

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BUFFER OVERFLOW ATTACK MITIGATION VIA TRUSTED PLATFORM MODULE (TPM)

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ABSTRACT
As of the date of writing of this paper, we found no effort whatsoever in the employment of Trusted Computing (TC)'s Trusted Platform Module (TPM) security features in Buffer Overflow Attack (BOA) mitigation. Such is despite the extensive application of TPM in providing security based solutions, especially in key exchange protocols deemed to be an integral part of cryptographic solutions. In this paper we propose the use of TPM's Platform Configuration Register (PCR) in the detection and prevention of stack based buffer overflow attacks. Detection is achieved via the integrity validation (of SHA1 hashses) of both return address and call instruction opcodes. Prevention is achieved via encrypting the memory location addresses of both the return and call instruction above using RSA encryption. An exception is raised should integrity violations occur. Based on effectiveness tests conducted, our proposed solution has successfully detected 6 major variants of buffer overflow attacks attempted in conventional application codes, while incurring overheads that pose no major obstacles in the normal, continued operation of conventional application codes.

Keywords:
Buffer Overflow Attack, Trusted Platform Module, Platform Configuration Register (PCR), ptrace, TPM_Extend, TPM_Seal.

INTRODUCTION

Buffer Overlfow Attacks (BOA) appears as of the date of writing of this paper- found in leading exploit reporting sites such as packetstorm security and exploit-db [1, 2]. Such is despite BOA was initially first reported by Aleph One way back in 1996 [3]. Untill BOA can be eradicated to an appreciably safe level or eradicated, work into BOA mitigation shall further necessitates momentum.

The source of BOA lies in the absence of limit check in codes, resulting in overflowing of statically allocated buffers. A simple example to illustrate BOA is via program tesbuff.c below [4]. Note that tesbuff.c and program refers to the same entity throughout this paper.

```
#include <unistd.h>

void Tesbuff()
{
char buff[4];
printf("Some input: ");
gets(buff);
puts(buff);
}

int main(int argc, char *argv[ ])
{
Tesbuff();
return 0;
}
```

Figure 1: Tesbuff.c – A Sample Code Vulnerable to BOA.

Input of chars in excess of four overflows buff array and results in the overwriting of the return address (0x40253f in Figure 2 below) of the main function in the memory stack. Overwriting of the return address results in the existence of vulnerability for exploit deployment, an example of one of such exploit is the spawning of a shell (via shellcodes) - a form of privilege escalation attack where control is redirected from the compromised host to a malicious adversary [6].

Some notable work focuses only on return address vulnerability attack mitigation were: hardware based protection of the return address as per SmashGuard [7], a micro-architecture based approach as per Park et al. [8] and compile time protection of return address as per Return Address Defense (RAD) [9].

Another aspect of an attack on a program's memory stack is the modification of the call instruction opcode (see 0x40253a in Figure 2 below) to effect a control flow hijacking attack. It was demonstrated via Return Oriented Programming (ROP) attacks that unintended instruction sequences can be introduced into x86 instruction sequences in the memory stack, particularly over the opcodes of an instruction. Such unintended instructions were never intended by the program or compiler [5]. Consider the following gdb dissassembly of the buffer overflow vulnerable code testbuff.c in Figure 1 above.

```
(gdb) disas main
Dump of assembler code for function main:

0x0000000000402526 <+0>: push   %rbp
0x0000000000402527 <+1>: mov    %rsp,%rbp
0x000000000040252a <+4>: sub    $0x10,%rsp
0x000000000040252e <+8>: mov    %edi,-0x4(%rbp)
0x0000000000402531 <+11>:  mov    %rsi,-0x10(%rbp)
0x0000000000402535 <+15>:  mov    $0x0,%eax
0x000000000040253a <+20>:  callq  0x4024f0 <Tesbuff>
0x000000000040253f <+25>:  mov    $0x0,%eax
0x0000000000402544 <+30>:  callq  0x4024e0 <Display>
0x0000000000402549 <+35>:  mov    $0x0,%eax
0x000000000040254e <+40>:  leaveq
```

```
0x000000000040254f <+41>:  retq
End of assembler dump.

(gdb) disas Tesbuff
Dump of assembler code for function Tesbuff:
0x00000000004024f0 <+0>: push   %rbp
0x00000000004024f1 <+1>: mov    %rsp,%rbp
0x00000000004024f4 <+4>: sub    $0x10,%rsp
0x00000000004024f8 <+8>: mov    $0x408ca5,%edi
0x00000000004024fd <+13>:  mov    $0x0,%eax
0x0000000000402502 <+18>:  callq  0x401e20 <printf@plt>
0x0000000000402507 <+23>:  lea    -0x10(%rbp),%rax
0x000000000040250b <+27>:  mov    %rax,%rdi
0x000000000040250e <+30>:  mov    $0x0,%eax
0x0000000000402513 <+35>:  callq  0x401e50 <gets@plt>
0x0000000000402518 <+40>:  lea    -0x10(%rbp),%rax
0x000000000040251c <+44>:  mov    %rax,%rdi
0x000000000040251f <+47>:  callq  0x4022c0 <puts@plt>
0x0000000000402524 <+52>:  leaveq
0x0000000000402525 <+53>:  retq
End of assembler dump.
```

Figure 2: gdb Disassembly of Tesbuff.c Memory Stack.

The control flow hijacking of the call instruction manifests when the original call was replaced with something like:

```
callq  0x4024fe <Evil_Tesbuff>
```

Program execution flow would then be redirected to the malicious function Evil_Tesbuff. Any malicious code residing in Evil_Tesbuff can subsequently be deployed.

While some work exists on protecting return address as mentioned earlier, we had discovered that till date no attempt was made to leverage any form of protection on the call instruction in memory stack from such control flow redirection vulnerability. While the return address is secured, the call instruction is still vulnerable [7-9]. Hence, the effective mitigation measures of BOA necessitates the protection of both the return address and call instruction opcodes. We shall refer to both to be Vulnerable Entry Points (VEP) throughout this paper.

Reasonably recent efforts into BOA mitigation proposed the vulnerability patching method: upon program binary execution, compromised vulnerabilities in overflowed programs are automatically patched to restore the program into normal working order and vulnerable buffers are moved into protected memory regions. Examples of such approaches: SafeStack and SoupInt [11, 12]. The patching methods employed, while effective in plugging BOA vulnerabilities, suffer from a major drawback: prevention occurs after damage/upon had been done. We are of assertion that an improved methodology would be to permit complete program execution only after the binary passed all essential integrity validations, especially at the vulnerable return and call locations.

In an attempt to propose a viable solution towards: a) the protection of both return address and call instruction opcode, b) prevention of the exploitation of BOA vulnerability prior to complete program execution, we propose the design and implementation of our solution: hardware anchored mitigation of BOA via Trusted Platform Module (TPM). We are

the first to utilise TPM in BOA mitigation work, as despite being first introduced in 2002, no effort was found to leverage TPM security features into BOA mitigation work.

Our approach utilises TPM security features of TPM_Extend and TPM_Seal into the two main arms of our BOA mitigation solution– the Validation and Preventive Modules, (VM) and (PM) respectively [13]. We begin with an initial state whereby the program is initially in a non operative RSA encrypted state, starting from location 0x40253a onwards (i.e. the Vulnerability Point or VP). The private RSA key is sealed into TPM hardware registers – the Platform Configuration Registers (PCR) for tamper resistance. Decryption (unseal) of the VP location (i.e. lifting of non-operative state) is permitted upon successful validation of the hashes (clean vs. runtime) of both return address and call instruction opcode – by the VM. Both hashes are stored (or extended) into TPM PCR – again for tamper resistance.

The contributions of our paper are as follows:

a. we had proposed an improved solution of BOA mitigation encompassing two major vulnerable points in a binary: return address and call instruction (which has so far being neglected in BOA mitigation works). BOA mitigation work providing solution at return address targets only the return address.

b. our proposed solution is hardware based – hence tamper resistant and its integrity is guaranteed. Such is due to the fact that the Validation Gadgets [(VG) – (See next section)] - are stored in hardware registers i.e. PCRs – the theft of which is impossible via software based attacks.

c. we had, to date, implemented the VM in 64-bit Fedora Linux OS and evaluated its effectiveness and performance using actual BUFFER OVERFLOW exploit codes.

Our proposed solution is anticipated to be ideal for real-world deployment due to the hereinlisted strengths:

a. Acceptable systems overhead
Hashes of VG are generated using TPM hardware SHA1 engine, hence we anticipate there will be acceptable penalty in terms of consumption of system resources.

b. Total trustworthiness
Absolute Integrity of the employed BOA Detection Mechanism is guaranteed due to TPM anchored protection of VG. Total trust can be placed on our solution since there's no way VG hashes can be stolen from TPM hardware registers.

The rest of the paper is organised as follows: Section 2 details the design and architecture of our proposed solution, Section 3 details the methodology employed in implementing our solution, Section 4 provides the experimental results and finally Section 5 summarises our work.

I. DESIGN

We introduce a high level overview for the design of our solution in this section. We then elaborate on how each component of our system functions in BOA mitigation. Our solution is based on the idiom 'its better to look before you leap' – thus VG shall be deemed to be malicious until proven otherwise. As mentioned in Section 1, our solution comprises two major arms- the VM and PM.

Note that the non operative state is the first tentative step towards realizing the idiom above. The PM's refined operating principle employed is that both memory locations and instruction opcodes are deemed to be malicious unless proven otherwise.

The initial state of the program binary is enforced by the PM, serving as an Enforcement Mechanism. All operations in memory addresses beginning from the call instruction to the bottom of the program's memory stack (i.e. from 0x40253a onwards) shall initially be in a non operative state. To achieve such a state, memory addresses from 0x40253a onwards need to be in a RSA encrypted state (whereby the private RSA key is sealed to TPM PCR using TPM_Seal).

The non operative state shall be lifted (i.e. memory addresses decrypted or unsealed using TPM_Unseal) only upon Validation Gadgets (see paragraph below) passing the validation stage by the VM as per next paragraph below.

Next, the VM serves as an Integrity Checkpoint Mechanism – verifying the integrity of Validation Gadgets (VG) which comprises both hashes (of return address and call instruction opcodes) and RSA private encryption keys. Note that the VGs are extended (i.e. stored using TPM_Extend) in TPM PCR for tamper proof measures, which in turn guarantees the integrity both of the VM and PM, i.e. guards the guard.

In the Validation Module, which serves as an Integrity Validation Checkpoint, the refined operating principle employed is that the program shall pass integrity validation checks at points of vulnerability.

We thus utilise the TPM built in SHA1 hash engine to generate both clean and runtime hashes of a program's function return address and call instruction opcode. The hashes of an uninfected program's return address and the call instruction opcode are extended into two PCRs (PCR - 13&14). See Figure 6. The runtime hashes of the identical program's return address and call instruction opcode are compared via an Integrity Assessment Engine (IAE). Mismatch indicates abnormal program behavior – hence the program is un-trustable.

II. IMPLEMENTATION

This section details the implementation of both the VM & PM in our proposed solution. Our solution mechanism comprises three phases: Pre-Deployment, Deployment and Post Deployment.

A. Pre-Deployment Phase

The internal architecture of the VM is illustrated in Figure 3 below. The core components of the VM are the Checkpoint Trap (CT) , PCR Extender (PE) and the IAE.

Prior to the deployment of the VM, a clean database of the SHA1 of the VG needs to be made available for a runtime comparison of the VG of the testbuff binary. The PE component

utilises the TSPI compliant function Tspi_TPM_PcrExtend () to both generate the SHA1 of the VGs and then extend the VGs to a chosen TPM PCR.

The CT functions similar to the gdb debugger – by initially forking the testbuff binary as a child process (via the fork () system call) and then setting breakpoints at VEPs, hence preparing the environment for the IAE to perform its operations of integrity assessment of the VG.

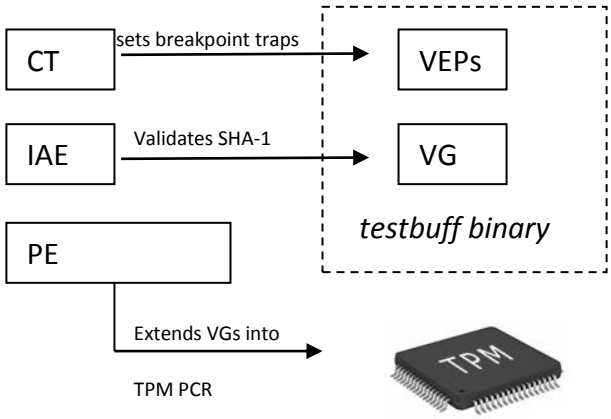

Figure 3: Architecture of the VM.

B. Deployment Phase

Breakpoints need to be set at two locations i.e. both the VEP as previously mentioned. The ptrace() system call is utilised to develop a gdb like feature – of setting breakpoints at both the VEP memory address locations [10]:

a. of the call instruction in the memory stack of a binary in execution (i.e. binary of compiled tesbuff.c) – we term this as VEP-1, and,

b. of the return address of tesbuff.c. We term this as VEP-2.

Breakpoints require the use of trap instruction - 0xcc. Hence, the VM writes the 0xcc into the opcodes of both VEP1 and VEP2 via the use of the POKE_TEXT enumeration parameter supplied to the ptrace () function. [10]. The code fragment below demonstrates the setting of a trap at VEP2:

```
unsigned return_addr = 0x000000000040252f ;  // address for
                                                VEP2

/* Write the trap instruction 'int 3' into the address in return_addr */
   unsigned ret_data_with_trap = (ret_data & 0xFFFFFF00) | 0xCC;
   ptrace(PTRACE_POKETEXT, child_pid, (void*)return_addr, (void*)ret_data_with_trap);
```

unsigned ret_readback_data = ptrace(PTRACE_PEEKTEXT, child_pid, (void*) return_addr, 0);

procmsg("After trap SIGNAL, data at return_addr (i.e RET ADDRESS) at 0x%08x: is -> 0x%08x \n\n", return_addr, ret_readback_data);

Upon code execution, the RIP (64 bit - Instruction Pointer) points to the location of the return_addr signifying that a trap had been set at 0x40252f. The terminal output (Figure 3) below shows the Instruction opcode of the return address has been changed from b8 to cc. See Figure 3 – indicated by the blue arrow. Such result in the child (testbuff binary) entering into a trap state, permitting the IEA to perform its operations of clean vs. runtime comparison of SHA-1 of VGs at VEP-1 and VEP-2.

The RIP is not permitted to 'point' to the call and return address memory locations respectively till the IAE approves of the integrity of the return address and call instruction opcode respectively.

C. Post Deployment Phase

An alert is immediate generated (see Figure 4 - red rectangle) should the hashes are not identical, signaling the occurrence of BUFFER OVERFLOW in the traced binary. Note that in Figure 3 below, the input of eight 'A's lead to the overflowing of the char buff array (see Figure 1) and hence the overwriting of the original return address at 0x040252f [4]. The PM operative state will not be lifted and the memory addresses after the 0x040252f location will remain in RSA encrypted state – such prevents the deployment of any form of exploits or malicious codes that results from the BUFFER OVERFLOW attack on the vulnerable testbuff binary.

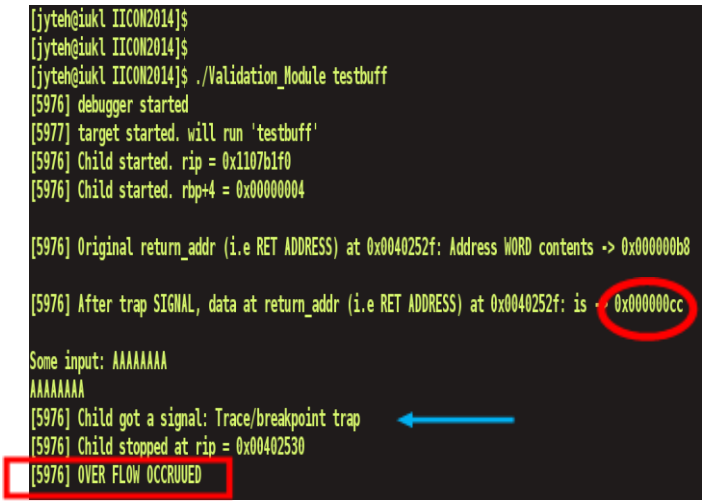

Figure 4: Validation Module in Deployment

EVALUATION

We had conducted capability tests on our proposed solution via effectiveness and performance evaluations. All experiments were conducted on an actual system for live, real time results. Our test-bed platform: Acer Veriton PC with 4GB RAM and Intel i3 Processor running Fedora Core 20 (64 bit) kernel version 3.15-6.

A. Effectiveness

We ran the VM against the list of well known BUFFER OVERFLOW attack variants as per Table 1. The modus operandi of these variants targets the function return address of programs - whereby the return address needs to be overwritten in order for the variants in Table 1 to operate. The VM is able to reliably detect overflow occurrences as shown in Table 1. The major categories of buffer overflow attack variants detected successfully by the VM demonstrates that our solution is indeed one vital addition into the current and ongoing research into buffer overflow attack mitigation.

B. Performance

To demonstrate that our solution is not only reliable but further ideal for deployment in actual environments we ran microbenchmark tests to gauge any overheads introduced by our proposed solution.

We initially measure the execution time of running the compiled C source binaries of all the buffer overflow attack variants in Table 1 without the VM and with inputs triggering overwrite of a singe return address. The execution time measurement is repeated, with the identical binaries and configurations as per the initial step but with the VM running. To obtain the required data for performance benchmarks, we utilised the most direct method for the acquisition of execution time of binaries, the time tool which operates with the gettimeoftheday() as the main software timer component. Figures 5 and 6 illustrate our performance measurement results.

Our deployment of the VM reported an average increase of ratio of binary execution time of 2.30. The ratio was due to the setting and removal of breakpoints in all the buffer overflow variant binaries in Table 1, hence resulting in the increase of binary execution time. Further, verification of the binary with the VM involves the execution of two binaries simultaneously, hence the reason behind the average execution time of 2.30 across all buffer overflow variants as per Figures 5 and 6. However, hash computation of VG were found not to contribute to the ratio increase - since the TPM's built in SHA1 engine was utilised in hash computation for the VG. Furthermore, the time tool measures execution binary time utilising only software based clocks. Hence, any lags in software execution time shall bound to be reported by the time tool.

Table 1: BOA Variants Detected by the VM

BUFFER OVERFLOW Variant No.	BUFFER OVERFLOW Attack Variant	Detected by VM
1	Local Char Array Buffer Overflow (i.e. *testbuff*.c)	Yes
2	Integer Overflow	
3	Return to lib-C	
4	Format String Attack	
5	NULL Pointer Dereferencing	
6	ROP based Exploit	

Figure 5: Performance Analysis – Measurement of Binary Execution Time of Our Proposed Solution

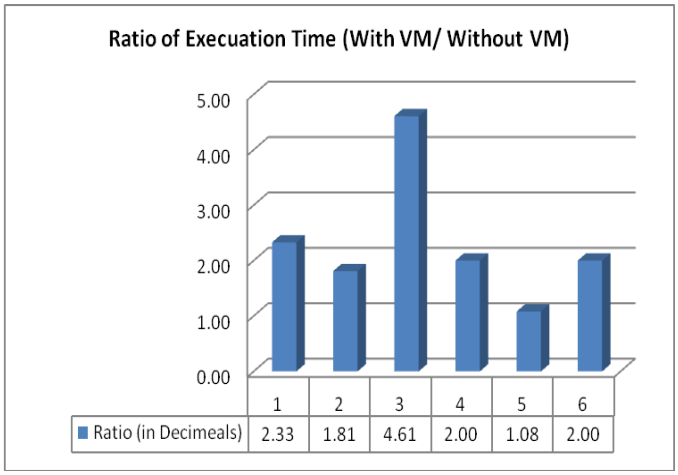

Figure 6: Ratio of Execution Time

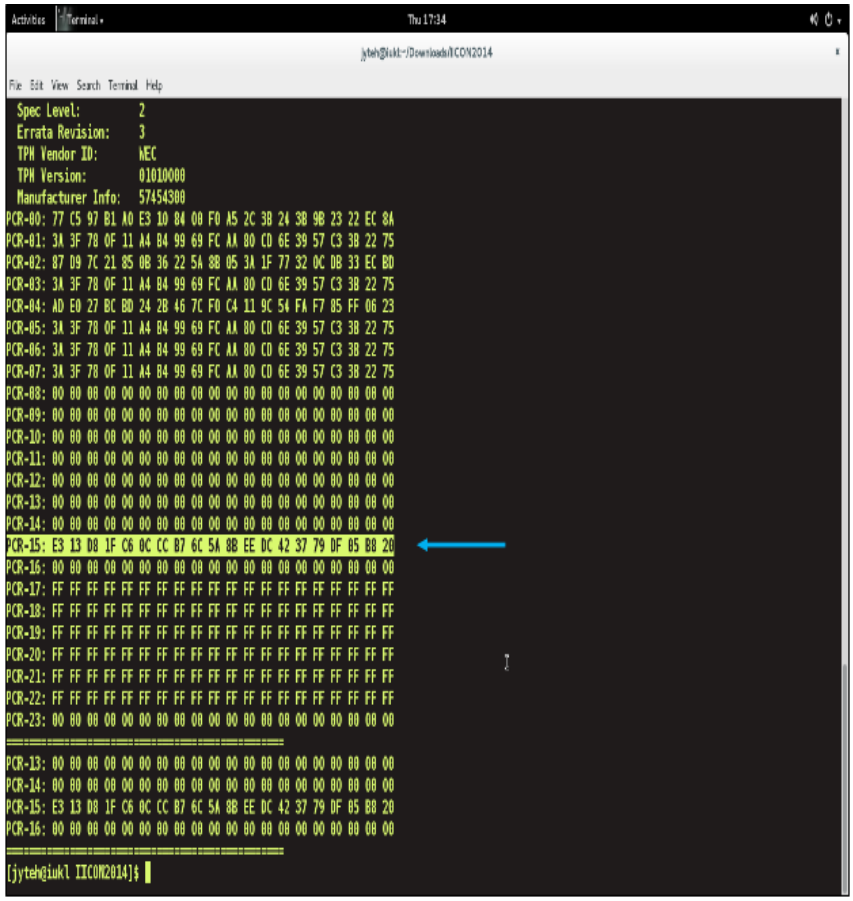

Figure 7: Extending VG into TPM PCR

CONCLUSION

We had presented a vital hardware based addition to the existing arsenal of mitigatory research efforts towards combating buffer overflow attacks, which continues to plague applications developed even till today. Our solution operates based on the principle that programs should not be granted execution privileges until its integrity had been duly verified hence ensuring that only safe, legitimate programs are permitted to be granted execution privileges.

The TPM anchored VM is guaranteed of its tamper resistance since the clean hashes of VG are stored in the PCR – the guard is totally trustable. Such is unlike past software only based buffer overflow mitigation works which posed risks of compromise – the guard isn't totally trustable. Furthermore, our solution proposed buffer overflow mitigation via two vital attack vectors in buffer overflow attack variants -both the call instructions and return addresses.

The empirical evaluation outcome of our approach i.e. a) the successful detection major buffer overflow attack variants and b) acceptable average ratio of execution time of 2.30 (with no reported major lag in binary execution upon validation by the VM – consolidates the viability of our proposed solution.

FUTURE WORK

We are in the process of adapting our proposed solution to solve the possibility buffer overflow attack on SELinux hooks (i.e function pointers) – the vulnerability in which we had previously reported in SELGuard [14]. Porting our proposed solution to SELinux requires implementation of both the VM and PM at the kernel level. Our pioneer work of buffer overflow attack mitigation with TPM anchorage opens another avenue for enhancing buffer overflow mitigation – we plan to append remote detection capabilities to the VM. Such is achieved via the use of remote attestation [15], whereby in networked systems, users can perform an attestation test to verify the authenticity and integrity of a executing program binary via clean-runtime comparison of hashes of VG.

The clean hashes of VG are stored in a remote user's database (secured with TPM) and runtime hashes of VG are delivered from the server (hosting a program binary) to the remote user. The user system performs comparison of the hashes (clean vs. runtime) the output of which will determine if a binary is executing in an untampered execution environment .We foresee such remote attestation mechanism deployable in financial business applications where integrity and trust are of vital importance – one such example is in Internet Banking.

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ZNO NANOSTRUCTURE: A REVIEW ON THEIR GROWTH AND STRUCTURAL PROPERTIES BY THERMAL EVAPORATE AND CHEMICAL VAPOR DEPOSITION METHODS

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ABSTRACT

In the past several decades, One-dimensional (1D) Zinc Oxide (ZnO) nanostructure was a unique material and ZnO has been extensively and intensively studied. Also, ZnO shows semiconducting and piezoelectric binary properties. Using of different techniques, nanowires, nanobelts, nanorings and nanosprings of ZnO had been fabricated under specific growth conditions. Since, ZnO has a wide band gap (3.37 eV); large exciton binding energy (60 meV) and it could lead to lasing action based on exciton recombination. ZnO is one of the materials that has extraordinary physical and chemical properties, also for current and future it would be different electronic and optoelectronic device applications. This paper reviews the different nanostructures of ZnO grown by two technique, for example, thermal evaporate and chemical vapor deposition also, comparison with together their corresponding growth mechanisms. The application of ZnO nanowire as nano-sensors and field effect transistors is demonstrated.

Keywords:

Zinc oxide, Nanostructure, Growth ZnO, Thermal Evaporation, Chemical Vapor Deposition

INTRODUCTION

Zinc oxide (ZnO) is a vital matter for fabrication nanowire's and thin films. Study on the ZnO nanowire started by many researchers from the 1969s, synthesised to nanowires and thin films have been an active field because it has several applications. Also, Zinc oxide is a key of technological material. Nanomaterials of the same zinc oxide has been proven to be a unique functional material during the last several years, which has been extremely used in field emission [1], electro-acoustic transducers [2], short wavelength optoelectronics [3], gas sensors [4], transparent conducting coating materials [5], piezoelectric devices [6], and photo-catalysis [7].

Characterisation of ZnO nanowires has been an active and attractive field reason that their applications as sensors and catalysts for solar cell fabrication. With the reduction in size, we will have novel physical, chemical and optical properties introduced. In addition, ZnO has physical properties include a wide and direct band-gap of 3.37 eV compound semiconductors that are suitable for short wavelength optoelectronic applications and large exciton binding energy for example (60 meV). Also in ZnO nano-crystal can ensure efficient excitonic emission at room temperature (300 K) and ultraviolet (UV) photoluminescence has been reported in disordered nanoparticles and nanowires.

ZNO NANOWIRES GROWTH METHOD

There are several methods applied to growth of ZnO nanowires and thin films, for example, thermal evaporation[8], annealing in a reactive atmosphere, molecular beam epitaxy (MBE) [9], laser ablation [10, 11], solution based method [12] and chemical vapor deposition (CVD) [13]. We want to focus on the synthesis of ZnO nanowires from zinc salts in solution. Also, chemical vapor deposition and thermal evaporation are widely used methods of physical vapor deposition (PVD) [14].

In this section, we discuss two methods, such as thermal evaporation and chemical vapor deposition for the growth and morphologies of 1D-ZnO nanostructures. The growth and morphologies of doped and structures of 1D-ZnO nanostructures are reviewed. Nanowires with very long-length can be synthesised this way [15]; so far, the substrates used are the same silicon or zinc and other FTO-coated glasses since that high-CVD growth temperature is one of the easy damages the transparent conducting oxide [16]. Furthermore, since the nanowires are not directly synthesised on FTO-coated substrates, a nanowire transfer stage is needed in the subsequent solar cell fabrication. Such a transfer stage causes contact issues between the nanowires. In spite of, most of the methods are not well suited for in-large area coating, low-temperature processing. However, the above mentioned methods could not be used for ZnO crystal fabrication below 150 ^{o}C. Then the equipment is expensive for large area process. In spite of, chemical vapor deposition (CVD) has been an attractive technology which is simple for thin-film to make.

There are several previous papers discussing the ZnO nanowires using electro-less deposition in solution bath and indicating to possible of low temperature [17]. Preparation of nanowire in a chemical solution, bath, presents several advantages: for instance, thin films can be obtained on substrates at low temperature, below 100 ^{o}C, also, the thickness and morphology of the film can be controlled via deposition parameters, furthermore the mobilisation is relatively cheap, and in addition, the method is more environmentally friendly.

These supply the technique compatibility for the easy and low-cost process and good quality for nanowire fabrication. In the present paper, we decided the patterning technique of ZnO nanowire and performed the bottom-gate type transparent thin film transistors (TFT) [18] device with a patterned active channel ZnO film on that used CBD method. Also, the properties of films and synthesis of ZnO were studied. This is reported in the summary of the studies on solution growth and the resulting structures. As can be seen in the summary of different work in Table 1.

Table 1: Summary of Various Results and Methods for Aqueous Solution Growth ZnO.

Growh solution	Morphology	Focus of investigation
Zinc nitrate, HMT	Nanotubes	Influence of substrate and seed layer [19]
Zinc nitrate,HMT	Micro tubes	On Si and conducting, glass substrates [20], [21]
Zinc nitrate, zinc acetate, HMT	Highly. Aligned Nano rods	Influence of substrate and seed layer [22], [23]
Zinc-nitrate, HMT, citrate	Oriented nanocolums	Control of aspect ratio: Nano Figures, addition of citrate anions decreases aspect ratio [24]
Zinc nitrate, triethanolamine, HCl (pH 5)	Ordered Nano rods	Influence of substrate and counter ions growth solution [25]
Comparison of different growth solutions	Star-like, Nano rods	Influence of reaction conditions: ligand, counter-ions, pH, ionic strength, and deposition time [19]
Zinc acetate, sodium hydroxide, citric acid	Disk-like, flowerlike, Nano-rods	Influence of pH on growth solution [26]
Zinc nitrate, thiourea	Nanowires, flower-like, tube-like	Influence of reactants, substrate pretreatment [27]

Andrés-Vergés et al. have also done studies on ZnO crystal morphology. They looked at experimental conditions for both Zinc chloride/HMTA and Zinc Nitrate/HMTA starting reactants [28]. They were able to determine under which precursor concentrations and reaction temperature produced the needle-like structures and those that produced the prism-like nanostructures.

THERMAL EVAPORATIONS METHOD

Nowadays, thermal evaporation is one of the most widely used applications of physical vapor deposition (PVD). This way is a kind of thin film deposition, which it is a vacuum mechanism wherein coatings substrate of pure materials is applied over the surface of many different objects. The deposited coatings ordinarily have a thickness in the range of nanometers to microns and are of a mixed single material or layers of multiple materials. Furthermore, For the grow of ZnO by thermal evaporation method two matter are important such as, gases flow rate in a vacuum chamber and annealing temperature. In coming paragraph, both issues will be explained.

First of all, gases flow rate in the chamber is one of the important matters for growing quality of ZnO nanowire. Change of gas in a vacuum chamber used chang of quality of ZnO. For example, Yanjun Fang et al. studied on property and growth of ZnO nanowire arrays by

Thermal Evaporation [29]. The growth of well-aligned ZnO nanowire arrays (see Figure 1) was carried out in a horizontal quartz tube inserted into a tube furnace.

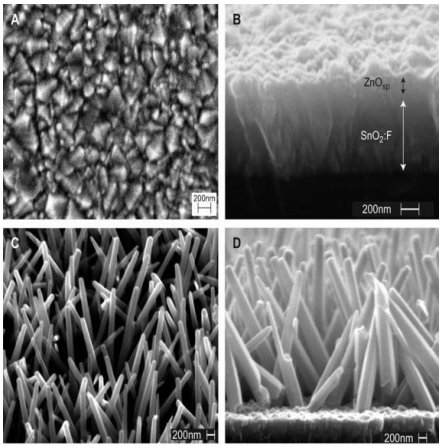

Figure 1: SEM figures: (a) the SnO_2 :F surface of the conducting glass substrate, (b) ZnO layer deposited by spray pyrolysis on conducting glass, (c) planar view (45° tilted) and (d) cross section of electrodeposited ZnO(20 c cm^{-2}) on a glass /SnO_2:f / ZnOSP sample [30]

It is interesting to know that the change of oxygen flow rate has a significant impact on the morphology of the as grown products. As can see, when the oxygen flow rate is increasing the mean diameter of the nanowire arrays does not go on to increase. Figure 2 shows this fact.

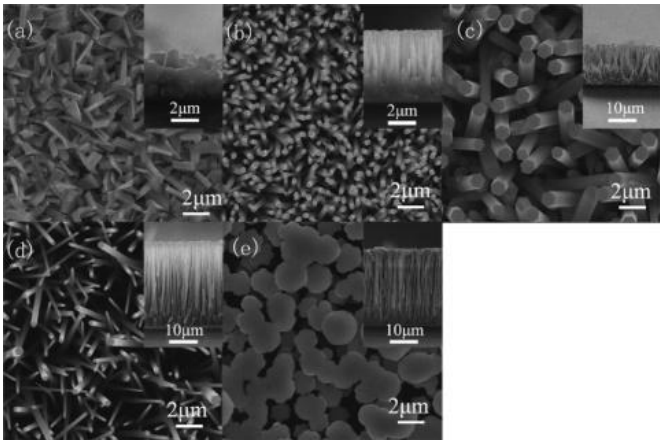

Figure 2: Evolution of the morphology of the as-grown ZnO nanostructures with the change of the oxygen flow rate (growth time: 60 min): top view SEM images with the oxygen flow rate of (a) 0, (b) 15, (c) 25, (d) 45, and (e) 75 sccm. Corresponding cross-section view SEM images are shown in the insets [29]

The oxygen flow rate and high-purity Ar gas during the growth process plays an essential role in the morphology evolution of the as-grown products, which results in the change from 2D to 1D growth and finally to 2D growth. As secondly approach, one of the another

important matter to real growth ZnO nanowire is changing annealing temperature. At the same time D. Calestani did testing about low-temperature thermal deposition for growth of aligned ZnO, and he obtained on both doped and undoped ZnO seeding films [17]. The observed nano rods (Figure 3) were usually rather homogeneous in diameter and length that, respectively, vary within 30–50 nm and 0.5–3 mm ranges depending on the growth conditions. Also, no morphological difference has been detected in the nanostructures grown on these two different kinds of film. Also, the test was done in temperatures below 500 ºC.

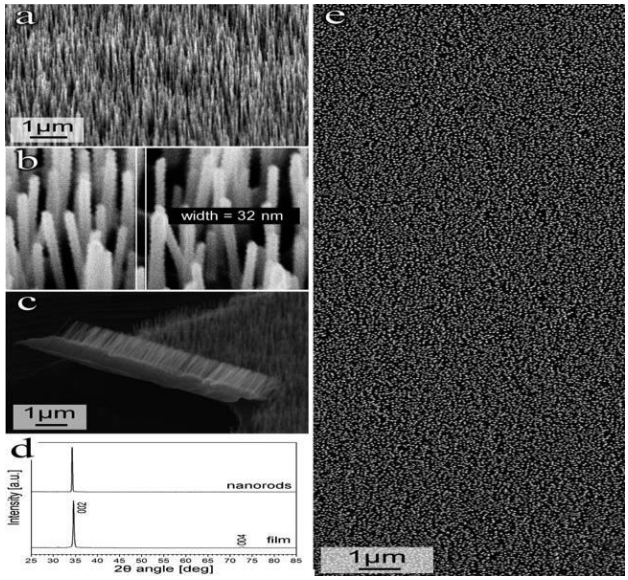

Figure 3: SEM images of the obtained arrays of vertically aligned ZnO nanorods: (a) tilted the view; (b) higher magnification image with the typical size of a nanorod; (c) cross-section view of a fractured zone, where the ZnO film-rod structure is clearly visible. (d) XRD spectra of a seeding ZnO film before and after the growth of ZnO nanorods; preferential orientation along the c-axis of the wurtzite hexagonal structure is clearly visible in both samples. (e) SEM top view image that shows vertical alignment and planar distribution [17]

The coating materials can be either molecule, including nitrides and oxides or purely atomic elements such as both metals and non-metals. The materials used to cover is called the substrate, which can be many different things, including semiconductor wafers, optical components, and solar cells. Thermal evaporation is a mechanism wherein a solid material is heated inside a high-vacuum chamber to a temperature which generates some vapor pressure. Inside the vacuum, even a very low-vapor pressure is adequate to create a vapor cloud within the chamber. This evaporated material now including of a vapor stream, which passes through a vacuum, and sticks onto the substrate as a wire or coating. Since, in the majority of cases, the material becomes liquid by heating it to its melting temperature, it is commonly placed in the bottom of the chamber, often in some form of upright crucible.

The vapor then rises above from this bottom source and reaches the substrates that are held inverted in suitable fixtures at the top of the chamber, with surfaces to be coated facing down toward the rising vapor to acquire their coating. Different measures may have to be taken in order to ensure film adhesion and control various film properties as desired.

CHEMICAL VAPOUR DEPOSITION (CVD) METHOD

One of the methods, for growing zinc oxide (ZnO), is Chemical Vapor Deposition (CVD) method. In this article, reported on the experimental data resulting from several researcher attempts to understand how zinc oxide (ZnO) can be grown on various substrate via a solid-vapor-solid process in an experimental made of chemical vapor deposition (CVD) apparatus using of a solid source. Different growth parameters such as growth temperature and different gas injection rate were used to change the ZnO nucleation process. Deposited thin films were characterised via photo-luminescence and scanning electron microscopy [31]. We found that Means of CVD method could grow ZnO nanowire or thin films with the thin film quality comparable to these grown by the most expensive apparatuses such as metal-organic chemical vapor deposition (MOCVD) [32]. Furthermore, for growth of ZnO nanowire by chemical vapor deposition two factors are very important, for example, synthesis and characterisation.
Firstly, zinc oxide synthesised directly on FTO/ITO-coated glass substrates in a horizontal furnace at a low temperature, where the nanowire growth followed a self-catalytic the same vapor–liquid–solid mechanism [33]. Figure 4 shows schematic of nanowire synthesis [34]. Moreover, quartz tube was mounted on a single-zone furnace that almost constant temperature heating zone of about 13 cm long. Also in Figure 4, a particular designed cylindrical source container with an inner diameter of almost 1.4 cm, outer diameter of 2.0 cm, as the length of 2.5 cm was used in this experiment. The container including 0.3-g zinc powder as the material was placed at the center of the chamber. FTO-coated glass substrate with a size of almost 1.0 × 1.5 cm^2 was first cleaned via acetone and isopropyl alcohol. In addition, substrate covered via a Si_3N_4 mask with around 0.5 × 0.5 cm^2 opening in the center.

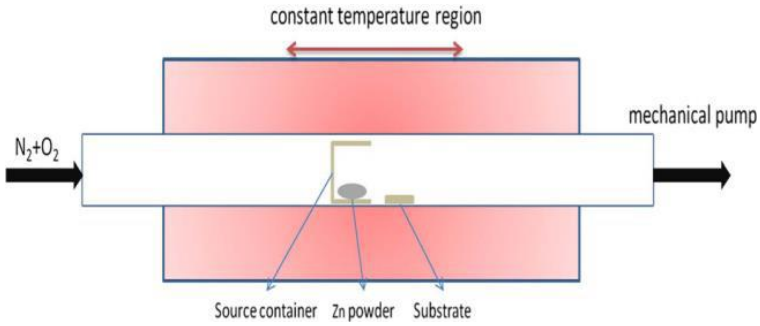

Figure 4: Schematic of the system setup for nanowire synthesis [35]

Synthesis of growth, the ZnO nanowire, is a vital matter, because it is one of the applications for fabrication of solar cell. Also, chemical vapor deposition is an interesting method for fabricate ZnO nanowire. For instance, J. Baxter et al. worked about growth ZnO nanowires on fluorine-doped tin oxide (FTO) substrate [36]. In addition, transparent conducted substrates that were seeded with a thin film of ZnO nanoparticles, as in the work by Greene [37]. ZnO seed nanoparticles with diameters ranging from 5 to 10 nm were synthesised according to the method described by Pacholski [38]. Furthermore in a study by D.I. Suh, a silicon wafer prior to the ZnO nanowire growth, the samples were cleaned by acetone/isopropyl alcohol sonication and then coated with a layer of Au thin film (2 nm) using an electron-beam evaporation [15]. Following this coating, zinc acetate dehydrate (99.999%, Aldrich Company)

was also coated on the substrate, by prior to the ZnO nanowire growth, the samples were cleaned by acetone/isopropyl alcohol sonication and then coated with a layer of Au thin film (2 nm) using an electron-beam evaporation. Following this coating, zinc acetate dehydrate (99.999%, Aldrich Company) was also coated on the substrate, by dip coating several times in a concentrated ethanol suspension. The additional coating of zinc acetate dehydrate on the both the Si and FTO glass substrates was used as seed nanoparticles for the vertical and branched structures of ZnO nanowire growth. Dip coating several times in a concentrated ethanol suspension. The additional coating of zinc acetate dehydrate on the both the Si and FTO glass substrates was used as seed nanoparticles for the vertical and branched structures of ZnO nanowire growth.

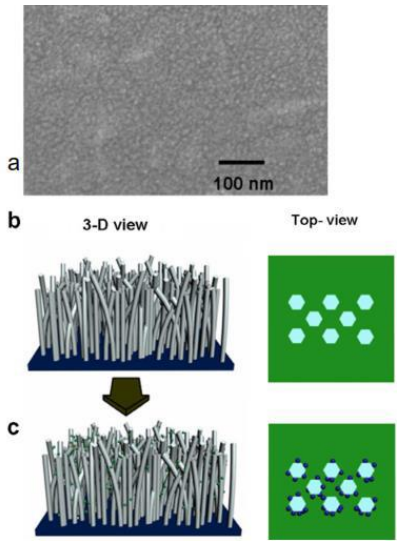

Figure 5: (a) A field-emission scanning electron microscopy (FE-SEM) image of zinc acetate dehydrates seeds coated on the Si substrate. The coated substrate was dried at 350 ºC for 20 min. Schematic diagrams (3D and top-view) of the fabrication processes (Step (b–d)) for the branched structures of the ZnO nanowires dye-sensitized solar cells (DSSCs) on the fluorine-doped SnO (FTO) glass substrates. (b) Vertical growth of the ZnO nanowires on the substrates. (c) The coating of the zinc acetate dehydrate Nanoparticles (seeds) on the substrates containing the vertically or randomly grown ZnO nanowires [15]

Secondly, one of the most important sections in growth of the zinc oxide is characterisation and it plays an important role for its use. Zinc oxide has several applications which one of the important applications that is to making solar cells. We review examples of zinc oxide to find a rule for full and comprehensive access. Such as Pai-Chun Chang et al. reported after synthesis, material characterisations, including electrical transport and electron microscopy measurements were performed [39]. The objective was to distinguish the carrier concentration difference and morphology change between the nanowires grown.

RESULTS AND DISCUSSIONS

One of the simplest way for fabrication ZnO nanowire is thermal evaporation that depositing material onto a substrate. Also, one major disadvantage of this method is that a lot of material is lost in the process. Purity of the thin film depends on the purity and quality of the source material and the thickness of the films vary according to the geometry of the vacuum chamber. In addition, another simple and cheap way for growth of nanowire is chemical vapor deposition. In the Table 2 using of materials, advantages and disadvantages of two different methods fabricated nanowire compared to each other.

Table 2: Table for Comparison of Two Methods Thermal Evaporate and Chemical Vapor Deposition.

Method	**Materials**	**Advantages**	**Disadvantages**
Thermal evaporate	Aluminum, chromium, copper, gold, nickel, cadmium, palladium, titanium, molybdenum, tungsten and tantalum	Simple and cheap. Less substrate surface damage. Excellent purity of films	Low melting point metals. Density and Adhesion are poor. It is not possible to evaporate the Di-electric materials. Lost of material.
CVD	Alloys, nitrides, oxides, nano-composites, semiconductors and intermetallic compounds	Produce extremely dense, films are highly uniform, processing is at low temperatures	Toxic, corrosive, flammable, low pressure or ultrahigh vacuum

CONCLUSION

In the present review article, described two methods, thermal evaporation (physical) and chemical vapor deposition (chemical) for thin films fabrication. It is clear that, thermal evaporation method is one of the oldest methods, but second method is simple, inexpensive, and suitable for large area deposition for good quality thin films. The data presented in tabular form indicate that the film formation could be carried out on various substrates. The physical and chemical properties of such semiconductors are comparable with the semiconductors prepared by other methods devices such as solar cells, photoconductors, detectors and solar selective.

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DETERMINING DEMOGRAPHIC PROFILES AND TOURISTS' MOTIVES FOR VISITING LANGKAWI ISLAND

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ABSTRACT

The purpose of the study is to address the profile of tourists visiting Langkawi and determine the motives of tourists visiting Langkawi. Using a quantitative research approach, data were collected from 340 respondents visiting Langkawi using the Leisure Motivation Scale (LMS) [1]. Data were analysed using descriptive statistics and t-test. The results showed that there were two kinds of tourists visiting Langkawi: sports tourists and non – sports tourists. The majority of sports tourists (72.9%) from the age of 22 up till 28 years of age was more interested in sports tourism and was found to be losing their interest in sports tourism at around the age of 28 to 33 years of age. Results also showed that there are no significant differences in terms of motives between sports tourists and non-sports tourists traveling to Langkawi. The information obtained from this study can be used by people in the sports tourism industry to implement it into their marketing segmentation by targeting the right type of tourist coming to Langkawi.

Keywords:
Tourist, Motives, Langkawi

INTRODUCTION

Malaysia nowadays is well known for organizing any kind of sports event, with its fully-equipped and sophisticated sports facilities which are now available to be used. Nowadays, Malaysia has become increasingly active on promoting itself as an event organiser by hosting various international world-class sports events and recreational activities [2].

There are many other interesting places in Malaysia that also provide facilities where sporting activities can be done, and at the same time be visited by tourists. One of those places is Langkawi. "Langkawi is suitable as an international sporting destination as it has numerous facilities" said Tun Mahathir [3]. Sports tourism can contribute to the development of a country. A small and developing country has the potential to be developed as a location for international sports organisation based on its natural resources. Furthermore, various aspects such as the infrastructure, services, and resource economics can be developed from an area. Among them, organising events such as Le Tour de Langkawi, Langkawi International Formula Jet Ski Super Series, Royal Langkawi International Regatta, Asian Sailing Championship, Langkawi International Mountain Bike Challenge, Paintball World Cup Championship, Ironman Malaysia Triathlon, Langkawi Water Festival, and Langkawi has one of the best sports facilities infrastructures in the world.

Besides having a list of sports events for the sport tourists to participate in or watch, Langkawi has a lot of other sports attractions that offers a lot of benefit for tourism in Malaysia.

Beaches, mountains and jungles are some of the beautiful and unique natural resources that can be enjoyed through sports and recreational purposes. As a result, tourists are given the opportunity to enjoy sports and recreation activities in Langkawi. Water sport activities such as snorkelling, scuba diving, jet skiing, parasailing, and kayaking in Cenang, Kok, Tengah and Teluk Burau beaches are the many things that tourists can participate themselves in. On the other hand, tourists are welcomed to do activities like jungle trekking, rainforest canopy adventure, horse riding, go-carting or caving at the Langkawi Geopark. In addition, there are three golf club courses in Langkawi which are known as Langkawi Golf Club, Gunung Raya Golf Resort and Danau Bay Golf Club which each golf club offers different types of golfing style. Of all the attraction that Langkawi have had, the number of the tourists' admittance has been increasing year after year. The number of tourists visiting Langkawi has been increasing from 2006 to 2008 [4]. It shows a positive future and these advantages may contribute maximum profit income to the country.

According to the tourists' sports literature, there are differences in either participating actively or passively in the sport tourism event. Hence, it will be better to try to define the differences between active and passive sport tourists [5]. Sports tourism is defined as "All forms of active and passive involvement in sporting activity, participated in casually or in an organised way for non-commercial or business/ commercial reasons, that necessitate travel away from home and work locality" [6]. Nevertheless, no attempt has been made based on demographic profiles to compare the differences between these two groups of tourists.

Furthermore, sport tourists' motivation need to be investigated. Motivation has been referred to as a need or desire that energizes behaviour and direct it towards a goal [7]. A number of disciplines have assisted in the explanation of the phenomena and characteristics related to motivation. Beard and Ragheb developed a model called the Leisure Motivation Scale (LMS) which tried to divide the motivators into four types based on the work of Maslow [1, 8]. The scale measuring the following dimensions of travel motivation: 1) intellectual (to extent to which an individual is motivated to travel to be involved in activities such as exploring, discovering or creating); 2) social (the extent to which an individual travels because of the need for friendship and interpersonal relationship); 3) competence mastery (the extent to which an individual engages in tourism activities that is challenging, achievement-oriented or competitive in nature; 4) stimulus avoidance (the extent to which an individual needs to escape and get away from over stimulating situations.

PROBLEM STATEMENT

One type of study that is often conducted in the early stage of strategic development process of sport tourism industry is the examination of sport tourists' demographic profiles. In the implementation of effective market segmentation and targeting, the information on the specific characteristics of sport tourists is crucial to have even though that the sport tourism is rapidly growing in Langkawi. Researches on tourists' profiles and travel motivations are still lacking. To implement effective market segmentation and targeting is rather impossible to do for the sport tourism industry as the information needed is not yet completed. According to Hanafiah, understanding peoples' motives is important in promoting tourism, since it provides a better explanation of the motives behind tourists' behaviours, it also enables tourism planners to predict tourists' actions [9]. A disregard for market research has often showed in the poor development of sport tourism in Langkawi. By an extent of our understanding about sport tourists' profiles, the authorities, marketers, and service providers of Langkawi, Langkawi

tourism will gain valuable data to implement effective market segmentation and targeting as well as underestimating the potential and sustainability of the sports industry in Langkawi. To identify the segments of the sport tourism market is very crucial to the Langkawi tourism industry. It determines how the tourists make vacation decisions and by identifying the specific characteristics of tourists who visited a particular destination in Langkawi or may have engaged in certain activities while on vacation. Information in terms of their profiles and characteristics, motivation of visiting Langkawi as a sport tourist and activities involved while on vacation on the sport tourists, may be needed as well.

RESEARCH OBJECTIVES

The general objective of this study is to obtain sport tourists comprehensive information related to the profiles visit to Langkawi. Specifically, the objectives of the study are:

1. To examine demographic profiles of tourists' visiting Langkawi.
2. To identify tourists' motive visiting Langkawi.

METHODOLOGY

A self-administered questionnaire was distributed to the tourists who are visiting Langkawi. The subject was comprised of a convenience sample of 340 tourists visiting Langkawi. The demographic profile of the tourists is shown in Table 1. The survey instrument consists of two sections. The first section was asked about demographic profiles of the tourists. The second part of the instrument consists of shortened version of the Leisure Motivation Scale (LMS) developed by Beard and Ragheb measuring the following dimensions of travel motivations: intellectual (the extent to which an individual is motivated to travel to be involved in activities such as exploring, discovering or creating), social (the extent to which an individual travels because of the need for friendship and interpersonal relationships), competence-mastery (the extent to which an individual engages in tourism activities that is challenging, achievement-oriented or competitive in nature), and stimulus-avoidance (the extent to which an individual needs to escape and get away form over-stimulating situations) [1].

RESULT AND DISCUSSION

A self-administered questionnaire was distributed to the tourists visiting Langkawi. A total of 400 subjects were given a survey and 340 subjects have responded to the survey provided. The total number of tourists who participated in this study is 340 subjects which are divided by two categories: sport tourist (n=248, 72.9%) and non-sport tourists (n=92, 27.1%). Table 1 and 2 discussed about demographic profile of sport and non-sport tourists visiting Langkawi.

Table 1: Demographic Profiles of Sport Tourists Visiting Langkawi

Demographic Profiles Sport Tourists (n=248)		**Frequency**	**Percentage (%)**
Nationality	Domestic	185	74.6
	Foreign	63	25.4
Ethnic	Malay	179	72.2
	Caucasian	34	13.7
	Chinese	18	7.3
	Indian	9	3.6
	Asian	8	3.2
Age (M=31.43, SD=10.32)	22-28	97	39.1
	28-33	43	17.3
	33-40	31	12.5
	17-22	29	11.7
	40-45	19	7.7
	45-50	14	5.6
	55-60	6	2.4
	50-55	6	2.4
	60 & above	3	1.2
Gender	Male	130	52.4
	Female	118	47.6
Marital Status	Single	127	51.2
	Married	108	43.5
	Widowed/ Divorce	13	5.2
Level of Education	High School	66	26.6
	Bachelor Degree	56	22.6
	Diploma	55	22.2
	Certificate	37	14.9
	Master/PhD	25	10.1
	Elementary School	9	3.6
Occupation	Company Employee	108	43.5
	Government Servant	54	21.8
	Student	39	15.7
	Self-Employed	29	11.7
	Retired	6	2.4
	Unemployed	9	3.6

	Others	3	1.2
Monthly Income	RM1000-2999	98	39.5
	RM3000-4999	40	16.1
	RM7000 and above	24	9.7
	RM5000 - 6999	18	7.3
	Less than RM999	9	3.6

From the total number of the sport tourists (n=248), majority of them were domestic sport tourists (74.6%) and foreign sport tourists (25.4%). Majority of the sport tourists visiting Langkawi were Malay (72.2%), males (52.4%), between the age of 22-28 years old (39.1%) consistent with Levinson theory of The Seasons of a Man's Life [10]. Levinson explains that males in their twenties are tending to be physically active equivalent with their youthful identity. As a result, they realised that they might be able to participate in some physical activities in Langkawi. About 51.2% of them are single and have less commitment towards family. Thus, they can actively participate in sport tourism activities. This result also suggest that sport tourists were high school educated (26.6%), occupied as company employee (43.5%) with the monthly income between RM1000-RM2999 (39.5%).

Table 2: Demographic Profiles of Non-Sport Tourists Visiting Langkawi

Demographic Profiles Non-Sport Tourists (n=92)		**Frequency**	**Percentage (%)**
Nationality	Domestic	65	70.7
	Foreign	72	29.3
Ethnic	Malay	63	68.5
	Caucasian	16	17.4
	Chinese	6	6.5
	Indian	4	4.3
	Asian	3	3.3
Age (M=30.04, SD=9.96)	22-28	38	41.3
	28-33	17	18.5
	33-40	9	9.8
	17-22	13	14.1
	40-45	6	6.5
	45-50	4	4.3
	55-60	2	2.2
	50-55	1	1.2
	60 & above	2	2.2
Gender	Male	43	47.8
	Female	48	52.2

Marital Status	Single Married Widowed/ Divorce	51 37 4	55.4 40.2 4.4
Level of Education	High School Bachelor Degree Diploma Certificate Master/PhD Elementary School	15 37 18 8 13 1	16.3 40.2 19.6 8.7 14.1 1.1
Occupation	Company Employee Government Servant Student Self-Employed Retired Unemployed Others	36 19 26 4 4 2 1	39.1 20.7 28.3 4.3 4.3 2.2 1.1
Monthly Income	RM1000-2999 RM3000-4999 RM7000 and above RM5000 - 6999 Less than RM999	21 24 10 6 3	22.8 26.1 10.9 6.5 3.3

From the total number of non-sport tourists (n=92), majority of them were domestic non-sport tourists (70.7%) and foreign non-sport tourists (29.3%). Majority of the non-sport tourists visiting Langkawi were Malay (65.5%), males (47.8%), between the age of 22-28 years old (41.3%), marital status single (55.4%), bachelor degree educated (40.2%), occupied as company employee (39.1%) with the monthly income between RM3000-RM4999 (26.1%).

Table 3: Motives of Sport Tourists and Non-sport Tourists Visiting Langkawi using t-test

Motives	**n**	**Mean**	**SD**	**t**	***Sig. (2 tailed)***
Intellectual				-1.059	.291
Sport tourist	248	4.087	.731		
Non-sport tourist	92	4.165	.559		
Social				.892	.374
Sport tourist	248	3.825	.844		
Non-sport tourists	92	3.736	.804		
Competence mastery				1.192	.235
Sport tourist	248	3.868	.797		
Non-sport tourist	92	3.736	.794		
Stimulus Avoidance				-.493	.622
Sport tourist	248	4.141	.751		
Non-sport tourist	92	4.183	.673		

*p < 0.05 significant difference

Table 3 shows that, there is no significant difference between sport and non-sport tourists with respect to the motives of visiting Langkawi. The results indicate that stimulus avoidance contributes the highest mean for both sport and non-sport tourists. This suggest that sport and non-sport tourists experienced high level of stimulation in their life as they are both sport and non-sport tourists are mostly occupied by company employee in private sector with stressful, challenge and orientate profit making working environment. This is why the sport and non-sport tourists seek for a vacation in order to satisfy their needs to escape the stress and pressure in their daily lives. In addition, the differences between both categories are that, the sport tourist participates more in sports and recreational activities whereas the non-sport tourists were more towards leisure activities, for example visiting historical place. Even though both sport and non-sport tourists are involved in different types of activities, in the end, both of them still share the same motive which is intellectual motive. They seek for new knowledge; new skills and new experience are more likely to be discovered for those who participate in competition in a different environment. The result also suggests that sport and non-sport tourists are motivated to have social and competence mastery motive at the least.

CONCLUSION

This study has important implications for tourism marketers in Langkawi. This paper has discussed an overview on profile of sport tourist and non-sport tourist and their motives on visiting Langkawi. A better understanding about motive and profile for both segments is crucial in order to develop and implement effective market segmentation and targeting. Besides that, strategic market segmentation may attract and convince the tourists to stay longer in Langkawi which then will increase the maximum profit of tourism in Langkawi. Conclusion drawn from this study should be considered in light of limitation imposed by small sample size. In order to be able to draw more conclusive conclusions, the study should be in a large sample size. This will then provide a more detail profile of tourist and motivation for this market and enable a more generalise application finding.

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DESKTOP VIRTUALISATION AS A TOOL TO SUPPORT IT VIRTUAL TEAM

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ABSTRACT
This paper provides an insight into the characteristics and benefits of desktop virtualisation to organisations implementing virtualisation services and solutions across their organisation. With the wide spread of technology and tremendous increase in organisations using cloud and virtualisation products to increase overall performance and serve clients efficiently, we can see a trend in more and more organisations implementing it and setting up virtual teams. Virtualisation which is part of cloud computing technology has extended from initially installing traditional software on a computer to use of internet and login username and password and directly access applications from anywhere and at any time. This study aims to add to the research in virtualisation and cloud computing technologies and discuss on the future implications of virtualisation.

Keywords:
Desktop Virtualisation; Virtual Desktop Infrastructure; Virtual Machine; IT Professional

INTRODUCTION

For most of us the word virtualisation is becoming very familiar especially when we have used software such as VMWare, Oracle VirtualBox and Citrix to run two or more operating systems and access our PC and stored files by using DropBox, GoogleDrive and LogMeIn. Virtualisation makes it possible to run multiple operating systems and applications from one single computer. This technology has emerged to our desktop environments as well.

Desktop virtualisation allows us to manage and control, through a central point, multiple client environments. It separates the desktop environment from the physical operating system itself and stores this desktop environment on a remote central server which then allows a user to work from their remote desktop and access and applications through it.

For large business organisations it is a guaranteed way to reduce hardware and support costs while delivering services to customers. It is also provide the potential for communication and collaboration of virtual teams.

LITERATURE REVIEW

In essence, system virtualisation is the use of an encapsulating software layer that surrounds or underlies an operating system and provides the same inputs, outputs and behaviour that would be expected from physical hardware. The software that performs this is called a Hypervisor, or Virtual Machine Monitor (VMM). This abstraction means that an ideal VMM provides an environment to the software that appears equivalent to the host system, but is decoupled from the hardware state [1].

According to Pearce, desktop virtualisation has two quite different usages.

1) Thin client - remote desktop usage which is similar to application streaming, except that it is targeted at the user experience. The entire operating OS appears to the user to be running locally, but is in fact running elsewhere. This is also referred to as Virtual Desktop Infrastructure (VDI).

2) System virtualisation in a Type-II environment - used by some to refer to the running of a virtualised machine on a standard workstation. Generally this is an incorrect usage of the term desktop virtualisation, as the whole OS is virtualised and not just the desktop.

A study revealed that virtualised infrastructure provides a layer of abstraction between computing storage, networking hardware and the applications running on it. Their study further explained that the deployment of virtual infrastructure is non- disruptive to the system, because the user experiences are typically un-noticed or unchanged. The authors concludes by emphasising that virtual infrastructure provide enterprise system management, the opportunity to manage pooled resources across the enterprise, thereby, allowing Information Technology (IT) managers to be more responsive to dynamic system needs to better leverage infrastructure investments [10].

Virtual teams can use computer-mediated communication technologiesto work interdependently across space, time and organisational boundaries. Virtual team members may be located across the office, but almost as easily across the country or across the world, and may rarely or perhaps never meet face to face. Town send, characterise virtual teams as "groups of geographically and/or organisationally dispersedco-workers that are assembled using a combination of telecommunications and information technologies to accomplish an organisational task" [11].

METHODOLOGY

This paper gathers data from the following sources:

- Primary data from the authors own experience in using the virtualisation systems
- Secondary data gained from online journals which discussed on virtualisation and virtual team.
- Secondary data from the Internet to extract some relevant information.
- Extracting some survey's findings which conducted by previous researchers to check the importance of the technology discussed and the benefits to the virtual team/IT Professional.

THE BENEFITS OF VIRTUAL DESKTOP

Desktop virtualisation has numerous benefits, including but not limited to data security, reducing cost and saving power consumption by limiting the number of clients systems to thin

clients. Its technology can prepare us for new client operating system migrations and also for moving to cloud computing. Desktop virtualisation is better in terms of speed and makes it easier to manage and to deploy new applications. A survey results which was conducted among IT professionals by Intel IT centre reports that the number one reason why organisations go for desktop virtualisation is due to security while reducing cost is second.

We asked IT professionals about the key drivers influencing their move to desktop virtualisation, and security was at the top of the list. While upper management has some security concerns about desktop virtualisation, IT views the technology as a way of improving client security (39 percent). Almost equally important are desktop management drivers, with lowering the cost of desktop management (38 percent) and improving overall client manageability (34 percent) ranking high on the IT professionals' list. Larger IT initiatives are also driving desktop virtualisation, as shown by the number of IT professionals reporting that they are virtualising both the server and client environments (36 percent) and those who see desktop virtualisation as part of their overall move to cloud computing (34 percent) [8].

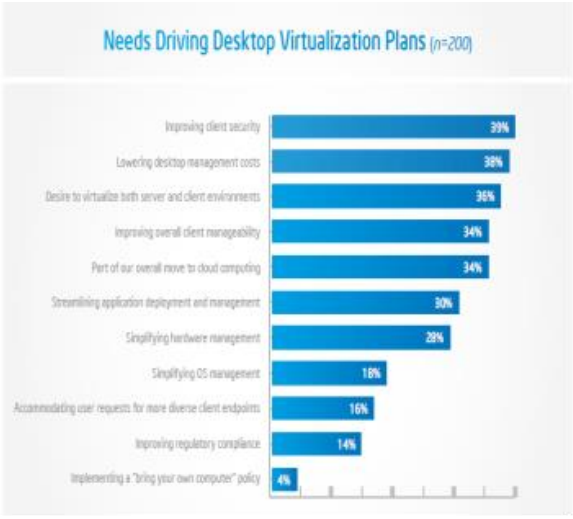

Figure 1: The Drivers to Virtualisation Plan
Source: Intel IT Center, September 2011.

4.1 Data Security

Many organisations have various systems with different applications and configurations, most of the time patching and securing these systems takes a huge amount of time and effort and during the process data might be lost or possibility of malware attacks on unpatched systems especially in large organisations with thousands of PC's for different user groups. This is where desktop virtualisation solves the problem by creating a centralised virtual desktop with all sets of applications and configurations whereby you can easily manage all the patches and security updates in a regular interval to ensure it is secured and also saves the time and task of updating each system one at a time. Desktop virtualisation also aids in risk of data leakage and theft by centralisation.

4.2 Cost Reduction

Reduce operational expenses by simplifying lifecycle management, including patching, provisioning, packaging and delivery [2]. Microsoft reports that desktop virtualisation reduces operation expenses and simplifies management and that more organisations are actively deploying desktop virtualisation today. It tends to reduce cost by reducing the number of clients, making it centralised and simplified management, controlled, easier to manage, patch, update, maintain, faster and reduces energy consumption costs.

4.3 Energy Saving

It simply provides more energy savings by reducing the consumption of organisation's numerous servers to only one centralised machine. Also when the user desktop goes to sleep a proxy server continues to host user's machine thereby saving more energy. In the United States alone, the Environmental Protection Agency reports that data centres consumed 60 billion kWh of power in 2006. The EPA also has calculated that if all computers sold in the United States met the Energy Star requirements, the total savings in energy costs would be around $2 billion [3]. Desktop virtualisation solution uses only 18% of the energy an average PC uses and even less when in sleep mode.

4.4 Disaster and Data Recovery

Virtual machines can revert back to their last known good states in case of disaster or crash occurring. It simplifies the storage of data and can be backed up easily, in case of crash or hard disk failure it can be reverted back easily. Storage space can be a problem especially when you have so many systems to maintain but virtual desktop makes it possible for a centralised storage which is easier to manage, organised and backed up.

4.5 IT Enterprises Utilising Virtual Team

A Virtual Team involves groups of people who work across time, space, and organisational boundaries using technology such as cloud computing and virtualisation to achieve task, communicate and make decisions that affects an enterprise. The virtual team must have skills and are committed to a common goal of an organisation, they must also share a common work ethic, even though they are geographically dispersed but with the use of virtualisation technology their task can be done efficiently without regards to time zone, destination.
Virtual team enables an organisation to coordinate task, faster communication, faster decision making and allows for entrepreneurs to share knowledge and ideas. Benefits that virtual teams provide: Emphasize teamwork skills - "In order for virtual teams to achieve their greater potential (and take advantage of their functional and structural diversity), members must first and foremost be able to establish a basis for the effective exchange of their varying capabilities — all of which requires teamwork-related skills as a critical ingredient. Otherwise, the virtual team could very likely perform worse than a collocated group. Thus, managers need to consider teamwork skills as a necessary attribution when selecting the members of a virtual team". Provide for face-to-face meetings, "Periodic face-to-face meetings of dispersed team members can be particularly effective for initiating and maintaining key social processes that will encourage informal communication, team identification and cohesion". Foster a "global culture

- "Our research suggests that a global mind-set, in which people see themselves as part of an international network, helps provide an environment that is conducive to dispersed teams" [6].

4.6 Desktop Virtualisation and Virtual Teams

Using desktop virtualisation can benefit virtual teams in several ways. Communication is very important to ensure that all tasks are done on time. Usually virtual teams are dispersed across the geographical destinations but by use of desktop virtualisation these individuals can work from any location.

One important software that supports virtual team and utilises virtualisation technology is TeamViewer. TeamViewer, is a leading software for remote control and online meetings. In a study of TeamViewer benefits to schools emphasised that 'TeamViewer is the perfect IT tool for universities, and any organisation that demands high security requirements to protect sensitive data and define access rights,' said Kornelius Brunner, Head of Product Management, and TeamViewer. IT departments like the team at St. Edward's choose TeamViewer because it delivers a comprehensive solution for their remote access needs, gives staff flexibility with the devices they choose to work on and has strong reporting and logging capabilities." TeamViewer offers St. Edwards University a cost management advantage by allowing them to purchase software licenses based on the number of administrators rather than the number of people being supported. Using TeamViewer, the university was able to purchase five licenses to serve the needs of more than 1,000 users. Prior to TeamViewer, the university worked with another remote access tool to solve faculty and staff IT problems, until they began to experience issues stemming from the platform itself " [7].

VIRTUAL DESKTOP INFRASTRUCTURE

Virtual Desktop Infrastructure (VDI) provides enterprise class control and management of desktop virtualisation. Built by VMware one of the big names in virtualisation software and solutions. VDI is the leading platform that provides efficiency and reliability for virtual desktop environments. It improves data security and reduces hardware expenditures and also allows centralised patching and application installation without loading the network. Another feature is its portability whereby users can reconnect from any location from different devices. VDI utilises resource pooling.

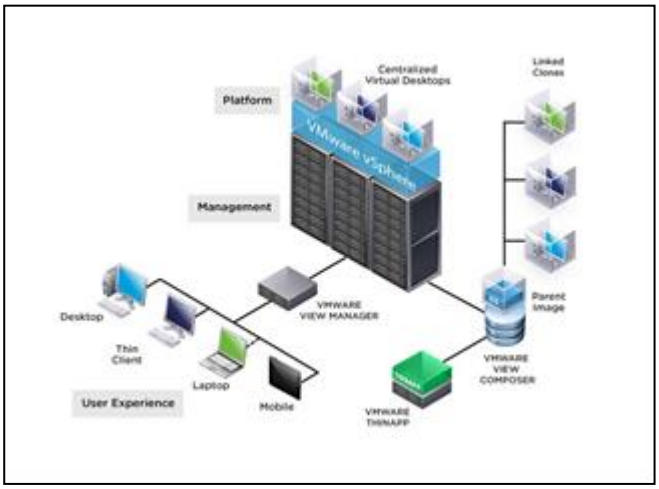

Figure 2: Virtual Desktop Infrastructure.

Source: [5]

Key features explained

- User Experience: Users get a virtual desktop that is exactly like normal PC, no change to applications or desktop.
- VMWare View Manager: This is where the administrators can control and manage client environments, allow users to install applications, customize their desktop and use printers and usb devices.
- VMWare ThinApp: It speeds up application deployment and makes it easier for application migration.

VMWare ViewComposer: It provides advance virtual image management whereby saving disk space. You can update and patch hundreds of desktops from a single master image while retaining user settings and configuration.

CHALLENGES FACED USING VIRTUALISATION

- Scalability

Scalability is a challenge because of balancing load and balancing connections especially for an increasing number of concurrent users. The need to ensure that a user does not loses their session which would cause loss in their work. Also, virtual desktops although they behave like physical systems while delivering better performance, security, and user experience it is important to remember that its technology is different and needs to be treated in that respect.

- Secure Remote Access

The problem of secure remote access occurs since users will have access to the entire application environment once you log in. The use of authentication and authorisation through SSL VPN is required to provide more control.

- Authentication and Authorisation

You need authentication and authorisation to remote access to your desktop environment. Without this there is a possibility of making your system vulnerable to attacks and malwares.

FINDINGS

According to Opara and Soluade, Enterprise IT practitioners find that virtualized environments create new general conditions which require new operational processes that create new demands for management solutions. The future requirements on new virtualized infrastructures in enterprise systems should be key indicators as to which components and products are appropriate for implementation. The authors concluded that IT Practitioners should conduct a precise analysis of risks relating to various operating processes as part of virtualisation project in mid-size and small organisations. Emphasis should be made in relations to the variants, about how many of enterprise virtual machines are to be run on real servers and identify the implications if the servers unexpectedly fail due to unforeseen circumstances.

In general, desktop virtualisation delivers benefits to business and end users. IT professional see its benefits throughout the organisation and in a survey conducted by Intel IT Center the graph below shows the expected benefits of desktop virtualisation.

Figure 3: Benefits of Desktop Virtualisation
Source: Intel IT Center, September 2011.

According to Berry, virtual teams can amplify both the benefits and downsides of traditional teamwork. On the positive side, virtual teams that are designed, managed and implemented effectively can harness talent and knowledge from anywhere in the world to solve problems and complete work tasks on a 24/7 schedule. However, if these teams are poorly designed and managed, the team dynamic may be weak or even fail, and outputs might be inept or non-existent. Organisations must consciously create the conditions for effective virtual teamwork, and the success or failure of virtual teams (or the organisation itself) may well be a

consequence of inept leadership or management more than a consequence of technology or other factors [11].

CONCLUSION

Intel report concludes that forty-two percent believed that desktop virtualisation increases user productivity by enabling workplace flexibility and decreasing downtime. More IT professionals believe that desktop virtualisation will deliver better business outcomes by enabling employees to use the right tools (34 percent) than believe desktop virtualisation will reduce money spent on client hardware (32 percent). At the bottom of the list—though still important to 13 percent of IT professionals—is the ability for them to say yes to senior business management who want IT to support new client types, such as tablets [1]. Desktop virtualisation is highly recommended to IT professionals in their organisation to help them reduce their work load by providing the various advantages we discuss in this paper and also improving their overall efficiency and IT services. However, problems commonly encountered using virtual desktop includes security, scalability, complexity and persistence.

Virtualisation technology enables virtual team to work closely and encourages collaboration and be able to access from anywhere and at any time. It is hoped that organisations planning to cut cost and implement virtualisation can consider the benefits of virtualisation and use of desktop virtualisation to increase performance while reducing costs.

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FOOD LABELS BASED ON THEORY OF PLANNED BEHAVIOR IN KLANG VALLEY

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ABSTRACT

The Theory of Planned Behavior (TPB) is used as a theoretical framework with an objective of explaining the consumer purchasing behavior which is affected by the uses of food labels for food products in Klang Valley, Malaysia. 300 respondents representing diverse Malaysian consumers were obtained using stratified random sampling technique. The study used primary data collected through self-constructed questionnaires. The study used descriptive analysis, reliability test and factor analysis to identify the impact of food labels on consumer purchasing behavior. The overall results which are based on the TPB model indicate that the uses food labels have positive significance towards the purchasing behavior of consumer.

Keywords:

Theory of Planned Behavior, Food Label, Consumer, Purchasing Behavior

INTRODUCTION

Recent years have shown an increasing interest of academicians and also consumers towards food labeling and consumer behavior in purchasing the food products. Food labels have become important instruments in purchasing numerous products in market by consumers. Food labels are the most important in adding value to a particular product. Consumers are more confident in buying food with labels as compared to unlabeled packaging. Food label varies from brand, logo, price, expiry date, nutritional value, ingredients to specific labels like genetically modified organism (GMO), eco-friendly and organic products.

Food labels are very useful for the consumers to make healthy choices in purchasing foods by comparing the nutritional value, preventing the high amount of fat, sugar and cholesterol in the food product and choosing food with higher in vitamins, fiber and protein (LaBarbera, 2012). Besides, the ingredient label can help the consumers to prevent any unwanted ingredients that might have allergic elements, or forbid ingredients based on religious. Aside from consumers, the food industry also gains benefits from nutrition labels as the food manufacturers and retailers are able to give an emphasis to the nutritional facts of the products to the consumer (Nutrition Society of Malaysia, 2012).

In Malaysia, the current studies on the impact of purchasing behavior of Non-Muslim consumers (Abdul Latiff et al., 2013a), the awareness of Muslim consumers on food labels (Abdul Latiff et al., 2013b), the impact of Halal brand personality towards consumers' purchase intention (Barzooei &Asgari, 2013), and the impact of Halal logo as an advertisement and a

signifier of third-party certification for non-Muslims consumers (Hassan & Hamdan, 2013) suggest that food labels specifically Halal label had an impact on the consumer behavior in purchasing food products.

There are many health issues related to purchasing the processed food product. According to Tao (2010), the adaptation of healthy food environment and consumers' dietary intake were caused by growing obesity problems among consumers worldwide. Thus, food labels help in choosing the right food products according to one's healthy preferences. This study will look into the impact of food labels as a whole on consumer purchasing behavior by using the Theory of Planned Behavior (TPB) as the theoretical framework to assess subjective norms, attitude, and intention of consumers in purchasing food products.

LITERATURE REVIEW

The purchasing behavior of the consumers is highly influenced by the food labels' credibility (Lee & Lee, 2004). Stuart (2010) stated that the food labels were obviously intended to influence the purchasing behavior of the consumers at point of purchase using the relevant information provided on the food packaging. Each food label plays an important role in consumers' intention towards their purchasing behavior.

Nutrition label is currently a must for any processed food products concerning healthy dietary habits among consumers. It is very important for consumers to be presented with essential nutritional information of the food products in order to make a better decision in choosing the healthiest food which influences their purchasing behavior (Mackison et al., 2008; Abdul Latiff et al., 2013b; Norazlanshah et al., 2013). Study by Norazlanshah et al. (2013) proved that the nutritional value labels on food products affect food purchasing behavior of the consumers. Tao et al. (2010) stressed out that nutrition label is very important as an education tool to promote and enhance the nutrition knowledge of consumers.

Besides, with the increase of halal products and services demand and the growing number of Muslim population worldwide, halal labels have become pertinent for global halal markets (Asmat-Nizam & Ili-Salsabila, 2013). Halal labels also caught the attention of Malaysian consumers which consist of Muslim and non-Muslim consumers. In Malaysia, halal certification is provided by Malaysia's Department of Islamic Development (JAKIM). Current studies by researchers had suggested that the halal labels are crucial in affecting the consumers' purchasing behavior for food products in Malaysia. (Abdul Latiff et al., 2013a; Abdul Latiff et al., 2013b; Barzooei & Asgari, 2013; Hassan & Hamdan, 2013).

Eco-friendly labels have also become one of the marketing sensations in promoting food products by manufacturers and retailers. Present environmental concerns towards global climate change by consumers clearly affected the consumers' purchasing intention. Based on a previous study by Nik Abdul Rashid (2009), he had concluded that eco-friendly label is essential for consumers to make a right purchasing decision when the environmental aspects are being considered. Additionally, knowledge on green products is very important in consumers' purchasing behavior for green products (Shahnaei, 2012). Eco-friendly label itself will also provide clear information about the food products and indirectly enhance the consumer knowledge on green products (Nik Abdul Rashid, 2009).

Therefore, Malaysian consumers are generally exposed to the importance of variety of food labels. According to Tee (2003), prepared cereal foods, bread, milk and powdered milk products, canned meat; canned fish, canned vegetables, canned fruit and fruit juices, soft drinks and botanical beverages are several food categories that require food labels in Malaysia.

However, the consumer awareness towards the food labels needs to be assessed to ensure the benefits of food labels is entirely practiced in the consumers' purchasing decision. The full advantage of food labels should be taken by consumers related to their purchasing behavior.

METHODOLOGY

Theoretical Framework

The TPB is an extension of the theory of reasoned action (TRA) made necessary by the original model's limitations in dealing with behaviors over which people have incomplete volitional control (Ajzen, 1991). However, TRA did not take into account the perceived behavior control as the TPB did. Theory of Planned Behavior (TPB) was used as a model to conduct this study. TPB model helps in determining the consumers' purchasing behavior by relating the existence of the food labels with their intention in purchasing the food products.

According to Alam and Sayuti (2011), the intention of buying the products was basically influenced by the subjective norms, awareness, attitude and perceived behavior control of the consumers. TPB is considered as relevant in studying consumer preferences in buying food products as it has been successfully applied by many researchers in their previous studies (Karijin et al., 2007; Alam & Sayuti, 2011; Rezai et al., 2012; Abdul Latiff et al., 2013).

Sampling Method and Procedure

Questionnaires were used as the primary data collection method in this study. The questionnaires had been constructed beforehand and distributed to the respondents in Klang Valley. The sampling was done using stratified random sampling technique which involved 300 respondents in total. The demographic information was identified. The consumers' awareness, attitude, subjective norms, perceived behavior control and purchasing intention were also identified using Likert scale in providing a quantitative measure for the constructed questions as proposed by Boone and Boone (2012). Seven Likert-type items were used which are Strongly Disagree (1), Somewhat Disagree (2), Disagree (3), Neutral (4), Somewhat Agree (5), Agree (6), and Strongly Agree (7).

Analysis Method

The analyses of the study consisted of descriptive analysis, reliability analysis and factor analysis which were carried out using SPSS software. Descriptive analysis was conducted to analyse the demographic information of this study which includes residential area, age, gender, marital status, education, race, occupation, income, and lifestyle.

Reliability analysis was done to estimate on the consistency of the data and the Cronbach's alpha was used as the index for the reliability of the data (Tavakol & Dennick, 2011). As suggested by Nunnally (1978), the Cronbach's alpha of the reliability test should have a minimum value of 0.6 for the data to be considered as consistent in the early stage of research. These data were further analysed with factor analysis to analyse the awareness, attitude towards food label, subjective norms, perceived behavior control and intention of all the respondents.

RESULTS AND DISCUSION

Demographic Information

The study covered 300 Malaysian consumers whot lived in urban areas (63.7%) and suburban areas (32.7%) in Klang Valley. The respondents consisted of 43.6 percent male and 53.7 percent female. Majority of the respondents are Malay (55.6%) which followed by Indian (30%) and Chinese (14.5%). Thus, the respondents' races were consistent with the percentages of the respondents' religion which were Islam (57.7%), Hindu (24.7%), Christian (9%), and Buddhist (8.7%). Based on the surveyed data, the respondents came from different education background where most of them having a degreel (47%) and the rest of the respondents varied ranging from primary, secondary, diploma, and postgraduate levels.

The highest contributors of the total number of respondents were married with 69.7 percent while single respondents were 30.3 percent. The occupation of the respondents were varied: public sector (46%), private sector (43.3%), self-employed (10%), retired (3%) and housewife (3%). Different respondents practiced different lifestyle environmental activities (17.0%), physical activities (23.3%), health consciousness (27.3%), and religious awareness (32.3%). Thus, understanding the socio-demographic information is important in understanding the consumers' purchasing behavior on specific group of consumers (Mackison et al., 2008).

Reliability Test

This study utilised 57 variables after factor analysis which was used to measure the attitudinal characteristics of consumers and their attitude, knowledge and awareness, subjective norms, perceived behavioral control and intention. The result of Cronbach's Alpha for this study shows a strong and positive consistency on the data collected (Table 1).

Table 1: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
0.964	0.966	57

The Cronbach's Alpha value estimated was 0.964 which was higher than the index of reliability test (0.6). This shows that there is consistency among the Theory of Planned Behavioral items used in the study and it can conclude that the model is fit for this study.

Factor Analysis

Results derived from Factor Analysis (FA) provide a confirmatory test of measurement theory for the constructs and explains how the variables that are being measured logically and systematically represent the constructs that are involved in the theoretical model. The overall results of KMO and Bartlett's Test show that the model is fit with the collected data (Table 2).

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.925
Bartlett's Test of Sphericity	Approx. Chi-Square	18149.871
	df	1596
	Sig.	0.000

In this regard, the Kaiser- Meyer-Olkin Measure of Sampling Adequacy (MSA) shows a value of 0.925 which is greater than the above minimum requirement (0.50). Theoretically, the overall (MSA) result shows an evidence of strong and adequate correlation among the items used in the study. Using the FA on the responses collected from 300 respondents, the study accomplished a five-factor solution accounting for 68.557 percent of the total variance explained. In general, the homogeneity of the construct was maximal (i.e. 1.00), each generating one component with Eigen values greater than one.

CONCLUSION

The main objective of this study is to determine the impact of food labels on consumer purchasing behavior by using the theoretical framework of Theory of Planned Behavior (TPB) among Malaysian consumers in Selangor. The TPB model of the study explained 68.56 percent of variance in the consumers' intention in purchasing labeled food products. Hence, the result on the impact of food labels on the consumer purchasing behavior is positively significant. TPB can be considered as an effective model in predicting the consumer purchasing behavior. Thus, this model is recommended on studying the relationship of food label products with the consumer purchasing behavior as it helps in demonstrating the importance of food labels in consumer purchasing decision.

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MEDIATING ROLE OF TECHNOLOGY AWARENESS ON SOCIAL INFLUENCE – BEHAVIOURAL INTENTION RELATIONSHIP

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ABSTRACT
Behavioural intention has received a tremendous attention in the technology adoption literature. Thus empirical studies have found a number of factors as influencers of behavioural intention, which included Social Influence, Technology Awareness among others. However, there is sparse of literature that examine the mechanism through which Social Influence predicts Behavioural Intention, especially given the fact that previous studies have resulted in conflicting findings. This study proposed and examined the mediating role of Technology Awareness on the aforementioned relationship. Available data from owners and managers of Nigerian retail industry, on the use of Point of Sale terminal, were analysed using Partial Least Squares – Structural Equation Modeling technique, with SmartPLS 2.0 software. Measurement model was assessed based factor loading, average variance extracted and composite reliability using standard PLS algorism, while the structural model was assesses based on coefficient of determination, effect sizes and predictive relevance using bootstrapping procedure and blindfolding. The direct effect was significant, but absorbed when the mediating variable was introduced, therefore we assessed the mediating effect based on variance accounted for. Technology Awareness was found to have significant mediating effect on the relationship between the two constructs; hence we offer recommendations to stakeholders, highlight limitations of the current study and chart way for future research.

Keywords:
Retail, Mediating Role, Technology Awareness, Behavioural Intention, PLS – SEM

INTRODUCTION

The volume and value of cash-based transactions are increasing in Nigeria (Ayo & Ukpere, 2012; Chima, 2011). The CBN introduced the cash-less policy to curtail the excess cash (Agboola, 2012; Ilesanmi, 2012; Yaqub, Bello, Adenuga, & Ogundeji, 2013), however, there is resistance to change to the alternative electronic payment channels, such as the POS, as the usage was put as 6% (Adepetun, 2012). Ironically, change is an inevitable phenomenon for all businesses, to survive it, business enterprise must embrace change (Ahmad, 2012; Drucker, 1969; Hamel, 2000; Mintzberg, 1988; Toffler, 1970). Interestingly, one of Kotter's eight (8) steps to change is Sense of Urgency (SU). It is argued that personal attributes such as behaviour should lead the execution of what the change brings (Belasco, 1990; Harari, 1996; Kotter, 1995, 1996). Furthermore, Plouffe, Hulland, and Vandenbosch (2001) defined behavioral intention as "respondent's sense of urgency for formally adopting an innovation after it becomes broadly available" (p. 212). As SU is linked to Behavioural Intention (BI), thus calls for research to examined user BI.

THEORETICAL BACKGROUND

Biola and Dan (2012) argued that behaviors of Nigerians are usually controlled by the actions of others, whom they have a high regard for, such as friends, parents, religious leaders, sports personalities, teachers, and politicians and celebrities. Their behaviors are also reactive to the influence of television, radio, internet, social media and print media. It is therefore appropriate to conclude that the resistant to change to e-payment systems by merchandise in Nigeria can be associated with lack of adequate infrastructure to support the use of the system, fear of uncertainty of the performance of the system and the required effort and influence of people who are important to others. Therefore there are substantial justifications to theorise that UTAUT construct, Social Influence is related to the Nigerian context, thus this study conceptualised that it influences the adoption of technology in the said context. Furthermore, information and communication technology experts in Nigeria believed that prospective users of POS are not aware of the system. If there is awareness, the penetration of the system will be high (Ilesanmi, 2012). It can be deducted here, that the awareness might be the mechanism through which the social influence-behavioural intention works better. Interestingly, it is suggested that UTAUT should be further extended to enhance our understanding of behavioural intention phenomenon.

"This might take the form of additional theoretically motivated moderating influences, different technologies (e.g., collaborative systems, e-commerce applications), different user groups (e.g., individuals in different functional areas), and other organisational contexts (e.g., public or government institutions)"(Venkatesh, Morris, Davis, & Davis, 2003, p. 470).

BEHAVIOURAL INTENTION

Behavioural Intention is an important determinant of actual behaviour (Zhou, 2008), thus researchers have used several variables and models to examine similar phenomenon, for example; Abadi and Nematizadeh (2012), Mangin, Bourgault, León, and Guerrero (2012), Chen, Kuan, Lee, and Huang (2011), Ho and See-To (2010), Huh, Kim, and Law (2009), Li and Huang (2009), Kim, Ferrin, and Rao (2008), Troshani and Rao (2007), Rigopoulos and Askounis (2007), Nysveen, Pedersen, and Thorbjørnsen (2005), Van Slyke, Belanger, and Comunale (2004), Chang and Cheung (2001), W.W. Chin and Gopal (1995) etc. However, a number of them yielded a conflicting findings, (Alrawashdeh, Muhairat, & Alqatawnah, 2012; Birch & Irvine, 2009; Foon & Fah, 2011; Gao & Deng, 2012; Huang & Qin, 2011; Lai, Lai, & Jordan, 2009; Sumak, Polancic, & Hericko, 2010; Yamin & Lee, 2010). Despite previous researchers' attempts to explain the phenomena, however, there is need to further our understanding beyond what is known and understood (Venkatesh et al., 2003). "future research should focus on identifying constructs that can add to the prediction of intention and behaviour over and above what is already known and understood" (Venkatesh et al., 2003, p. 471).

SOCIAL INFLUENCE

The construct is originated from Fishbein and Ajzen (1975)'s TRA. Identified assubjective norm, the construct was later adopted in Davies, et al., (1989)'s TAM2, Ajzen, (1991)'s TPB/DTPB and Taylor and Todd, (1995)'s C-TAM-TPB. The three theories maintained the construct's name as subjective norm. However, it was subsequently modified in Thompson, et

al., (1991)' MPCU and More and Benbasat, (1991)'s IDT as social factors and social norm respectively. Upon review of these theories and identification of their similarities, Venkatesh, et al., (2003) named the construct social influence and defined it as 'the degree to which an individual perceived that others believe he or she should use the new system" (p. 451). Thus the current study defines it as the degree to which the behaviour of owners and managers of retail business is subjected to their perception that other people who are important to them think that they should use POS and that its usage will enhance their business image.

Social influence was proposed as a direct determinant of behavioural intention to use technology, although there is difference of significance influence between users in mandatory and those in voluntary settings Venkatesh, et al., (2003). Warshaw, (1980) stressed that the explanation for such differences is, in mandatory settings, rewards and punishment could trigger the user to behave according to the beliefs of their superior executives. A further variation was detected among different gender and experience levels of users (Venkatesh & Davis, 2000; Venkatesh & Morris, 2000).As declared by Biola and Dan, (2012), social influence plays an important role in shaping the behaviors of Nigerians, it is therefore expected that social influence can affect behavioral intention of retail managers in Nigeria. Thus it is important to empirically test Biola and Dan, (2012)'s assertion in order to confirm or reject their claim.

H1: There is significant positive relationship between social influence and behavioural Intention to use POS.

H2: There is significant positive relationship between social influence and technology awareness.

TECHNOLOGY AWARENESS

Mofleh, Wanous and Strachan (2008) defines awareness as citizen's knowledge about the existence and advantages of using the e-government. Similarly, a variable related to awareness is 'technology cognizance' (Nambisan, Agarwal & Tanniru, 1999). Rogers (1995) defined it as "user's knowledge about the capabilities of a technology, its features, potential use, and cost and benefits, i.e., it relates to awareness-knowledge" (p. 372). Based on the definition of awareness and technology cognizance, the current study coined and operationalized the construct as 'technology awareness' and define it as the merchant's knowledge of the existence, features, costs, benefit and simplicity or otherwise of using POS in their businesses.

Although there are no much study that examines the relation between awareness and behavioural intention, the few ones are reviewed and found awareness as important predictor of behavioural intention. For example, Charbaji and Mikdashi (2003) empirically investigated the influencing e-government adoption factors among Lebanese postgraduate MBA students. Factors included in the study are knowledge, awareness, and feelings. Multiple regression analysis was used to analyse the data collected from 220 subjects. Although the variance explained by the model was rather small (12.9%). Findings of the study indicated that awareness significantly influenced behavioural intention to use e-government.

Similarly, Rehman, Esichaikul, and Kamal (2012) empirically examined the adoption of e-government among internet users in Pakistan. The study was carried out in two folds. The first was to determine behavioural intention to get information and secondly, to determine the behavioural intention to transact. Results from regression analysis found that awareness significantly influence behavioural intention in both cases. In the field of environmental management, Wan, Cheung, and Shen (2012) coined the variable as 'awareness of

consequences' and investigated its influence on behavioural intention to recycle among Hong Kong university staff and students. A PLS SEM analysis technique was employed to analyse 205 valid data sets obtained. Wan et al. (2012) found that awareness of consequence significantly influenced behavioural intention. Therefore the following hypotheses are stated;

H3: There is significant positive relationship between technology awareness and behavioural intention to use POS

H4: Technology awareness mediates the relationship between social influence and behavioural intention to use POS

METHODOLOGY

Measurement instrument for the three constructs in this study were adapted from extant literature. Five (5) items for the dependent variable behavioural intention to use POS are adapted from Du, Zhu, Zhao, and Lv (2012), over and above the three (3) items in Venkatesh et al. (2003). Futhermore, five (5) items for social influence and technology awareness are adapted from Cheng, Liu, Qian, and Song (2008) and Nambisan et al. (1999) respectively. All of them were measured reflectively. 600 questionnaires were prepared and personally administered to retail owners/managers in Nigeria's six geo political zones. 165 valid data were obtained. This is adequate, based on power analysis (Jacob Cohen, 1992), using G*power (Erdfelder, Faul, & Buchner, 1996) and Barclay, Higgins, and Thompson (1995)'s "rule of 10". PLS-SEM was used to analyse the data as it is a predictive technique (Sanchez-Franco, 2006). PLS-SEM is an analyses technique that allows simultaneous test of multiple variables for predictive models (Wold, 1974, 1982). Chin, (1998a) maintained that PLS-SEM can be used for both confirmation and development of theory. Recently, there has been widespread use of PLS-SEM technique as a main analysis technique for multivariate research in various business and management fields (Wold, 1982). Ringle, Wende, and Will (2005) argued that the robustness of PLS-SEM enable a test of several relationships simultaneously, thus produces an enhanced, valid and reliable conclusion better than covariance based analysis technique. PLS-SEM can be run with fewer sample size and non-normal data (W.W. Chin & Gopal, 1995; Wynne W Chin, 1998a; Compeau & Higgins, 1995; Lohmöller, 1989). Therefore, we used SmartPLS 2.0 software (Ringle et al., 2005) and analysed the data.

ANALYSIS AND FINDINGS

First of all we checked for missing values and found that it is missing completely at random, at less than 5%. Therefore it was remedied using mean replacement (J Cohen & Cohen, 1983; Kumar, Talib, & Ramayah, 2013). Then the demographic characteristic of the data was assessed. About three-quarter of the respondents are male, while female constitutes 26.9%. This signifies that the retail business in Nigeria male-dominated. 15.7% of the respondents aged between 1-23 years, 23.9% are 26-30, 15.7% are 31-35, 16.8% are 36-40, 10.2% are 41-45, 6.9% are 46-50, 5.1% are 51-55, 5.3% are 56-60, while only 0.5% of respondents are above 60 years of age. 61% of them are married; half are educated to secondary school level, while only about 10% each have bachelors and master's degree. 45 and 40% of them are owners and managers respectively. As discussed earlier in the methodology section, the data was drawn from six (6) geo-political zones in Nigeria; these are North Central, North East, North West,

South East, South South and South West. The distribution of responses from these zones is 28, 42, 39, 16, 18 and 22, representing 17, 25.5, 23.6, 9.7, 10.9 and 13.3 per cent respectively. Furthermore, the data was checked for outlier and multicollinearity. No outlier was detected and there is no indication of presence of multicollinearity, based on the values of variance inflated factor and tolerance value. See Appendix.

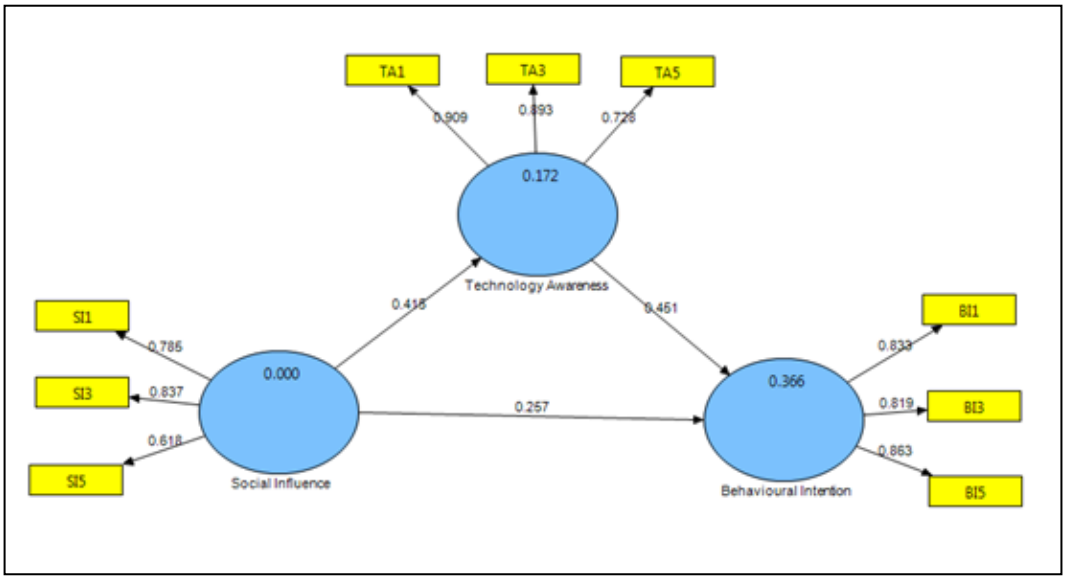

Figure 1: Mesurement Model

MEASUREMENT MODEL ASSESSMENT

The reflective measurement model was assessed based on the indicator and internal consistency reliabilities and convergent and discriminant validity. Individual item loading should be >0.7 (J. J. F. Hair, Black, Babin, & Anderson, 2010), however, >0.4 is also acceptable (Hulland, 1999). Three out of five indicators for each construct have met and exceeded the minimum threshold, while two each were dropped from the analysis because their loading does not achieve the minimum threshold (see table 1). Composite reliability was used to assess internal consistency and it should be >0.70 for each latent construct (Joe F Hair, Ringle, & Sarstedt, 2011). Interestingly, CR values for all the constructs are above 0.7 (see Table 2).

Table 1: Loading and Cross Loadings

Constructs	Items	BI	PE	SI
Behavioral Intention	BI1	**0.833**	0.461	0.356
	BI3	**0.819**	0.427	0.309
	BI5	**0.863**	0.508	0.438
Technology Awareness	TA	0.591	**0.909**	0.428
	TA	0.466	**0.893**	0.393

	TA	0.237	**0.728**	0.092
Social Influence	SI1	0.263	0.309	**0.785**
	SI3	0.430	0.378	**0.837**
	SI5	0.277	0.226	**0.618**

Average variance extracted (AVE) was used to determined convergent validity. The value should be greater than 0.5 for each latent construct (Fornell & Larcker, 1981; J. J. F. Hair et al., 2010). Table 2 depicted the AVE values for all the latent variables, having exceeded the benchmark. Furthermore, the discriminant validity was assessed using Fornell and Larcker (1981) criteria, by comparing the square-root of the AVE with inter-construct correlation. The later correlation must be less than the square-root of the AVE (Wynne W Chin, 1998b). Table 2 shows that this condition has been met.

Table 2: Discriminant Validity and Internal Consistency Reliability

	BI	**PE**	**SI**	**AVE**	**Composite Reliability**
Behavioral Intention	**0.838**			0.703	0.876
Technology Awareness	0.558	**0.847**		0.718	0.883
Social Influence	0.444	0.415	**0.753**	0.567	0.794

STRUCTURAL MODEL ASSESSMENT

Having met the all the assessment conditions for measurement model, we assessed the structural model by performing the bootstrapping procedure in SmartPLS (Joe F Hair et al., 2011; Joseph F Hair, Hult, Ringle, & Sarstedt, 2014). Hypotheses were tested to examine the relationship among the variables in the model and all the paths are significant. First of all, without the mediator variable in the model, we tested the direct relationship between social influence and behavioural intention. The relationship was significant (beta 0.451). This relationship was strong. However, the model was then run with the mediator variable. Accordingly, the beta value is for the direct effect becomes small (0.257). This indicates that the mediating variable has absorbed the direct effect as it was included in the model (refer to figure 2 and 3). Furthermore, the social influence-technology awareness and technology awareness-behavioural intention paths were all found significantly positive, with path coefficient 0.415 and 0.451 respectively. The indirect effect is also significant at ($p<0.001$), as depicted in Table 3.

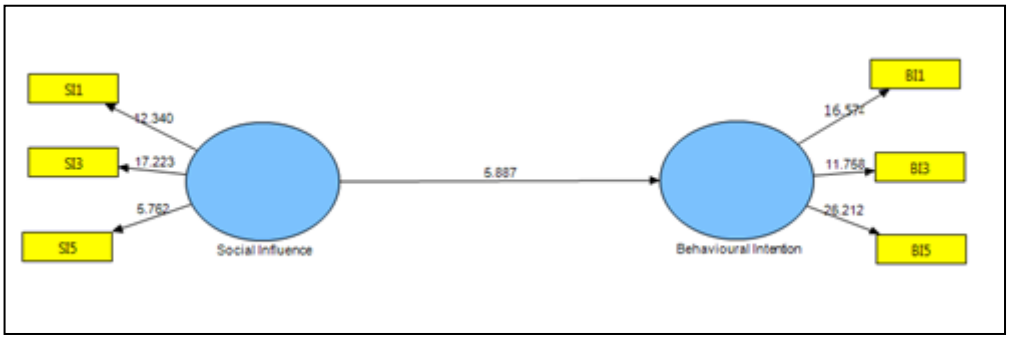

Figure 2: Direct Effect Model

Prior to that, the coefficient of determination of the endogenous variable in the model was assessed. Jacob Cohen (1988) recommended three levels of structural model quality as; substantial (0.26), moderate (0.13) and weak (0.02) respectively. During the assessment of measurement model for this study, the standard PLS algorism was calculated for the main effect model. The R^2 values for technology awareness and behavioural intention are 0.172 and 0.366 respectively (refer to figure 1). Therefore they are satisfactorily based on Falk and Miller (1992). They are precisely moderate and substantial (Jacob Cohen, 1988) respectively. We further adopted Helm, Eggert, and Garnefeld (2010)'s method of assessing indirect effect. Variance accounted for (VAF) is a useful tool to assess the indirect effect. As demonstrated in Joseph F Hair et al. (2014), VAF value of greater than 80% is full mediation, while greater than 20% but less than 80% is partial mediation. We substituted the VAF formula (indirect effect/total effect), thus the size of the indirect effect in respect of the total effect in 0.421. Therefore the indirect effect of social influence on behavioural intention is partial mediation. Additionally, we assess the effect sizes (f^2) of the exogenous variables (Jacob Cohen, 1988; Henseler & Fassott, 2010). Effect sizes are evaluated as small (0.02), medium (0.15) or large (0.35) respectively (Jacob Cohen, 1988). Technology awareness and social influence have medium and small effect sizes respectively, as shown in Table 4.

Table 3: Summary of Hypotheses Testing

Direct (without mediator)	**Path Coefficients**	**Std Error**	**T Value**	**P Value**
Social Influence -> Behavioural Intention	0.451	0.077	5.887	0.000
Indirect and Total Effect (with mediator)				
Social Influence -> Behavioural Intention	0.257	0.085	3.037	0.001
Social Influence -> Technology Awareness	0.415	0.066	6.304	0.000
Technology Awareness -> Behavioural Intention	0.451	0.077	5.852	0.000
Social Influence ->Technology Awareness -> Behavioural Intention	0.189	0.039	4.871	0.000

Table 4: Effect Sizes

Endogenous Variable	Exogenous Variables	R2 Incl	R2 Excl	R2Inc-R2 Excl	1-R2 Incl	Effect Size
Behavioural Intention	Technology Awareness	0.366	0.203	0.163	0.634	25.71%
	Social Influence	0.366	0.305	0.061	0.634	9.62%

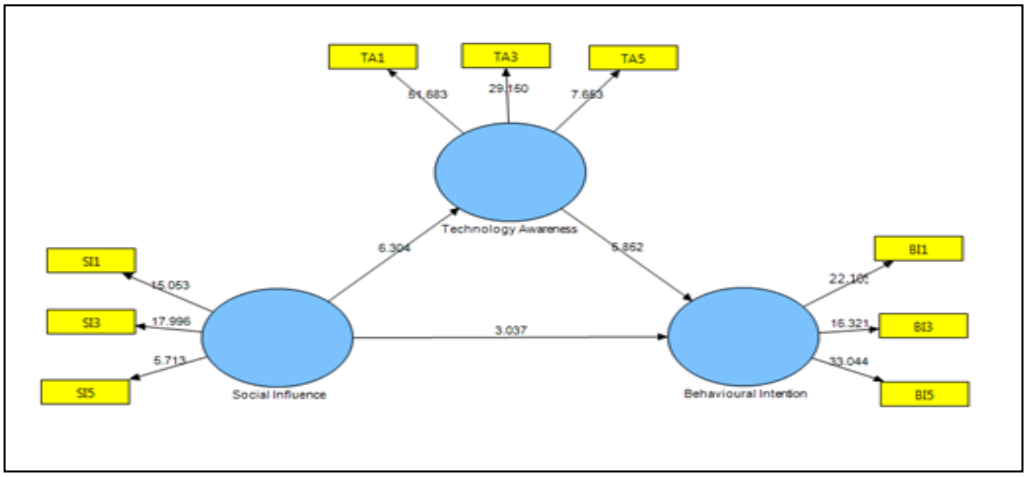

Figure 3: Bootstrapped Structural Model

Furthermore, a blindfolding procedure (Henseler, Ringle, & Sinkovics, 2009) was run with 7 omission distance, to obtained Q^2 value for the endogenous latent constructs. Q^2 is the measure of model predictive capability (Geisser, 1974; Stone, 1974). As demonstrated in Joseph F Hair et al. (2014), a PLS path model with Q^2 greater than 0 has predictive relevance. As shown in table 5, the Q^2 values for behavioural intention and technology awareness are 0.246 and 0.101 respectively. This implies that the model has predictive relevance.

Table 5: Predictive Relevance

Endogenous Latent Variable	R Square	CV Red	CV Com
Social Influence	_	_	0.5676
Behavioral Intention	0.366	0.2463	0.7035
Technology Awareness	0.172	0.1011	0.7181

DISCUSSION AND CONCLUSION

Social influence is operationally defined as the extent to which of owners and managers of retail business is subjects their behaviour to perception of other people who are important. Thus they think that they should use POS, because it will enhance their business image. Therefore it was established as direct determinant of behavioural intention. However, little was known about the mechanism through which social influence predicts behavioural intention. Interestingly, technology awareness was proposed as intervening variable in this relationship, after careful consideration of the context of the current study. Hypotheses for the direct and indirect relationship was put forward and tested. All the four hypotheses are supported, thus the finding can be interpreted as; social influence-behavioural intention relationship is better understood by the intervening of technology awareness.

The findings are in line with a number of past literatures. For example, Huang and Qin (2011) found significant positive relationship between social influence and behavioural intention in the context of adoption of virtual fitting room among Chinese shoppers. Furthermore, Wu, Yu, and Weng (2012) found significant positive relationship between social influence and behavioural intention in the study of I-Pass adoption among Taiwanese passengers. Similarly, the current study findings concurred with the result of the examination of the relationship between social influence and behavioural intention (Lin & Anol, 2008), in an online social support adoption study. On the other hand, finding is consistent with Charbaji and Mikdashi (2003) findings. They found that awareness significantly influenced behavioural intention to use e-government.

It is interesting to note that the direct relationship between social influence and behavioural intention was absorbed when the mediating variable of technology awareness was introduced. Therefore technology awareness becomes the most important variable of interest. This might be true, because of the managers' exposure to media campaign about the benefits and cost of deploying POS in one's business, thus they became aware of the importance of adopting technology such as POS, then subsequently intent to use it. For example, the CBN is engaged in massive media campaign to reach out to the merchant to embrace electronic payment gateways, particularly the POS. Therefore regulators, promoters and other stakeholders in the payment, retail and POS industries should focus more on giving awareness to the prospective users of POS.

Finally, this study charted an avenue for expanding the body of knowledge with respect to finding the mechanism through which social influence predicts behavioural intention. However, we do acknowledge the parsimonious nature of the study, thus researchers might expand the horizon of technology adoption literature to integrate more of such mechanisms. Similarly, as the current study focused only on the intention, researchers should therefore focus beyond, particularly the mechanism through which the consequences of behavioural intention works.

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RELATIONSHIP BETWEEN ENTREPRENEURIAL PASSION FOR INVENTING, ENTREPRENEURIAL PASSION FOUNDING AND ENTREPRENEURIAL INTENTION: THE ROLE OF PERCEIVED CREATIVITY DISPOSITION

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ABSTRACT

Given the multi-dimensional nature of entrepreneurial passion and the hierarchical construct model development in partial least squares path modeling (PLS), we employed the partial least squares structural equation modeling (PLS-SEM) to investigate the relationship between entrepreneurial passion for inventing (EPI) and entrepreneurial passion for founding (EPF) and entrepreneurial intention (EI). We also examine the moderating role of perceived creativity disposition on these relationships. With a sample of 130 students, our study found a significant relationship between EPF and EI, but our proposed relationship between EPI and EI was not supported. Again the moderating role of perceived creativity disposition was significant for EPF and EI relationship but not for EPI and EI. We therefore, extend empirical research in the entrepreneurial passion and intention domain.

Keywords:

Entrepreneurial Intention, Creativity Disposition, Entrepreneurial Passion For Inventing and Founding

INTRODUCTION

Researches on entrepreneurial intention have continued to grow among researchers because of its importance in dictating actual entrepreneurial behaviour. Bird (1988, 1989) convincingly argued that intention is fundamental to entrepreneurial behaviour, while entrepreneurs are said to be good example of intentionality (Rickards, Runco, & Moger, 2008). It is in fact a major determinant in entrepreneurs' success, because of its dominant motivating factor in influencing individual behaviour (Ajzen, 1991). Hence, entrepreneurial intention is seen to play a vital function in the choice to start a new firm or venture or the creation of new value in an existing ones (Bird, 1988; Lee & Wong, 2004). In it general sense, entrepreneurial intention is the interest to undertake entrepreneurial activity (Fitzsimmons & Douglas, 2011; Gurbuz & Aykol, 2008; Krueger Jr, Reilly, & Carsrud, 2000), which usually involves inner guts, desire and the feeling to be independent (Ayobami & Ofoegbu, 2011). As a result, entrepreneurial intention can be employed to envisage participation among students in entrepreneurship and could clarify the reason for students' decision to venture into business (Ariff, Bidin, Sharif, & Ahmad, 2010).

According to Lee & Wong (2004) the intention to exhibit entrepreneurial behaviours could be affected by a number of cognitive factors, for example, needs, values, wants, habits, and beliefs. The significance of cognitive variables in understanding the individual decision process has been pointed out by researchers like Baron (2004) and Shaver & Scott (1991). Passion, which has an affective, cognitive, and behavioural components (Chen, Yao, & Kotha, 2009), that influences people behaviour (Cardon, Sudek, & Mitteness, 2009; Murnieks,

Mosakowski, & Cardon, 2011), is a fundamental factor in entrepreneurship (Bird, 1988; Cardon, Gregoire, Stevens, & Patel, 2013).

Entrepreneurial passion refers to "consciously accessible intense positive feelings experienced by engagement in entrepreneurial activities associated with roles that are meaningful and salient to the self-identity of the entrepreneur" (Cardon, Wincent, Singh, & Drnovsek, 2009, p. 517). While also building on social psychological and entrepreneurship literatures, Chen, Yao & Kotha (2009), define entrepreneurial passion as the extreme emotional condition of an entrepreneur manifested through cognitive and behavioural action that is personally valuable. Consequently, if passion is quite integral to successful entrepreneurship activities, then, it is only logical that this must be present or build prior to setting up of ventures. Hence, researchers have call for more understanding of passion for its fundamental importance in entrepreneurial activity (Cardon, Sudek, et al., 2009; Chen et al., 2009).

However, most studies on passion (Baum & Locke, 2004; Chen et al., 2009) focuses on individual entrepreneurial passion in relation to organisations and other outcomes that are behavioural (Murnieks et al., 2011) or otherwise without direct emphasis on entrepreneurial intentions. Even, studies that considered passion with intention, does so indirectly by observing the impact of passion as a moderator to other antecedents factors (De Clercq, Castañer, & Belausteguigoitia, 2011) or as antecedent to other variables that explain its impact (Murnieks et al., 2011; Vallerand et al., 2007).

This research therefore examined the relationship between two entrepreneurial passion domains (passion for inventing and passion for founding) considering their dimensions as defined by Cordon et al. (2013) and entrepreneurial intention. This is because, what seems to matter most and more immediate in the process of nurturing entrepreneurial passion especially among students, is the passion for inventing new products and founding new organisation (Fitzsimmons & Douglas, 2011).

Other quite integral components of entrepreneurship as recognized from previous studies are creativity and innovation. While creativity of entrepreneurs could depend on special circumstances and personality characteristics of individuals, Rickards et al. (2008) argued that creativity is the most critical trait of an entrepreneur. The ability to think creatively or the perception that one poses creative ability therefore, could explain why some people would choose to be or not to be entrepreneurs, which involves recognizing the opportunities for creating new product or services or new ways of doing things that is worthwhile profitable, and so the requirement for a successful entrepreneur (Baron, 2004; Bird, 1989; Schumpeter, 1934). Batey & Furnham (2008) also argue that individuals understand themselves better when it comes to their own creative ability.

Though, creativity is a necessary element for entrepreneurship, its motivation could differ among different types of entrepreneurs (Rickards et al., 2008). This mean that creativity could play a role in entrepreneurship but may not be enough as a "stand-alone" factor, given that most entrepreneurs are adapting innovations instead of being the original inventors (Rickards et al., 2008). In a study by Batchelor and Burch (2012), who investigated to find out among 152 undergraduate students if individual creativity predicts intention to venture into entrepreneurship. Their result revealed that divergent thinking predicts entrepreneurial intention, but that creative personality was only a supporting factor, which suggests creative personality as less important in directly impacting entrepreneurial intention. This study and others therefore, opens an avenue for framing further question on how the perception of creativity can influence entrepreneurial intentions.

Consequently, given the multidimensional nature of entrepreneurial passion (passion for inventing, founding and developing) and the creativity supporting role as insinuated by previous

studies, we model to investigate the role of perceived creativity disposition on the relationship between two domains of entrepreneurial passion and intention. We believe that the perception of creativity disposition will increase the intensity between the classes of entrepreneurial passion for inventing and entrepreneurial passion for founding in relation to entrepreneurial intention. We also feel that the level of perception of creativity disposition will vary among students sample within each domain of entrepreneurial passion.

LITERATURE REVIEW

Entrepreneurial Intention

Entrepreneurial intention is one of the main characteristics that make entrepreneurs successful, because of its dominant motivating factor that influence individual behaviour (Ajzen, 1991). It is generally agreed that intention is strongly related with the actual behaviour (Krueger Jr et al., 2000; Summers, 1998). Entrepreneurial intention is therefore, defined as the deliberate position of individual mind that comes before an activity and pushes one's consideration to engage in business formation (Bird, 1989; Shane & Venkataraman, 2000).

An intention then is seen to play a vital function in the choice to start a new firm or venture or the creation of new value in an existing ones (Bird, 1988; Lee & Wong, 2004). Thus, entrepreneurial intention is an important factor for providing good predictive power for engaging in entrepreneurship (Ajzen, 1987; Brush, Manolova, & Edelman, 2008; Kolvereid & Isaksen, 2006; Shook, Priem, & McGee, 2003). Understanding entrepreneurial intention is therefore crucial when predicting entrepreneurial behaviour (Arendt & Brettel, 2010; Bird, 1988; Gerba, 2012; Kruger, 2004; Zhang & Duan, 2010). Moreover, the role of entrepreneurial intentions is also accepted to be relevant in the managerial literature (Sutton, 1998). Earlier contributions show that intentions have the ability to predict both individual behaviours (Ajzen, 1991), and organisational results in terms of survival, development and growth (Mitchel, 1981). Consequently, it is generating the interest of managers and entrepreneurs in appreciating and predicting intentions as an important element to succeed (Tubbs & Ekeberg, 1991).

According to some scholars' entrepreneurial intention which is the interest to undertake entrepreneurial activity (Fitzsimmons & Douglas, 2011; Krueger Jr et al., 2000) usually involves inner guts, desire and the feeling to be independent (Ayobami & Ofoegbu, 2011). As a result, entrepreneurial intention can be employed to envisage participation among students in entrepreneurship and could clarify the reason for students decision to venture into business (Ariff et al., 2010). Understand the real factors responsible for shaping intention of students' to start a new venture is crucial for building the programmes and policies aim at promoting entrepreneurial behaviour (Bakotić & Kružić, 2010).

According to Lee & Wong (2004) the intention to exhibit entrepreneurial behaviours could be affected by some number of cognitive factors, for example, needs, values, wants, habits, and beliefs. The significance of cognitive variables in understanding the individual decision process has been pointed out by researchers like Baron (2004) and Shaver & Scott (1991). Therefore, the cognitive perspective makes understanding the difficult process of entrepreneurship easier. In other situations, models were used that includes individual attributes, characteristics, values, culture and demographic factors to show the reason why some people will engage in entrepreneurial behaviour while others will not (Mueller & Thomas, 2001; Mueller, Thomas, & Jaeger, 2002).

Since the choice to be an entrepreneur is an outcome of intricate mental processes, the planned behaviour theory (Ajzen, 1991) is mostly useful to clarify this obscure mental process resulting to establishing business venture. Scholars like (Fayolle & Degeorge, 2006; Fayolle & Gailly, 2005; Kolvereid & Isaksen, 2006; Krueger, 2007) have employ the theory to clarify the decision process in firm creation. Hence, agreed that the intention to become an entrepreneur is as result of individuals' attitude, their perception of behaviourial control of the venture, and the perceived social influence to be or otherwise an entrepreneur.

Entrepreneurial Passion and Entrepreneurial Intentions

The important role of passion in encouraging persistent pursuit and achievement of one's desired goal that is meaningful has attracted the attention of psychologist and recently entrepreneurship scholars. Passion or "love" for something (Baum & Locke, 2004; Shane, Locke, & Collins, 2003), which has the connotation of affective feelings, particularly intense positive feelings (Cardon, Wincent, et al., 2009) has been define in various ways by scholars, for example, Vallerand et al. (2003) define passion as a strong inclination towards an activity that people like, that they find important, and in which they invest time and energy tirelessly.

Cardon et al. (2009) on another hand expressed entrepreneurial passion as "consciously accessible, intense positive feelings related to the entrepreneurial activities that are meaningful and salient to the self-identity of the entrepreneur". Passion therefore influences people behaviour (Cardon, Sudek, et al., 2009; Donahue, 2008; Murnieks et al., 2011). It is an "all-alone" construct that distinctively account for variance in entrepreneurial behaviour (Murnieks et al., 2011).Consequently, if passion is quite integral to successful entrepreneurship activities, then, it is only logical that this must be present or build prior to setting up of ventures.

Another quite interesting aspect of the recent definition of passion is the issues concerning the extreme positive feelings and self-identity. While the intense positive feelings are directed towards activities that are of importance to individuals and hence more enduring (Wincent, Örtqvist, & Drnovsek, 2008), the self-identity concern the realization of the central role that the activity plays in one's identity (Cardon et al., 2013). This shows that identity centrality will defer among individuals, leading to entrepreneurs engaging in selected activities they identify more personally with, and disengaging from the activities with which they do not (Cardon et al., 2013). However both intense positive feelings and the activity central to self-identity are embedded in the entrepreneurial domains of founding, inventing and developing (Cardon et al., 2013).

The inventing domain is characterise by individuals whom have passion for searching opportunities, delighted for always been on the run to usher in new products or services or new ways of doing things to solve current problems (Cardon et al., 2013; Cardon, Wincent, et al., 2009). The passion for founding as discussed by Cardon et al., (2009) has to do with organisation of human, financial and social resources required to create a new venture. Most entrepreneurs are driven by the desire to found new venture (Aldrich & Zimmer, 1986) which signifies the achievement of been able to create something tangible that can be attributed to them (Katz & Gartner, 1988). Such achievement of founding an organisation could be the central role reflecting particular self-identity of an individual entrepreneur (Cardon, 2008).

Developing the organisation beyond its initial survival and successes comes with the passion of growth and expansion (Cardon, Wincent, et al., 2009). Hence, Entrepreneurs who experience passion for developing their own ventures might quite cherish making return on their investments by generating more sales, engaging employees and other stakeholders, or even acquiring new investors to support the businesses (Cardon et al., 2013). However, this study is

concern with the first two domains given the nature of its sample of university students. We believe that the passion for inventing and founding is more likely to be experienced and nurtured prior to the real activity. Hence, we develop the following hypotheses:

H1: There is a significant positive relationship between entrepreneurial passion for inventing and entrepreneurial intention.
H2: There is a significant positive relationship between entrepreneurial passion for founding and entrepreneurial intention.

Creativity and Entrepreneurial Intention

Shackle in 1970 introduced creativity and imagination in his work and links it to entrepreneurship process, while arguing that in an uncertain situation every entrepreneur apply his imagination to decide on the best possible action. This point to the importance of creativity and imagination as required skills in business decision making processes, capable of reducing unfavourable business consequences (Lourenço & Jayawarna, 2011).

Creativity involves recognizing the opportunities for creating new product or services or new ways of doing things that is worthwhile profitable, and so the requirement for a successful entrepreneurs (Baron, 2004; Bird, 1989; Schumpeter, 1934). Entrepreneurship therefore, has been describe as a good playing ground for creative individuals to be successful (Batchelor & Burch, 2012), because creativity involves novelty and usefulness which are important to entrepreneurship (Amabile, 1996; Ward, 2004). Hence creative individuals are more expected to engage in entrepreneurship behaviour (Ward, 2004).

Creativity could be considered as a dormant trait that lay creative behaviour (Eysenck, 1995). Thus, indicating that exhibition of high creative performance is as a result of creative personality trait in individuals (Oldham & Cummings, 1996). Moreover, several studies have supported self-assessment of creativity disposition, for example, Batey & Furnham (2008) argue that individuals understand themselves better when it comes to their own creative ability. Therefore, people should be allowed to make effort to judge themselves as capable of generating new and valuable ideas necessary to succeed as entrepreneurs (Darini, Pazhouhesh, & Moshiri, 2011).

Hamidi, Wennberg & Berglund (2008) also clearly indicated the need for considering creativity in entrepreneurial intention based models. Fatoki (2010) identified in a study of entrepreneurial intention of South African final year graduating students that creativity was a motivator of entrepreneurial intention. We therefore modeled and include creativity in entrepreneurial intention based model, believing strongly that creativity disposition will built enormous amount of confidence that is very likely to yield expected result of becoming self-employed. It is also suppose that, the ability to think creatively or the perception that one poses creative ability could also explain why some people would choose to be or not to be entrepreneurs. Thus, we develop the following hypotheses:

H3: Perceived creativity disposition moderates the relationship between entrepreneurial passion for inventing and entrepreneurial intention.
H4: Perceived creativity disposition moderates the relationship between entrepreneurial passion for founding and entrepreneurial intention.

METHODOLOGY

In a survey research, questionnaire were administered and collected from a population sample of 130 students. These students come from various faculties of the Usman Danfodio University, Sokoto (UDUS) in Nigeria. The respondents have all participated in the compulsory entrepreneurship course offered by the University. Items of the variables in this study develop for the questionnaire was adapted from various sources.

Item for the perception of creativity disposition was adapted from Zhou and George (2001). It has 8-items with a 7-point Likert-type scales of 1 = strongly disagree, 7 = strongly agree. The measures for the entrepreneurial passion dimensions in the two domains (entrepreneurial passion for inventing and entrepreneurial passion for founding) were adapted from Cardon et al., (2013). There are 5 items for inventing (consisting of 4 item for intense positive feeling for inventing and 1 item for the identity centrality for inventing) and 4 items for founding (consisting of 3 item for intense positive feeling for founding and 1 item for the identity centrality for founding). All the 9-items are rated on 7-point Likert-type scales of (1 = strongly disagree, 7 = strongly agree). The 6-items that measured entrepreneurial intention were adapted from Linan and Chen (2009). The items are rated on a 7-point likert scale of (1 = total disagreement, 7 = total agreement).

We performed the analysis using the SmartPLS 2.0 (Ringle et al., 2005). We estimated the measurement model by meeting all the measurement requirements, and then the structural model was evaluated. This study employed smart PLS for the analysis, because, of the small sample size nature of the data as well as the presence of second-order formative variables (Hairs et al., 2014). However, the sample size is adequate given the minimum sample size required based on the 10 times rule of thumb (Barclay, Higgins & Thompson, 1995) as well as the power analysis using G*power.

RESULTS

Measurement Model

In the measurement model, items loadings were examined and only items that loaded above 0.70 were retained (Fornell and Larcker, 1981). The internal consistency was measured by composite reliability and has reached the satisfied criteria, as the lowest is 0.82 and the highest is 0.93. Average Variance Extracted (AVE) were also examined and have all met the minimum requirement of 0.5 (Fornell and Larcker, 1981), the values range from 0.54 to 0.74. These are presented in table 1. We also present the second- order formative indicators weights, significance and collinearity assessment in table 2. It can be seen from the table that all the formative weights are significant. Also the tolerance and variance inflation factor (VIF) are above 0.20 and below 0.5 (Hair et al., 2014) respectively. Therefore, the indicators do not show sign of collinearity problem.

Table 1: Item Loading, Internal Consistency, and Average Variance Extracted for the First-Order Constructs

Construct	Indicators	Loadings	Composite Reliability	AVE
Entrepreneurial Intention	EI2	.718	.933	.738
	EI3	.909		
	EI4	.925		
	EI5	.822		
	EI6	.904		
Identity Centrality for Founding	ICF	1.000	1.000	1.000
Identity Centrality for Inventing	ICI	1.000	1.000	1.000
Intense Positive Feeling for Founding	IPFF1	.840	.822	.608
	IPFF2	.794		
	IPFF3	.698		
Intense Positive Feeling for Inventing	IPFI1	.752	.859	.604
	IPFI2	.798		
	IPFI3	.749		
	IPFI4	.808		
Perceive Creativity Disposition	PCD1	.740	.824	.540
	PCD6	.789		
	PCD7	.701		
	PCD8	.707		

In confirming the discriminant validity, the inter-construct correlations were compared with the square root of AVE across the diagonal. The values of the square root of AVE exceed that of the inter-correlation among the constructs in the model. Table 3 shows the discriminant validity with the descriptive statistics of the constructs.

Table 2: Formative Indicators Weights, Significance, and Collinearity Assessment

					Collinearity Statistics	
Construct	Indicators	Weights	T Stat.	P Value	Tolerance	VIF
Entrepreneurial Passion for Inventing	IPF-I	.843	28.479	.000**	.580	1.725
	IC-I	.258	10.134	.000**	.710	1.408
Entrepreneurial Passion for Founding	IPF-F	.758	27.649	.000**	.554	1.804
	IC-F	.348	13.681	.000**	.638	1.567

**: P<0.001

Table 3: Square Root of AVE and Correlations of Latent Variables for the First-Order Constructs

	Mean	Std. Dev.	1	2	3	4	5	6
1) Entrepreneurial Intention	6.142	1.187	**.859**					
2) Identity Centrality for Inventing	5.760	1.334	.361	**Single Item**				
3) Identity Centrality for Founding	5.810	1.753	.376	.325	**Single Item**			
4) Intense positive feelings for founding	5.745	1.287	.404	.422	.577	**.780**		
5) Intense positive feelings for Inventing	5.552	1.227	.397	.514	.464	.552	**.777**	
6) Perceive Creativity Disposition	5.479	1.141	.484	.335	.267	.256	.423	**.735**

Note: Diagonal elements (figures in bold) are the square root of the variance (AVE) shared between the constructs and their measures. The single items are the constructs measured by a single item. Off diagonal elements are the correlations among constructs

Structural Model

The structural model was assessed to test the hypotheses of the study. We also examined the quality of the model criteria. The model hypotheses testing show that, the relationship between the entrepreneurial passion for inventing and entrepreneurial intention is not significant (t-value, 1.012). Relationship between entrepreneurial passion for founding and entrepreneurial intention was significant (t-value, 2.830; p< 0.005). The moderating effect of perceived creativity disposition on the relationship between entrepreneurial passion for inventing and entrepreneurial intention was not significant (t-value, 0.535). On the other hand, perceived creativity disposition moderates the entrepreneurial passion for founding and entrepreneurial intention relationship (t-value, 4.047; p< 0.001). Table 4 is the result of the hypothesis findings. In examining the R2 of the model, it shows that the value of 34% obtained was acceptable since it is higher than the recommended 10% (Falk and Miller, 1992). Figure 1 shows the structural model.

Table 4: Path Analysis and Hypothesis Testing

Hypotheses	Relationship	Beta value	Std. Error	t-value	p-value	Decision
H1	EPF -> EI	.272	.096	2.830	.003*	Supported
H2	EPI -> EI	.105	.104	1.012	.157	Not Supported
H3	EPF * PCD -> EI	-.355	.088	4.047	.000**	Supported
H4	EPI * PCD -> EI	-.047	.087	.535	.297	Not Supported

**: P<0.001; *: p<0.005

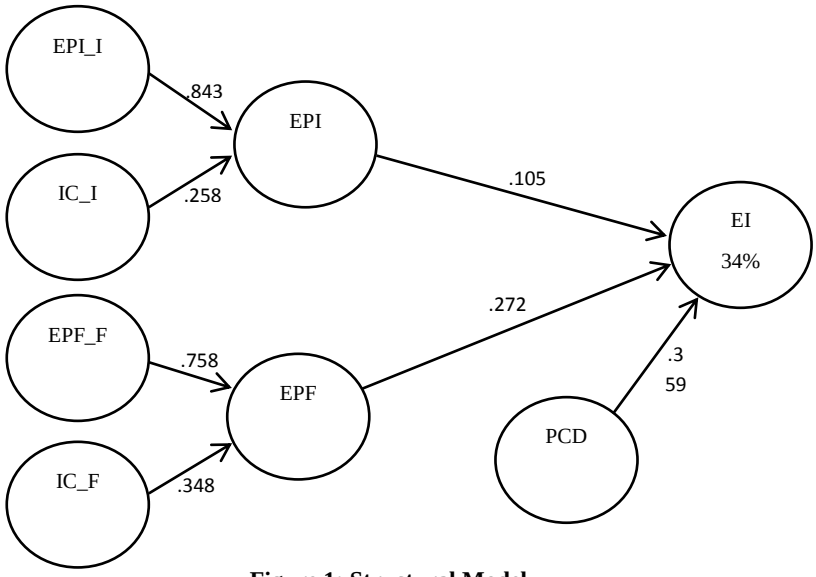

Figure 1: Structural Model

DISCUSSION AND CONCLUSION

The study was carried out to examine the relationship between two entrepreneurial passion domains (passion for inventing and passion for founding) and entrepreneurial intention. We also investigated the role of perceived creativity disposition on the relationship between the two domains of entrepreneurial passion and intention. We found a significant relationship between entrepreneurial passion for founding (EPF) and entrepreneurial intention (EI). Our proposed relationship between entrepreneurial passion for inventing (EPI) and entrepreneurial intention (EI) is not supported. Again the moderating role of perceived creativity disposition (PCD) is significant for entrepreneurial passion for founding and entrepreneurial intention relationship, but, not for entrepreneurial passion for inventing and entrepreneurial intention.

The level of significance was determined by the t-values and p-values obtained from the analysis. For hypothesis one, the relationship between EPF and EI was supported (t-value=2.830, $p<0.005$). Hypothesis two (EPI---->.EI) was not supported (t-value=1.012). Hypothesis three was also supported (t-value=4.047, $p<0.001$), while hypothesis four was not supported (t-value=0.535).

The unsupported relationship between entrepreneurial passion for inventing and entrepreneurial intention seems to be explainable, as passion for invention required searching opportunities, ushering in new products or services or introducing new ways of doing things to solve current problems (Cardon et al., 2013; Cardon, Wincent, et al., 2009). All these require skills, determination and courage, but the fear of introducing something new and considering its acceptability has kill so many ideas before they are brought up. This can also explain Shackle's

(1970) argument that in an uncertain situation (fear of failure) every entrepreneur applies his imagination to decide on the best possible action. Furthermore, the self-identity centrality in (Cardon et al., 2013) definition shows that individual entrepreneurs will only engage in selected activities they identify more personally with and disengage from the activities with which they do not (Cardon et al., 2013).

Creativity was found not to moderate the relationship between entrepreneurial passion for inventing and entrepreneurial intention, suggesting it does not strengthen the relationship between the two variables. Though, creativity is known to be a necessary element for entrepreneurship, Rickards et al. (2008) emphasize that its motivation could differ among different types of entrepreneurs. The outcome of this study therefore shows that perceived creativity disposition is not a motivator for the entrepreneurial passion for inventing group of students. Hence, this study supports the assertion that most entrepreneurs are adapting innovations instead of being the original inventors (Rickards et al., 2008).

Even though, Nigeria is a developing country and the environment does not adequately support innovation among students, we believe the schools can employ certain strategies aim at developing skills and courage among students. It is also believe that government can support this initiative by providing the necessary resources required to help in this direction. Moreover, by establishing a relationship between entrepreneurial passion for founding and entrepreneurial intention and identifying the role of perceived creativity disposition in this relationship, we extend knowledge in the entrepreneurial passion domain.

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SOCIO ECONOMIC IMPACT OF SOIL EROSION ON AFFECTED POPULATION AT SG. LANGAT

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ABSTRACT

Erosion occurs naturally when, during rainfall, water in the river flows rapidly thereby eroding the river banks. Eventually the river banks collapse, forming silt on the base of the river, gradually makes the river shallower, which increases the possibilities of flooding along the river bank. Studies carried out along the Sg. Langat banks had identified the Hulu Langat area as the most seriously affected by soil erosion. The Hulu Langat area is quite heavily populated, mainly by villagers that had set up roots in the area for generations and owned properties in the area. Majority of the population either live in detached kampong houses or terrace houses. These are the people that will be mostly affected by soil erosion occurrences and due to this, impact of soil erosion towards social, psychological, environmental and economics of the affected population was assessed in this study. The impact assessments were made based on findings from interviews and survey questionnaires distributed to locals living in the affected areas. Responses from the survey carried out were tabulated and analysed to determine the extent of socio economy and psychological impact caused by the soil erosion. It was found that soil erosion occurrences in the Hulu Langat area do not have significant economic impact on the affected community. However, it was observed that there may be potential psychological impact that could include but not limited to increase in anxiety on safety of both lives and properties of the affected community.

Keywords:

Soil Erosion, Social Impact, Psychological Impact, Environmental Impact, Economic Impact, Affected Population.

INTRODUCTION

This paper is a subset of the research on Erosion Risk Potential Categorization in Langat River, a Scientific Collaboration between Infrastructure University Kuala Lumpur (IUKL) and HTC Kuala Lumpur, Department of Irrigation and Drainage Malaysia (DID). The research objectives include determining the degree of soil erodibility along the Langat River; evaluating rainfall erosivity at the Langat River; identifying erosion risk potential along the Langat River and categorizing erosion risk potential in the Langat River.

Soil samplings carried out at sampling points located at affected areas in Hulu Langat namely Pansoon, Kampung Kuala Kerdik, Dusun Tua, Kg. Seri Nanding and Sungai Serai had

shown that the occurrence of soil erosion along the Sungai Langat river bank is most serious at these areas. Impact of soil erosion towards social, psychological, environmental and economics of the affected population were thus assessed in these affected areas. The impact assessments were made based on findings from interviews and survey questionnaires distributed to locals living in affected areas.

LITERATURE REVIEW

Soil erosion is an issue where the adage 'think globally, act locally' is clearly apropos. Think globally, because soil erosion is a common problem that has, does, and will continue to impart the global community. Act locally, because effective erosion control requires action at the hillslope, field, stream channel and upland watershed scales Terrence J. Toy et al., (2002).

Soil erosion has been a major issue in the past and will become an even greater issue in the future as population growth continues to expand and land resources are more intensively used, often to a point of destruction. Soil erosion is a natural process, occurring over geological time, and indeed it is a process that is essential for soil formation in the first place. With respect to soil degradation, most concerns about erosion are related to accelerated erosion, where the natural rate has been significantly increased as the results of logging activities, the introduction of rubber plantations, tin mining activities or deforestation associated with land conversion for agricultural, industrial or urbanization purposes Gregersen et al., (2003).

There are two major types of erosion, by wind and by water. However, soil erosion caused by running water is the type that of soil erosion that is mostly seen around the world. This includes rivers that erode the river basin, rainwater that erodes various landforms, and the sea waves that erode the coastal area. Water erodes and transports soil particles from higher altitude and deposits them in low lying areas. Wind erosion is most often witnessed in dry areas wherein strong winds brush against various landforms, cutting through them and loosening the soil particles, which are eroded and transported towards the direction in which the wind flows.

Under the Malaysian conditions, erosion by water is the most significant due to high mean annual rainfall, storm density and frequency. Higher rates of erosion will occur when the vegetation cover is disturbed or removed. Once the vegetation is cleared, interception of rainfall will be greatly reduced which will result in a severe increase in surface runoff velocity and volume. Erosion by running water may take place in the form of rill or gully erosion, particularly in loose sandy granitic soils (University of Malaya Consultancy Unit, 2003).

According to Pimentel (2006), the United States is losing soil 10 times faster than the natural replenishment rate, while China and India are losing soil 30-40 times faster. As a result of erosion over the past 40 years, 30% of the world's arable land has become unproductive. Around 60% of eroded soil ends up in rivers, streams and lakes, making waterways more prone to flooding and to contamination from fertilizers and pesticides. Erosion also reduces the ability of the soil to store water and support plant growth, thereby reducing its ability to support biodiversity. This further affirms the seriousness of the issue of soil erosion not only in Malaysia but in the world at large.

It is generally understood that increased soil erosion can lead to loss of land, reduced soil fertility, greater rainfall runoff, lower groundwater recharge, more sediment flows in river, higher contaminants in diminishing water supplies, lowered quality of drinking water, increased flooding, and diminished economic benefits and increased hardships to both rural and urban populations. The impact of soil erosion on the affected population therefore, should be studied

so as to come up with suitable and appropriate mitigating measures applicable locally as well as internationally.

METHODOLOGY

Methodology used to capture the qualitative type of information to assess the socio economic impact of soil erosion along the Sungai Langat on the affected community was through interviews and survey questionnaires that were randomly distributed to the community living within the affected area. List of questions asked and responses in the survey questionnaire distributed are listed in Table 1.

Section A of the questionnaire was aimed at acquiring general demographic information of the community and level of property ownerships.

Table 1: List of Survey Question and Possible Responds

A. POPULATION DATA (Kindly tick (√) the relevant answer)		
1	Please state your occupation	a) Student b) House wife c) Government servant d) Private sector e) Professional f) Self employed g) Un-employed
2	Total household income per month	a) Less than RM1,500 b) RM1,500 to RM2,999 c) RM3,000 to RM5,000 d) RM5,001 to RM9,999 e) More than RM9,999
3	Number of household	a) Living alone b) 2 to 3 persons c) 4 to 5 persons d) More than 6 persons
4	Type of dwelling	a) Flat/ Apartment/ Condominium b) Terrace/ Link house c) Semi detached d) Detached house/ Bungalow
5	Length of stay in present dwelling	a) Less than 1 year b) 1 to 3 years c) 4 to 10 years d) More than 10 years

6	Property ownership	a) Own/ Under mortgage b) Rented/ Quarters c) Inheritance		
7	Is your house/ place of work located close to the Langat River? If yes, please state the area you live/ work in.	Yes	No	
		Area:		
8	Are you aware of the erosion occurring near/ at your area? If yes, please state the area and proceed to Section B of this questionnaire.	Yes	No	
		Area of occurrence:		
B. IMPACT ON SOCIO ECONOMY (Kindly tick (√) the relevant answer)				
1	How do you come to know of the erosion occurring at/ near your area?	a) General public b) Personally visited the area c) From relevant government department d) Mass media (TV/ Radio/ Newspaper) e) Others _____		
2	Distance of the erosion from your house/ place of work.	a) Less than 1 Km b) 1 Km to 2 Km c) More than 2 Km		
3	What mitigation measures have/ will you take to protect your family against the impact of the erosion?	a) Move to another location b) Sell the house/ land located in the affected area c) Monitor the erosion activity and ensure appropriate mitigative measures are being carried out by the relevant department.		
4	Has the soil erosion resulted in: a) Loss of source of income?	Yes	No	Not sure
	b) Reduced income?	Yes	No	Not sure

	c) Reduced rental rate/ value of house and/ or land?	Yes	No	Not sure
	d) Unable to continue with recreational activities like fishing etc. in the Langat River?	Yes	No	Not sure
	e) Migration of local people to other places?	Yes	No	Not sure
	f) Damage to your property?	Yes	No	Not sure
	g) Damage to public property such as roads, bridges etc.?	Yes	No	Not sure
	h) Flooding in affected area especially during heavy rain?	Yes	No	Not sure
	i) Anxiety and feeling of unsafe when at home/ work place located near to the affected area?	Yes	No	Not sure

Questions in Section B were aimed at assessing the level of economy, psychological and environmental impact of soil erosion on the affected community. Responds from the survey carried out were tabulated and analysed using Microsoft Excel to determine the extent of socio economy and psychological impact caused by the soil erosion on the affected community.

SURVEY FINDINGS

A total of 57 responses were collected and findings from these responses were analysed using the MS Excel. Questionnaires were randomly distributed in six areas within Hulu Langat as shown in Table 2 below. Only one respondent was not from the Hulu Langat area and this respondent was not aware of any soil erosion activities within the area.

Table 2: Breakdown of the Survey Responds by Area

No.	Area	Total	Percentage
1	Taman Titiwangsa, Hulu Langat	9	15.8%
2	Batu 14, Hulu Langat	13	22.8%
3	Hulu Langat	3	5.3%
4	Pangsun, Hulu Langat	18	31.6%
5	Dusun Tua, Hulu Langat	12	21.1%
6	Hulu Langat Police St, Bt 14	1	1.8%

7	Not near Sungai Langat		1	1.8%
		Total:	**57**	**100%**

General Demographics

The respondents were mainly self-employed (30%), work in the government (25%) and private (21%) sector while the other 24% comprise non income earners that include housewives and students. Majority (42%) of the respondents have total household income of RM3, 000.00 to RM5, 000.00 a month while the total number in a household is mainly four (4) to five (5) persons (44%).

Questions on type, length of stay and ownership of the present dwelling were asked to determine the level of economical and psychological impact of the soil erosion occurrences on the affected community. Results showed that majority of the respondents live in detached houses or bungalows (46%) and terrace or link houses (46%). 65% of the respondents have lived in the Hulu Langat area for more than ten (10) years which could indicate original settlers in the area, which is further affirmed by findings on the ownership of the dwellings which showed that 77% of the dwellings are owned by the respondents. Figures 1 to 3 show the findings of the survey on type, length of stay and ownership of dwellings.

Perceived Impact of Soil Erosion

98% of the survey respondents live or work near the Sungai Langat area, out of which 47% are aware of the occurrences of soil erosion along its banks. A total of ten (10) areas of soil erosion occurrences were identified from the survey, that include Batu 14, Hulu Langat, Sg. Semungkar, Sg. Tekali, Jln Hulu Langat/Ampang, Kg. Sg. Semungkis, Sg. Chua, Sg. Serai, Sg. Limau Manis, Batu 11, Hulu Langat and Dusun Tua.Most of the respondents interviewed had either witness the soil erosion occurrences along the Sungai Langat themselves (45%) or had heard about it from people living in the affected area (42%). Responds to questions asked to determine the extent of economical and psychological impact of the soil erosion on the affected community are tabulated and shown in Table 3 and Figure 4 and Table 4 and Figure 5 respectively.

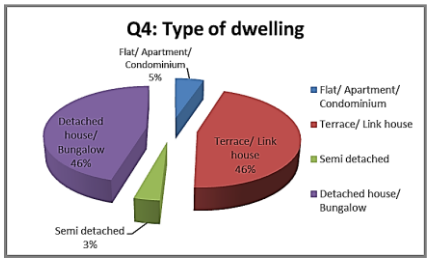

Figure 1: Type of Dwelling

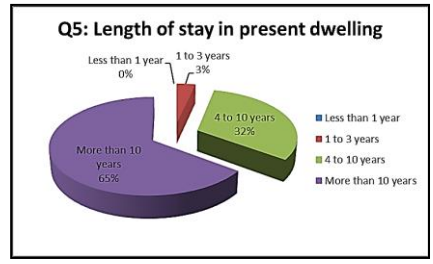

Figure 2: Length of Stay

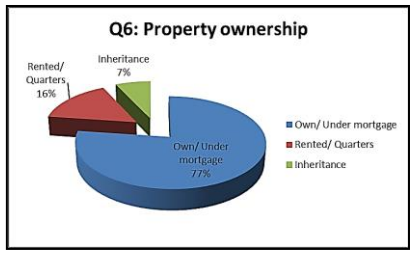

Figure 3: Property Ownership

Table 3: Determination of the Extent of Economic Impact of Soil Erosion on the Affected Community.

Question		Answer (%)			Total (%)
		Yes	No	Not Sure	
4a	Has the erosion resulted in loss of source of income?	0.0	100.0	0.0	100
4b	Has the erosion resulted in reduced income?	0.0	100.0	0.0	100
4c	Has the erosion resulted in reduced rental rate/ value of house and/ or land?	3.7	63.0	33.3	100
4f	Has the erosion resulted in damage to your property?	11.1	88.9	0.0	100

Table 4.0: Determination of the Extent of Psychological Impact of Soil Erosion on the Affected Community.

Question		Answer (%)			Total (%)
		Yes	No	Not Sure	
4d	Has the erosion resulted in you being unable to continue with recreational activities like fishing etc. in the Langat River?	51.9	40.7	7.4	100
4e	Has the erosion resulted in migration of local people to other places?	25.9	14.8	59.3	100
4g	Has the erosion resulted in damage to public property such as roads, bridges etc.?	96.3	3.7	0.0	100
4h	Has the erosion resulted in flooding in affected area especially during heavy rain?	70.4	22.2	7.4	100
4i	Has the erosion resulted in anxiety and feeling of unsafe when at home/ work place located near to the affected area?	66.7	29.6	3.7	100

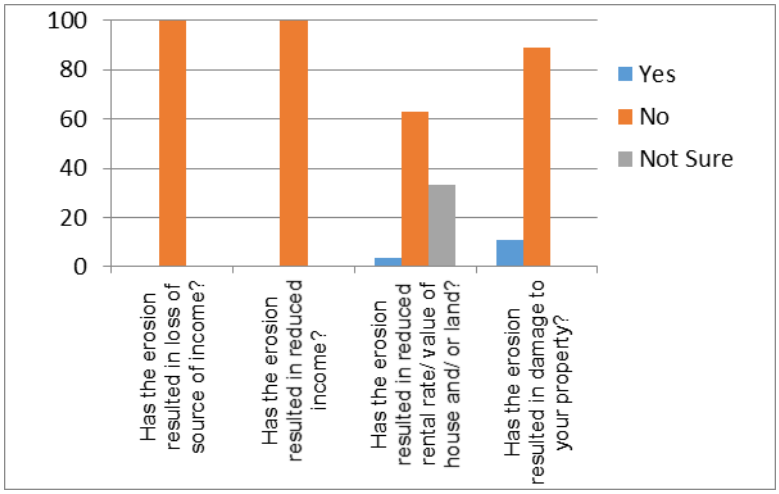

Figure 4: Determination of the Extent of Economic Impact of Soil Erosion on the Affected Community

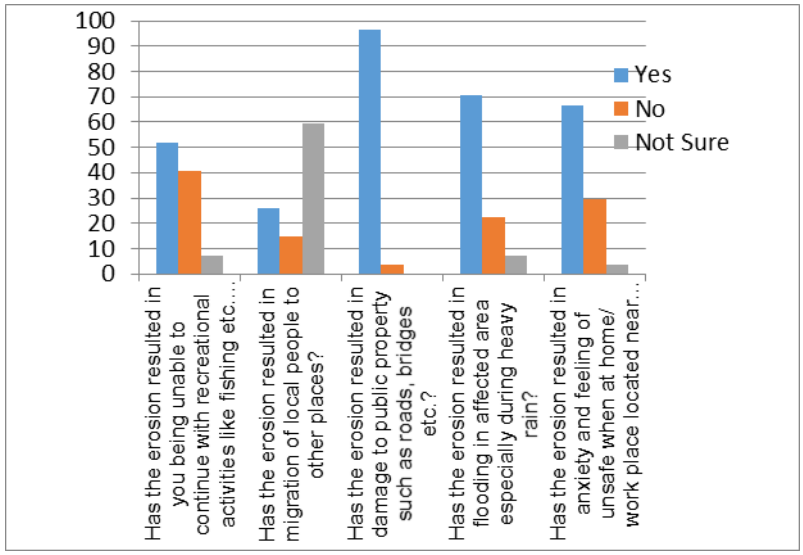

Figure 5: Determination of the Extent of Psychological Impact of Soil Erosion on the Affected Community

DISCUSSION

Community affected by the soil erosion occurrences along the Sungai Langat area are generally from the middle income group with monthly household income of between RM3, 000.00 to RM5, 000.00. Household sizes varies between three to five family members which could indicate a young family comprising parents and a child and a standard Malaysian family that normally comprise parents and two to three children. Majority own either detached or terrace houses located near the affected area and had been staying in the area for either more than ten years or between four to ten years, which could indicate original and new settlers of the Hulu Langat area respectively.

Areas of soil erosion occurrences identified by respondents in the survey coincide with areas that had been identified in the soil sampling activities carried out in the major research component. A total of 87% of the people interviewed had either visited the areas or heard about the soil erosion occurrences from people living in the Hulu Langat area.

Perceived Economic Impact of Soil Erosion on the Affected Community

In general soil erosion occurrences along the Sungai Langat area has no significant impact on properties located in the area. Neither has it caused any loss or reduction of income to the affected community, as shown in Figure 4.0. This is because majority of the people interviewed are salary earners working in the private or public sectors (46%) and self-employed (30%), mainly with own businesses and their livelihood is not dependent on the land, like farmers etc. Only a fraction (3.7%) of those interviewed was of the opinion that reduction in rental rate or value of properties in the affected area was caused by the soil erosion along Sungai Langat. It therefore could be concluded that the soil erosion occurrences in the area do not have any significant economic impact on the affected community.

Perceived Psychological Impact of Soil Erosion on the Affected Community

Significant number of people interviewed had expressed their concerns on the potential impacts of the soil erosion occurrences along the Sungai Langat. These concerns include flooding at the affected areas especially during heavy rain, damage to public properties and not being able to carry out recreational activities as shown in Figure 5.0. A significant 66.7% of the respondents admitted to feeling unsafe when being in or near the soil erosion areas. 25.9% of the people interviewed were of the opinion that migration of local people to places located outside the affected area are due to the soil erosion occurrences in the area while 59.3% were not sure whether or not this is the cause for migration. Prolong exposure to psychological threats on safety of lives and properties of this nature if not resolved could eventually lead to psychological impact that could eventually impair the community's ability to function as a social group.

CONCLUSION

Based on findings from the survey and interview carried out at the affected areas in Hulu Langat, it could be concluded that the soil erosion occurrences at Sungai Langat which was found to be at its worst in the Hulu Langat area does not have significant economic impact on the affected community. However, feedback gathered from the affected community during the survey indicated potential psychological impact that could include but not limited to increase in anxiety about safety of both lives and properties.

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CHANGES IN THE IDENTITY OF A TOWN CENTRE: A CASE STUDY OF AL-KHOMS CITY, LIBYA

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ABSTRACT

This study aims to study the changes in the identity of the town centre in Al-Khoms Libya. According to Lynch (1982) identity combines both similarity and difference, creates a sense of distinctness an individual, group or society identifies his or herself with. Identity is also used to differentiate themselves from others. In this study, the researcher will examine the uniqueness of the features and qualities which the residents link to the identity of the town centre. The first objective of the study is to study the qualities of the elements that residents associate with the identity of Al-Khoms city. Secondly, the difference in the perception of the residents pertaining to elements and qualities which are linked to the identity of different sectors of Al-Khoms city will be examined. Thirdly, the research will identify main features that have an influence on the identity of the town. Lastly, this study will also identify the qualitative attributes of elements linked with the identity of Al-Khoms. Al-Khoms city was selected for this case study since it is an ideal example of an urban settlement in Libya with rich historical and cultural heritage. The location of Al-Khoms is well known and the historical centre of the Al-Khoms is the old section of the city whereby most of the buildings and urban forms which illustrates the social and physical features of the present and past lifestyle in Libya give a sense of identity. The research adopts mixed methodologies or triangulation method which utilises both quantitative and qualitative methods of data collection and analysis. The quantitative approach involves the collection of data through the distribution of questionnaires to a sample of the residents in the town centre. SPSS, AMOS is used to process the data and descriptive statistics mainly frequency and percentage are used to analyse the data. The qualitative method involves focused interview, photo recognition interview, sketch map task and visual survey which includes recording and field observations.

Keywords:
Changing Identity, Image, Physical Features, Qualities, Sense Of Place, Town Centre.

INTRODUCTION

This study aims to study the changes in the identity of the town centre Al-Khoms in Libya. According to [1] identity combines both similarity and difference, creates a sense of distinctness an individual, group or society identifies his or herself with. Identity is also used to differentiate themselves from others. In this study, the researcher will examine the uniqueness of the features and qualities which the residents link to the identity of the town centre.

THE PROBLEM STATEMENT

Libyan cities today lack coherence and harmony, leading to architectural confusion and erratic architectural features. This is the consequence of an absence of a clear identity to differentiate one building from another although there are different local conditions which affect the architecture. Besides, there is a lack of initiative from town planers and the bylaw set for overseeing building architecture plans and growth. The absence of supervision led to the emergence of slums and poor architectural features. In addition, local authorities have failed to find solutions, leading to these unsighted features playing an important part in the architectural scene [2].

Previous studies done by [2, 3 and 4], have raised concerns regarding the identity of city centres in Libya. Nevertheless, their studies are more related to how the Libyan identity is expressed in the built environment. For instance, [4] studied the problem of identity loss in architecture and urban planning which had created a Libyan image in Tripoli. The focus of his study is similar to other existing researches on the image of cities done by [6 and 7]. However, his focus was in terms of the physical image of building types which were found in the city centres rather than what elements and qualities the residents' perceived to be associated with identity of the city centres.

Most Libyan cities and towns have new buildings with similar features. Many projects in Tripoli, Benghazi and Al-Khoms are duplicated in other cities and towns throughout Libya with relatively no changes. In architecture terms, buildings are starting to appear with new designs and characteristics. For instance, the use of large glass facades, the use of imported decorative materials and the lack of courtyards are some of the new attributes of modern design. Similarly, there have been more construction of high-rise and glass buildings in Al-Khoms city lately.

Currently, Al-Khoms is facing physical and social problems. These could be due to the alterations which have occurred in the town centre not too long ago. Observing current architecture, there is a no integration between the people and environment that they live in. There is also little focus on simplicity or beauty driven by the natural, social, and economic environment. New buildings do not have a clear identity and no longer uses historically accepted architectural features. For instance, the simplicity of design is no longer practised with the overuse of colours and architectural decoration. European architecture has also been increasingly copied by the use of huge glass surfaces and the openness to the outside rather than having an internal courtyard. In recent times, the courtyard is the most important traditional architectural element that is missing [5].

Moreover, another issue which compounded the problem is weak management and poor supervisory system in the architecture and urbanization of the city. The main ministry responsible for policy on architecture and urbanization which is the Ministry of Housing and Planning, has been subjected to problems related to ensuring the availability of houses for the ever increasing population. In addition, the municipality has not been paying attention to the change in identity of the city because of the issues it faces internally along with a high level of workload [2].

PROPOSAL QUESTIONS

- What elements and qualities are associated with the identity of Al-Khoms city?
- What are the opinions of the residents of Al-Khoms on the changes in the identity of the town centre?

- What aspects play a major role in influencing the identity of a town?
- What are the attributes that give an identity to Al- Khoms city?

PROPOSAL OBJECTIVES

- To study the elements and qualities that residents associate with the identity of Al-Khoms city.
- To examine the difference in the perception of the residents regarding the elements and qualities which are associated with the identity of different parts of Al-Khoms city.
- To identify main features that has an influence on the identity of a town.
- To identify the qualitative attributes that are linked with the identity of Al-Khoms.

LIMITATIONS OF THE PROPOSAL

This research is only focused on studying the elements in the physical environment and the attributes that the residents associate with the identity of Al-Khoms city. Even though, activities and meanings are also important features of identity, their influence are only analysed on the basis of why the physical environment is noticeable and considered different. This study does not cover the users perception towards the town centre and is only limited to the residents' perception of identity.

SIGNIFICANCE OF THE PROPOSAL

The research contributes to the current collection of information in both the academic and professional field. In general, it is also considered a vital step to develop a Libyan coastal city. The research revealed that political, social and economic factors are motivating forces in influencing the identity of a city. The empirical section of this research revealed how the changes in the identity of the town centre of Al-Khoms occurred. The findings of this research help to explain the role of urban planning in altering the identity of a major city in Libya, an area relatively untouched by scholars and researchers.

SELECTION OF THE STUDY AREA

Al-Khums, also known as Homs, or Al-Khoms is a city at the northwest of Libya. It is situated on the Mediterranean coast which is approximately 60 miles (97 km) st the southeast of Tripoli. Al-Khoms serves as a tourist centre for Leptis, ancient city exotic remains of the Roman architecture (Figure 1). Al-Khoms is a historical city which has a rich cultural heritage. It is serves as a good exemplar of an urban settlement in Libya. The old section of Al-Khoms city serves as the historical base, home to many buildings and urban features that facilitates us to encounter the social and physical environment of its yesteryears and the present days in Libya, thus giving the city a unique identity. Colonisation has also contributed to a new phase of urban and architecture planning. This occurred before the fast development in the second half of the 20th century. Al-Khoms is the connection between Libya and the rest of the world. It is the core

of Libyan culture and arts. Therefore, it portrays the development in the architectural and urban identity of Libya.

Figure 1: Location of Al-Khoms city in Libya

LITERATURE REVIEW

Past research done on how people perceive environment offered the theoretical framework for this research. Existing theories on identity, perception, imagination and qualities associated with the identity of a city will be examined. Many researchers had reached an agreement that the identity of place involves the attributes of the physical environment, meanings, aspects, and human activities [8, 9, 10, 11, 12, 13, 14, and 15]. It is vital to remember that place identity is a result of the mutual relation between these different components. Many researchers are of the opinion that since this interrelationship is very complex, it is not easy to determine how each part of the component influences each other in order to create place identity [8, 19, and 18]. However, the attributes connected with the physical environment and activities are more tangible, and therefore, many past studies had been conducted to determine how important is their influence on identity [20].

The literature review done based on several past researchers and previous studies related to environmental perception showed the significance of the physical features and their appearance as important element for the place identity [8, 25, 26, 11 and 27]. Besides, the perception of identity is varied among the different residents depending on their demographic characteristics [29, 30, 28, 31, 32, 33, 34 and 22]. Lastly, a few elements are stated by all the residents as being part of their image of the city. These elements summarize the public image of an urban environment.

After reviewing the existing research done on the perception of the environment by the residents, a theoretical framework for this research was done. The vital attributes of the theory were examined namely the concepts of perception, cognition, image and identity of place as well as theories on the features of the identity of a place. These theories were advocated by Western scholars based on their Western perception of the built environment and physical features of the cities/. On the other hand, this research contributes a different perspective to the past research as it offers a base for further investigation from a Libyan context.

RESEARCH METHODOLOGY

This research uses triangulation method or a mixed methodology approach utilising both the quantitative and qualitative method of data collection and analysis. This is similar to other urban environmental research done by [23, 24, 21, 17, 13, and 16]. Quantitative method uses questionnaires which are distributed to a sample of residents in the town centre. The sample survey involves 100 residents from the residential areas within the town centre boundaries. The data collected from the survey gives information on the perception of residents regarding the environment of the town centre as well as the residents' profiles. The survey data is analysed using SPSS, AMOS and descriptive statistics for example frequencies and percentages. A cross-tabulation table is also utilised to identify the elements perceived by the respondents of different gender, ethnic and age groups. The qualitative methodology involves four techniques which are focused interview, photo recognition interview, sketch map task and visual survey that involve recording and field observations. Thirty residents were involved in the interviews. Qualitative analysis is further done on the data collected from this second phase. The photo recognition interview and focus interview were recorded on tape and transcribed. Analysis of the interview is focused on the recurrent themes and categories which are captured in the transcripts. The findings of the research are based on the summary of the cross analysis between the qualitative and quantitative approaches.

OUTLINE OF THE THESIS

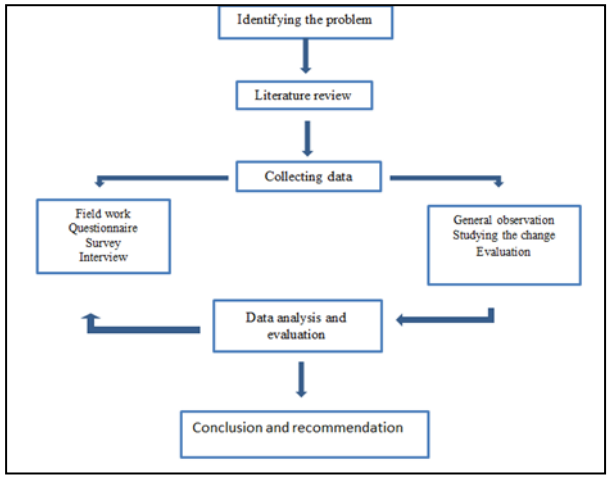

Figure 2: Outline of the Thesis

EXPECTED RESULTS

- The findings will reveal the difference in perception of elements associated with identity of different parts of the Al-Khoms city.

- The findings will identify the elements which are considered unique by the residents in Al-Khoms town centre and the qualities which are associated with these identities.

- The findings will be associated with the quality attributes linked with the identity of the town centre.

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THE USE OF FILLERS AND HESITATION DEVICES AS COMMUNICATION STRATEGIES AMONG MALAYSIAN LANGUAGE LEARNERS

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ABSTRACT

Communication strategies are the conscious plans taken by speakers in dealing with communication breakdowns, and it can be verbal and non-verbal, in relation to the notion of *strategic competence*; originally proposed by Canale & Swain (1980). There are various types of strategies in different taxonomies, and the use of fillers and hesitation devices is listed in the taxonomies proposed by Dörnyei (1995). This study looks into the use of fillers and hesitation devices as communication strategies among students in group discussion. Using the taxonomy of communication strategies proposed by Dörnyei (1995) as the basis of the study, this qualitative study describes the types of fillers and hesitation devices that the language learners use during group discussion. The findings show that fillers and hesitation devices are commonly used among the speakers for the group discussion task. The findings also revealed that there are differences in terms of the usage of fillers and hesitation devices as communication strategies between the high and low proficiency learners.

Keywords:

Communication Strategies, Fillers, Hesitation Devices, Language Learners, Group Discussion

INTRODUCTION

This study investigates the use of fillers and hesitation devices as communication strategies among Malaysian language learners. The patterns of fillers usage among the learners as a part of their strategies in communication are very important to be noted by the English teachers to make sure that they can practice the appropriate usage of communication strategies in the ESL classroom.

Background of the Study

Language learning in educational institution is generally designed to cater the need for the students to be proficient in using the language, and to provide language and communication and service training. Therefore, in language learning courses, students are provided with the exposure and training of integrated language skills, such as writing, reading, listening and

speaking. As for speaking, set of skills and strategies are projected towards producing proficient language users for certain uses, such as professional group communication, as well as academic discussion. Communication will ideally involve information transfer, and problems are bound to occur, and language barrier is one of the most relevant issues when it comes to English as the learners' second language. Nevertheless, some speakers of second language can still communicate effectively in spite of the fact that they lack the knowledge of the vocabulary and the grammar rules. This is when the communication strategies play the role in assisting the speaker to convey his or her messages. Dornyei (1995) discusses about this very example in his study, and relates the idea of strategic competence; where the main focus is given to verbal and non-verbal strategies used to compensate communication breakdown.

With the concern regarding the importance of communication strategies in the teaching and learning of English as the second language, this study is projected towards finding out the extent of usage of fillers and hesitation devices as communication strategies among the learners, specifically during group discussion as the speaking task. The findings will be able to provide the educators with the inside view of learners' knowledge about fillers and hesitation devices as communication strategies, and perhaps become the basis of rectification that can be done to improve the language teaching and learning at the institution.

Statement of the Problem

Communication is inevitably important and it is a major part of what is happening in people's life. In the context of language learning, especially English as the second language to Malaysian students, the problem in mastering the language knowledge, and lack of strategies used to rectify the process of communication become the additional factor that lead to their unsatisfactory achievement in their language proficiency. The awareness and knowledge of communication strategies among language learners, where fillers are listed as one of them are important to assist them in enhancing their ability to use the language and communicate effectively with others. As discussed in Faucette (2001), awareness among the learners about communication strategies could be increased by in-class instruction by the educator.

However, regardless of the importance of communication strategies in achieving successful interaction, little is known about to what extent actually the strategies have been utilised by the learners in the communication, specifically the usage of fillers and hesitation devices during their group discussion. The strategies may have or have not been taught explicitly in class, and the usage of the strategies among the learners could be naturally occurring as the result of the strategies that they have used in their first language communication. As such knowledge and skills regarding communication strategies are made available to the learners; it can assist them in preparing themselves for the future needs, such as the expertise pertaining to professional communication in the workplace.

Purpose of the Study

The main purpose of the study is to find out the usage of fillers and hesitation devices as communication strategies by the learners in group discussion. This study also compares the usage of the strategies between the high and low proficiency learners. The findings from this study exemplify the knowledge and the actual usage of the strategies among the learners, and it can be the benchmark of the future approach by the educators in the context of communication strategies exposure to the learners.

Objectives of the Study

The objectives of this study are to:

1. Find out the types of fillers and hesitation devices used among language learners in group discussion

2. Compare the usage of fillers and hesitation devices between the high and low proficiency learners.

Research Questions

The research questions for this study are as follow:

1. What are the types of fillers and hesitation devices used among language learners in group discussion?

2. Is there any difference in terms of the usage of fillers and hesitation devices between the high and low proficiency learners?

Significance of the Study

The findings from this study will be useful in providing the extent of usage regarding fillers and hesitation devices as communication strategies among the students during their speaking task. It will also present the information about the possible connection between the uses of the strategies for students of different proficiencies. Therefore, future teaching for the lesson can be improved with the infusion of such strategies in the language class. This study will also benefit the educators in planning the lesson with consideration given to communication strategies as an approach for the course. Consequently, it could be a descriptive way of gauging the current approach used by the educators, especially pertaining to speaking. In general, the findings from this study could possibly offer some contribution to the improvement of language teaching and learning in the institution and consequently enhance the quality of English education in Malaysia.

Limitation of the Study

This study was implemented using a case study approach, thus it involved a small number of participants. There were only four learners involved in the group discussion which were observed and recorded for the purpose of this study, with two of them representing high proficiency learners and the other two representing low proficiency learners. Furthermore, the participants chosen for the study are all male learners. Moreover, the study also focused on one particular product-based communication strategies taxonomy, the one suggested by Dornyei (1995), and did not include other taxonomies of communication strategies. Apart from that, the instruments used for the group discussion was originally used for the academic evaluation purpose; hence the discussion was formal in nature. Moreover, the controlled situation during the speaking task might have affected the spontaneity of communication among the learners. Last but not least, the data obtained was solely based on the researcher's observation of the

group discussion; therefore, in-depth reasoning for particular usage of communication strategies among the learners was not available for this study.

LITERATURE REVIEW

Communication Strategies

Plenty of researches have been done on communication strategies, and that lead to various ways of defining the strategies. However, a definition which is generally working to define the term 'communication strategies' is proposed by Corder (1980; cited in Dornyei, 1995). He defines communication strategy as '*a systematic technique employed by a speaker to express his [or her] meaning when faced with some difficulty*'. The definition provided is consistent with the two important concepts proposed by Canale and Swain (1980) and Faerch and Kasper (1983) regarding communication strategies, which are problem-orientedness, as well as systematic and consciousness. Conceptually, communication strategies emerge from communication breakdown that occurs as the result of L2 speakers' failure to convey their intended message because of their limited mastery of the knowledge.

The two important defining criteria for communication strategies in general are 'problem-based' and 'consciousness'. As for the first criteria, it occurs as the result of the clashing between the communicative intention of the speaker and the linguistic resource available. Dornyei and Scott (1997) argue that the notion of 'problem-based' is too general and there is a need to narrow it down to the exact type of problems that arise in the communication. They proposed the following four problem; *resource deficits* which prevent the speaker from verbalizing the message, *own-performance problem* which emphasize on the realization of the speaker upon the problems in his discourse and the way he deal with it, *other-performance problem* which focus on the problems of the interlocutor in the communication, and finally *processing time pressure* which highlight on the importance of sufficient time for the speaker to process and plan the communication.

The second defining criteria; 'consciousness' could occur in many stages during the process of communication. Some of the instances are the speaker's consciousness about the problematic occurrences, the attempts to deal with the problem, as well as the possible ways to rectify the crisis. Therefore, the four aspects which are recommended by Schmidt (1994; cited in Dornyei and Scott, 1997) as the main construct of the term consciousness in communication strategies are intentionality, attention, awareness and control. As for fillers and hesitation devices, they are both generally related to these two important criteria.

Dornyei's (1995) Taxonomy of Communication Strategies

This taxonomy is one of the most employed taxonomies of communication strategies for the related research in this field. Dornyei's (1995) taxonomy is outlined based on the most common and important strategies which consistently appeared in the earlier taxonomies. The following figure illustrates the taxonomy and the strategies, which listed fillers and hesitation devices as a part of it.

Avoidance or Reduction Strategies
i. Message abandonment ii. Topic avoidance
Achievement or Compensatory Strategies
iii. Circumlocution iv. Approximation v. Use of all-purpose words vi. Word-coinage vii. Use of non-linguistic means viii. Literal translation ix. Foreignizing x. Code switching xi. Appeal for help
Stalling or Time-gaining Strategies
xii. Use of fillers/hesitation devices

Figure 1: Dornyei's (1995) Taxonomy of Communication Strategies

Fillers and Hesitation Devices as Communication Strategies

Dornyei (1995) argues that insufficient processing time for the speaker is the primary source that leads to communication breakdown. Thus, he suggested an extension for the definition of communication strategies with the inclusion of stalling activities. The logic underlying the inclusion of such strategy is for the speaker to have more thinking time while at the same time to keep the flow of the conversation going. As it helps the speaker to keep the communication going as well as for him to plan the discourse, time-stalling strategies such as lexicalized pause fillers and hesitation are also regarded as communication strategies.

Dornyei has originally considered Faerch and Kasper's (1983) conceptualization of communication strategies that highlight on 'problem-orientedness' and 'consciousness' as the central features. He proposed that the use of fillers and hesitation satisfy both stated criteria. Furthermore, this strategy falls under 'production' instead of 'communication' following Tarone's (1980) distinction of strategies; as the former refers to general attempts to use the linguistic system efficiently and clearly while the latter defines the efforts to specifically negotiate meaning by alternative means to convey an intended message.

METHODOLOGY

Research Design

The study was implemented using the qualitative approach, and case study was chosen as the main design. The type selected for the case study is illustrative, as it attempted to describe the fillers and hesitation devices as communication strategies usage among language learners. Furthermore, case study of illustrative type was utilised to provide indepth example and description about the strategies used by the language learners in the communication process; namely group discussion. Detailed account about the exact usage of the strategies among the learners was recorded and analysed. The analysis from the recorded data was employed to illustrate the way the language learners make use of the strategies in meaningful way during the group discussion; which is a major part of the speaking component in the language course.

This particular study is a representative case study, as the findings were made as generalization about the usage of fillers and hesitation devices as communication strategies among language learners for the chosen institution; UiTM Johor. The chosen students for the study represented the other students in terms of language proficiency; both high and low. As the students enrol in the same course in the institution with highly similar approaches in teaching and learning, generalization is deemed appropriate to be made.

The scope of the study is one selected group with four students for the speaking task, which is the group discussion. The students were randomly chosen from one of the faculties in UiTM Johor, specifically the Faculty of Information Management. As differences regarding communication strategies used between language learners of high and low proficiency are highlighted in this study, purposive sampling was done for the four learners involved in the group discussion, as the representatives of both levels of proficiency.

Research Method

For the purpose of this study, direct observation was carried out in investigating the communication strategies used by the language learners during group discussion, namely fillers and hesitation devices. The researcher observed a group of students and identified the strategies that they used when they engaged in the group discussion. For the purpose of noting the data, the instrument used for the observation was the checklist of communication strategies as well as video recording of the group discussion. The checklist is adapted from Dornyei's (1995) taxonomy of communication strategies. The recording was examined by the researcher to support the data collected from the observation.

Data Analysis Procedures

The data recorded from the observation as well as the video recording were analysed with focus given to the fillers and hesitation devices used by each student as communication strategies for both individual presentation and group discussion. The analyses were done to cater the research questions formulated for this study. The discussions were made based on two main focuses, which are:

1. The types of fillers and hesitation devices used among language learners in group discussion.

2. The difference in terms of the usage of fillers and hesitation devices between the high and low proficiency learners.

The analyses were done using thematic coding, based on the framework of communication strategies taxonomy by Dornyei (1995). The analyses were done inductively from the recorded and transcribed data, followed by tentative codes generating, specifically based on fillers and hesitation devices in the checklist. Detailed descriptions about each student; A, B, C and D were provided, and followed by the accounts on the patterns of the usage of fillers and hesitation devices as communication strategies by the students in general. Therefore, similarities regarding the strategies were highlighted among all four students. As the strategies used by students of different language proficiency is concerned, the data was analysed by quantifying qualitative data and was utilised to see the pattern and the differences of usage, as well as to compare the strategies used by the low and high proficiency students.

Participants and Setting

There were four students chosen as the participants for this study, and they are the diploma students from the Faculty of Information Management in their second semester of study in UiTM Johor. For the purpose of this study, two of the participants were chosen among the high achiever for the English course, and the other two from the low achiever. The selection was made based on their examination result for the English course from the previous semester, as well as their speaking test marks. These differences are highlighted to compare the differences of communication strategies usage between language learners of different proficiencies. The selection of the course was made based on the group discussion as the main part of speaking component. Based on the course information and syllabus, each and every student should be able to take part in a discussion, which comprises both individual presentation and discussion in the group. Therefore, the course is deemed suitable to cater the focus of the study which is communication strategies used by the students in group discussion.

FINDINGS

The Types of Fillers and Hesitation Devices Used

The use of fillers and hesitation devices is commonly used among the speakers for the group discussion task. Regardless of their proficiency level, this strategy, which is generally termed as stalling/time-gaining strategy (Dornyei, 1995) is frequently found in their spoken discourse. Naturally, the usage of fillers and hesitation devices are related to processing and thinking time among the speakers. This strategy could be further classified into more subcategories, which are *lexicalized fillers*, non-*lexicalized fillers*, *repetition*, *short pause*, and *long pause*. However, there is only an evidence of lexicalized fillers among the high proficiency learner in the recorded data. In addition, the findings also indicate that only low proficiency learners used long pause during the group discussion. The evidences and examples available from the data are classified under the other three sub-categories, and they are relevant among all speakers of both high and low proficiency.

Lexicalized Fillers

In general, communication strategies based on time-gaining or stalling are the ones mainly used among all speakers during the group discussion. The usage varies between these four sub-categories of strategies; non-lexicalized fillers, lexicalized fillers, repetition, and pauses, both short and long. However, there are some differences observed between the avoidance/reduction strategies which were used by the speakers of different proficiencies.

First of all, it is found that the usage of lexicalized fillers is uniquely used by the speaker of high proficiency level. The example of usage is as follows:

Table 1: Example of 'Lexicalized Fillers' Strategy Usage (as Fillers/Hesitation Devices)

Communication Strategy	Example	Notes
Use of fillers/hesitation (lexicalized fillers)	• I think, it is... how do I say this... profitable.(L117)	• Using lexicalized fillers 'how do I say this'

The usage of lexicalized fillers indicates the ability of the speaker to utilise his knowledge in the target language, which is English in helping him to deal with the problem that he faced during his attempt to communicate his idea. Thus, it shows that he is a better user of the target language hence proving his high level of proficiency. Rather than using other kind of strategies listed in avoidance/reduction category which portrays inadequacy of language knowledge such repetition of words or simply pauses, he managed to substitute the gap using the target language itself.

Non-lexicalized Fillers

The use of non-lexicalized fillers is indicated by the usage of simple sound fillers such as '*uh*', '*uhm*', and '*err*'. Basically, these examples of fillers are just sound without any particular meaning. The speakers used this strategy in order for them to allow some processing time for them, while at the same time keeping the conversation going without defects which could possibly occur if they just pause without filling in the gaps with these non-lexicalized fillers. From the data, all four speakers regularly used this strategy, and these fillers occurred at various positions in their sentences, at the beginning, in the middle, as well towards the end of the sentences, as illustrated by the following examples:

Table 2: Examples of Non-Lexicalized Fillers Used

Position	**Examples of non-lexicalized fillers used**
Beginning of the sentence	• *HP1 : Uhm, why did I say that is because,...* ***(L12)*** • *HP2 : Uhm... I think, business, there's something in your mind...* ***(L111)***

	• *LP1 : Uh... the reason is, because uh...* ***(L6)*** • *LP2 : Uh... the example of job that...* ***(L42)***
Middle of the sentence	• *HP1 : ... with the certificate we can use it to uh, apply uhm, uh... apply at the many of uh...* ***(L15)*** • *HP2 : ... Ejat's point just now, he, you stated that uh... you highlight the word experience right?* ***(L107)*** • *LP1 : ...so, we are, we are not uh... from the 90's, ...* ***(L49)*** • *LP2 : ...give my opinion that uh, student who did not perform well in their exam,...* ***(L19)***
Towards the end of the sentence	• *HP1 : ..., but they also seek for uhm... their... skills.* ***(L58)*** • *HP2 : ..., like your point, then, they can... uh, set up a business.* ***(L113)*** • *LP1 : ... soft skill is very needed in uh... in, in order to get a job.* ***(L102)*** • *LP2 : ..., they learn in uh... only theory.* ***(L27)***

The nature of these non-lexicalized fillers which makes them easy to use, but at the same time improve the efficiency and clarity of the communication could be the main reason for the frequent usage among all the speakers during the task.

Repetition

Repetition which falls under the category of fillers/hesitation devices simply means the repetition of words or phrases in the speakers' spoken discourse, which occur almost immediately after the first utterance of the word, or combined with other words as well as non-lexicalized fillers. It is different from the repetition that the speakers did when they attempt to highlight the significance of the points, hence repeating it in their sentence. Repetition of word functions to improve the speech production in terms of its clarity. Instead of keeping quiet or filling in the gaps with non-lexicalized fillers, the speakers repeat the words that they have uttered before to keep the conversation going, while allowing them to have some processing time and come up with their ideas after that. Some examples of the usage of repetition among the speakers as fillers are as follow:

Table 3: Examples of Repetition Usages (As Fillers/Hesitation Devices)

Repeated words / phrases	**Examples of usage**
office	• LP2 : ...clerk at office, any office, any... lots of office in Malaysia right? (L42)
apply	• HP1 : ..., I think that, when they... apply... apply for the IKBA, they... (L56)
the skill	• LP1 : ... teach their student the skill, the skill about... (L101)
spray	• HP2 : Spray, spray anything that your customers want. (L115)

The usage of repetition as fillers in the communication is frequently recorded among all speakers, thus it is generally an example of a common strategies which occur in communication, regardless of the difference in terms of the speakers' proficiency levels.

Short Pauses

Another sub-category under the use of fillers and hesitation which occurs in all speakers' spoken discourse is short pause. Slightly different than non-lexicalized fillers and repetition, short pause does not involve any use of word or phrase in its usage. The speaker simply stops talking for a brief moment, approximately 1 to 2 seconds, and continue with his points afterwards. It is quite similar with the other fillers/hesitation devices discussed earlier in terms of function, as it provides the speaker with some processing time to deal with his language deficiency or idea development. Some of the examples regarding the usage of short pause recorded in the data are as listed below:

Table 4: Examples of Short Pauses Usages (as Fillers/Hesitation Devices)

Level of Proficiency	**Example**	**Notes**
• *High*	• *HP1 : ..., they... do more practical rather than theory.* ***(L16)***	Short pause after the word '*they*'
• *High*	• *HP2 : ... you've said that... they must... work, right?* ***(L31)***	Short pause after the word '*might*'.
• *Low*	• *LP1 : ...they might... have a good result.* ***(L7)***	Short pauses after the word '*that* and '*must*'.
• *Low*	• *LP2 : ...looking for a suitable job, why I said this is a best... suggestion that because...* ***(L138)***	Short pause after the word '*best*'.

The usage of short pause in speakers' spoken discourse can be related to the speakers'attempts to ensure the continuation of the points that they try to explain to the other speakers. Instead of using non-lexicalized fillers, which somehow could interrupt the flow of the message presented, the speakers paused shortly, about 1 to 2 seconds after certain word, and continue the sentence with the idea that they have thought of. Thus, rather than separating the chunks of idea, they could keep the idea together in one continuous utterance of sentence.

Long Pause

The usage of long pause, which indicates the loss of idea without any attempt of substituting the gaps is only recorded among the low proficiency speakers. A little different from short pause, long pause is indicated by longer duration, which is more than 5 seconds. The following are some of the examples from the data:

Table 5: Example of 'Long Pause' Strategies Usage (as Fillers/Hesitation Devices)

Communication Strategy	Example	Notes
Use of fillers/hesitation (long pause)	• *So, about my point, uhm... it... (long pause) go back to school...**(L103)***	• Long pause indicates loss of idea/words and processing time.
	• *...lots of graduated person that are... un...employed. (long pause). **(L25)** Actually, uh...**(L26)***	

Long pause, other than defecting the efficiency and clarity of the message being conveyed, it also shows lack of skills and language knowledge of the speaker. In addition, longer thinking time indicates lack of abilities among the learners in dealing with the problems that occur during the communication, possibly caused by their low level of proficiency in the target language.

Generally, the findings suggest that the communication strategies categorized under the use of fillers and hesitation devices are the high-frequency elements, and learners tend to resort to the strategies in numerous problem-situations in their discourse. Thus, these sets of strategies became routinized; as proposed by Gass and Selinker (1994). Moreover, as suggested by Dornyei and Scott (1997), rather than planning to execute the strategies to handle the difficulties, which the speakers are aware of during the communication, the devices are used most of the time without a conscious decision (p.185). Therefore, it can be concluded that the usage of these devices normally occurred among learners regardless of their level of proficiency; hence became the common strategies used by the learners during the speaking task.

DISCUSSION

All of the learners used fillers and hesitation devices in their communication; specifically non-lexicalized fillers, repetition, and short pause. It suggests that these kinds of communication

strategies are the high frequency elements, and learners tend to resort to the strategies in numerous problem-situations in their discourse. Thus, these sets of strategies became routinized; as proposed by Gass and Selinker (1994). Moreover, as suggested by Dornyei and Scott (1997), rather than planning to execute the strategies to handle the difficulties, which the speakers are aware of during the communication, the devices are used most of the time without a conscious decision (p.185). Therefore, it can be concluded that the usage of these devices normally occurred among learners regardless of their level of proficiency; hence became the common strategies used by the learners during the speaking task.

With regard to the usage of fillers and hesitation devices between the high and low proficiency learners, it differs in terms of the choice of strategies made by the learners in their communication. In general, high proficiency learners used more lexicalized fillers while low proficiency learners used more pauses in their spoken discourse.

As the choice of communication strategies among high proficiency learners is concerned, the strategies that they chose implied the better mastery that they have with regards to the language. The notion about the usage of knowledge language is previously proposed by Nakatani (2006) as a characteristic of good language user. Pertaining to the use of lexicalized fillers as time-gaining or stalling strategies, the learners employed their knowledge of the vocabulary to fill in the gaps while thinking of some ideas to justify their points. It indicates the willingness of the learners to take the risk of using the language while gaining the time to think, rather than opting for non-lexicalized fillers. It is related to the findings from previous research that highlights on the risk-taking nature which is observable among high proficiency learners (Chuanchaisit & Prapphal, 2009).

On the contrary, the communication strategies choices by the low proficiency learners indicate their low ability in terms of the language knowledge as well as usage. Based on the findings, the strategies choice that they made generally stemmed from their low proficiency in the language, and their restricted ability to use the language in their communication. For instance, they used pauses regularly in their communication, which apparently indicate the loss of words or idea, as well as difficulties in explaining it. In addition, the usage of long pause, which caused defect to the flow of the communication were only evident among the learners with low proficiency. It is justifiable by their lack of knowledge and skills in using the language, thus they opted for such strategies. As proposed by Qingquan et.al (2008), such usage of time-gaining strategies among the low proficiency learners is possibly due to the limited knowledge of the learners, hence using the strategies to compensate the defects.

Implication

Direct instruction or explicit training of communication strategies, including fillers and hesitation devices; can be a good practice in language class or course, as it will directly expose these strategies to the learners. Thus, the learners will be more aware of these strategies, getting more related knowledge and skills hence assisting them in improving their language proficiency. However, it is notable for the language practitioners to highlight the role of communication strategies as temporary solution for communication breakdown stemming from language deficit, and not simply using it as the excuse to stop improving their language knowledge and skills.

In a more general view, considering the fact that direct instruction and explicit training of communication strategies are proved to improve language knowledge and skills among the learners, it is a good point to include communication strategies as part of the topics covered in

the English language courses syllabuses, especially the courses for beginner students. Early exposure to the strategies can help the learners in building good foundation in the language skills, specifically in speaking.

RECOMMENDATIONS

Based on the present study several recommendations can be made for the future research.

1. Research can include more communication strategies in analysing the findings thus more aspects can be discussed
2. Research can include more participants to expand the context of study hence enriching the potential findings with regard to the usage of communication strategies
3. Research can involve variety of task other than group discussion such as public speaking and object description
4. Research can involve participants from both genders to provide deeper insights from wider contexts to the findings
5. Combination of several communication strategies can be used as the framework of the research to justify more aspects in the usage of strategies among the language learners.

CONCLUSION

The present study aims to investigate the usage of fillers and hesitation devices as communication strategies among Malaysian language learners. Qualitative method was used to achieve the objectives of the study. Observation of a group discussion was implemented to obtain the data. The data obtained was analysed thoroughly using thematic coding, chiefly based on the framework of communication strategies taxonomy proposed by Dornyei (1995). The findings show that fillers and hesitation devices are commonly used among the speakers for the group discussion task. The findings also revealed that there are differences in terms of the usage of fillers and hesitation devices as communication strategies between the high and low proficiency learners.

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RELATIONSHIP BETWEEN THE AWARENESS OF 1MALAYSIA CAMPAIGN AND SECONDARY SCHOOL STUDENTS' THINKING AND BEHAVIOUR

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ABSTRACT

The Malaysian government introduced the 1Malaysia concept in 2009, which aimed to achieve a multicultural nation in which all races could accept one another and be united as a nation. Consequently, when unity is achieved, the country's development can achieve greater heights of success. Over the years, the concept has received nationwide publicity through electronic and print media. Although there have been a few researches on the 1Malaysia concept, there has been very little research done to investigate the awareness of the 1Malaysia concept from the perspectives of secondary school students and relationship between the awareness of 1Malaysia campaign and secondary school students' thinking and behaviour. 1700 questionnaires were distributed to secondary school students in the Federal Territories Malaysia using stratified random sampling method. 50 students were interviewed to find out about the views on the changes in their way of thinking and behaviour towards people of different races. The finding showed that more than 70 per cent of respondents were aware of the 1Malaysia concept. There was a significant relationship between awareness of 1Malaysia concept and change in thinking. There was also a significant relationship between 1Malaysia concept and change in behaviour. From the interviews, many of the students reported that their way of thinking and behaviour have changed after learning about the 1Malaysia concept, where they become more tolerant, more accepting of differences, and more understanding of people of other cultures and races. However, it was an interesting finding that the number of respondents who did not undergo any changes in thinking and behaviour was quite high. They reported that they had been practising multicultural tolerance even before the 1Malaysia concept was introduced. Thus, the findings from this study will serve as a platform for the 1Malaysia campaign planning unit to reassess their current promotional activities and embark on effective future activities to ensure positive cognitive and behavioural outcomes among the youngsters.

Keywords:

1-Malaysia Concept & Thinking and Behavioural Outcomes

INTRODUCTION

The Prime Minister of Malaysia, YAB Dato' Sri Najib Tun Razak introduced the 1Malaysia concept in 2009. The concept aims to achieve a multicultural nation in which all races could accept one another and be united as a nation. When it was launched the, it was part of the government's holistic effort in transforming and branding the country in the hope of building a united and progressive nation.

Since the launching, research on 1Malaysia concept has gained momentum. According to Borneo Post (2012), a series of survey on 1Malaysia were conducted in 2009, 2010 and 2011 to determine public support toward 1Malaysia concept championed by Prime Minister, Datuk Seri Najib Tun Razak. Most of the researches focus on the level of awareness, concept and values, general acceptance and appreciation about 1Malaysia concept among the public. However, these researches have used the general public as the respondents for the studies. There has been very little research to gauge the awareness of the 1Malaysia concept from the perspectives of secondary school students and investigate the relationship between the awareness of 1Malaysia campaign and secondary school students' thinking and behaviour.

LITERATURE REVIEW

Since the independence of Malaya and the formation of Malaysia on September 16, 1963, national unity has been one of the fundamental focuses for nation building (Denison Jayasuria, 2010). Tunku Abdul Rahman's administration began building a more pluralistic and multi-cultural Malaya to enable him to fulfil his immediate priority which was national unity (Cheah Book Kheng, 2002). The second Prime Minister, Tun Abdul Razak continued with the agenda to unite the multi-races in this country. Subsequently, Tun Hussein Onn concentrated all his efforts to instil unity among the multi-races in Malaysia. Tun Dr. Mahathir and Tun Addullah Hj Ahmad Badawi continued the legacy by introducing Vision 2020 and the concept of excellence, glory and distinction, respectively, in efforts to instil unity among the many races and provide social justice for each of the races in this country.

The need to transcend racial boundaries is crucial if the country wants to avoid the possibility of racial harmony being lost or destroyed. This could be considered as a principle passed on amongst the country's line of previous leaders who believed that without the strength of unity amongst the people, Malaysia would not be successful in increasing and developing the population of the country (Sivamurugan Pandian, 2010). Tun Dr Mahathir Mohamad, the forth Prime Minister, who introduced Vision 2020 in February 1991. He stressed that Malaysia's major challenge in nation building is to create a Malaysian nation that is united and has similar aspirations, integrate at the territorial level and between ethnics based on equal rights and justice.

Mahathir in describing Vision 2020's aims said:
"Malaysia should not be developed only in the economic sense. It must be a nation that is fully developed along all the dimensions: economically, politically, socially, spiritually, psychologically and culturally. We must be fully developed in terms of national unity and social cohesion, in terms of our economy, in terms of social justice, political stability and the system of government, quality of life, social and spiritual values, national pride and confidence (Mahathir Mohamad, 1991)"

Therefore, the realization that national unity is integral to Malaysia being a developed nation, the government of Malaysia has embarked on various campaigns to promote unity amongst diversity over the years. The Neighbourliness Campaign was created under the Department of National Unity (DNU) in 1986 as an effort to create a national identity between the three major races in Malaysia. Taylor & Botan (1997) conducted an analysis on the Neighbourliness Campaign to investigate its role in building national unity. The study combined in-depth interviews and questionnaires. Public perception showed that the respondents did perceive some of the goals of the Neighbourliness Campaign. They believed

that integration and unity were the goals of the campaign. However, when they were asked what suggestions they had for the DNU for building national unity, one-fifth of the respondents stated that the government should be fairer to all races in their administration and national policies. Other than the Neighbourliness Campaign, there have been numerous other campaigns to promote racial harmony and unity. The latest of such campaigns is the 1Malaysia campaign, which has received nationwide publicity.

Malaysia has unique compositions that are based on multi-racial, multi religious, multi-cultural and multi-lingual population. This creates challenges in forming national unity, getting every member of the society to understand other cultures and build strong ethnic relations. 1Malaysia emphasizes on the attitude of accepting the diversity in ethnicity. Furthermore, one ethnic could openly accept the uniqueness and appreciate other ethnics as valuable assets and identity as Malaysians (Tarmizi Abdul Rahim, 2009).

There has been a growing interest on the 1Malaysia concept that has resulted in more researches being carried out. Although, there is an increased number of studies done to look into the effectiveness of the 1Malaysia campaign, a study that instigate on the awareness of the 1Malaysia campaign from the perspectives of young Malaysian i.e. secondary school students is timely due to the fact that this young generation will be the pillar of Malaysia in the near future.

The findings of this study can provide insight into young Malaysians' view of the 1Malaysia concept. This in turn serves as a platform for the 1Malaysia campaign unit to reassess their current stand and formulate future strategies to further enhance the acceptance of the 1Malaysia concept that translates into appropriate behaviour modification.

METHODOLOGY

Participants

Questionnaires were distributed to secondary school students in the Federal Territories Malaysia. The participants were all Malaysian. They consented to take part in the study. The participants were briefed on the details of the study and informed that their participation was voluntary, anonymous and the study would be carried out in strict confidentiality.

The completed questionnaire was pre-tested through a pilot survey using 70 respondents. The objective of the pilot survey was to test the content and clarity of the questionnaire. The questionnaire was produced in two languages, which are Malay and English. The alpha coefficient for the items tested is .809, suggesting that the items in the questionnaire have relatively high internal consistency.

The questionnaires were then distributed to 2200 secondary school students all over the Federal Territories Malaysia using stratified random sampling method. Out of which, 1700 questionnaires were received and used in the analysis of the data. Table 1 presents the characteristics of respondents.

Table 1: Characteristics of the Respondents

Categories	Characteristics	Percentage
Gender	Male	45.7
	Female	54.3
Ethnicity	Malay	60.6
	Chinese	25.2
	Indian	8.4
	Others	5.8
Age	13	15.4
	14	13.2
	15	15.8
	16	21.9
	17	22.3
	18	5.6
	19	5.8

Data Collection

The participants were asked to answer all questions in the Awareness of I Malaysia Campaign Questionnaire (A1CQ), which took approximately 10 minutes to complete. The researcher collected the surveys. The responses to A1CQ were used to determine participants' awareness level of the 1 Malaysia campaign.

50 students were interviewed to find out about the views on the changes in their way of thinking and behaviour towards people of different races.

Data Analysis

Data collected was analysed using SPSS version 20.0. To meet the objectives of the study, reliability analysis (Cronbach alpha), descriptive statistics, Pearson's correlation, and Chi-Square analysis were performed.

RESULTS

From the study, it was found that majority of the secondary school students were aware of the 1Malaysia concept. Table 2 exhibits the percentages.

Table 2: Students' Awareness of the 1Malaysia Concept

Responses	Percentage (%)
Yes	84.8
No	15.2
Total	100.0

When chi square test was used to determine whether there is a significant relationship between students' gender and awareness of 1Malaysia concept, it was found that there is significant relationship. Since the value is less than .05, then the statistics is considered to be significant, thus there is a significant relationship between gender and awareness of 1Malaysia concept (see Table 3).

Table 3: The Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.569	2	.005
Likelihood Ratio	10.759	2	.005
Linear-by-Linear Association	10.562	1	.001
N of Valid Cases	1700		

The respondents were asked on how well they understand the 1Malaysia concept. 67.7% of the respondents answered that they moderately understand the concept. A total of 16% of the respondents answered understand and strongly understand and a total of 16.3% answered that they do not and strongly do not understand (see Table 4 & Figure 1)

Table 4: Respondents' Level of Understanding of 1Malaysia Concept

Statements	Percentage (%)
Strongly Understand	7.5
Understand	8.5
Moderately Understand	67.7
Do Not Understand	13.5
Strongly Do Not Understand	2.8
Total	100.0

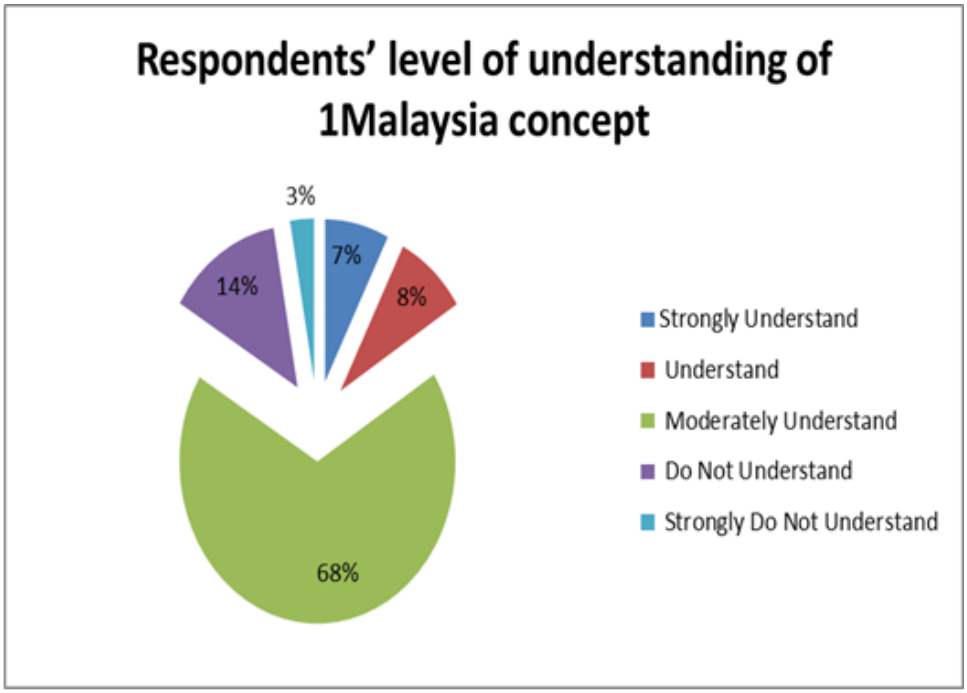

Figure 1: Respondents' Level of Understanding of 1Malaysia Concept

The top three responses given by the respondents when asked on their interpretation of 1Malaysia concept were: promoting ethnic relations in Malaysia (45.2%), promoting sense of respect for other cultures (27.2%) and instilling ethnic solidarity (16.6%). This shows that majority of the respondents has a basic understanding the 1Malaysia concept is about racial harmony and unity (see Table 5).

Table 5: What 1Malaysia Concept is about?

Responses	Percentage (%)
Promoting ethnic relations in Malaysia	45.2
Promoting sense of respect for other cultures	27.2
Instilling ethnic solidarity	16.6
Inculcating moral values among ethnics	3.8
Spearheading ethnic progress	1.1
Instilling social justice	1.1
Inculcating innovation culture	4.6
Inspiring common goals	0.2
Inspiring one nation spirit	0.2

A Pearson product-moment correlation coefficient was computed to assess the relationship between the 1Malaysia concept awareness and students' change of thinking towards people of different races. There was a significant relationship where there is a positive correlation between the two variables, ($r = .146$, $n = 1700$, $p < .0005$). See Table 6.

Table 6: Relationship between Awareness of 1Malaysia Concept and Students' Change of Thinking

		B1	F1
B1	Pearson Correlation	1	.146 **
	Sig. (2- tailed)		.000
	N	1700	1700
F1	Pearson Correlation	.146**	
	Sig. (2-tailed)	.000	
	N	1700	1700

**. Correlation is significant at the 0.01 level (2-tailed)

When the respondents were asked whether there are any changes in the way you think towards people of different races after they learn about the 1 Malaysia concept, 45% per cent of them answered 'yes', 28% were neutral and 27% answered 'no'.

Table 7: Changes in the Way Respondents' Think towards People of Different Races

Responses	Percentage (%)
Yes	45
Neutral	28
No	27

From the interviews, 20% of the students reported that their ways of thinking have changed after learning about the 1Malaysia concept, where they value unity/harmony more, 16% become more tolerant and 13% believe that they all equal (see table 8).

Table 8: Reasons for 'Yes' Answers:

Reasons	Percentage (%)
Value Unity / harmony more	20
Respect differences	16
We are all Malaysians / Equality	13
More comfortable with others	12
Mix around / learn from different cultures	11
Other reasons	28

A Pearson product-moment correlation coefficient was computed to assess the relationship between the 1Malaysia concept awareness and students' change of behaviour towards people of different races. There was also a significant relationship where there is a positive correlation between the two variables, ($r = .170$, $n = 1700$, $p < .0005$). See table 9.

Table 9: Relationship between Awareness of 1Malaysia Concept and Students' Change of Behaviour

		B1	F3
Pearson Correlation		1	.170**
B1	Sig. (2-tailed)		.000
N		1700	1700
Pearson Correlation		.170**	1
F3	Sig. (2-tailed)	.000	
N		1700	1700

**. Correlation is significant at the 0.01 level (2-tailed)

The respondents were then asked whether there are any changes in the way they behave towards people from different races after learning about the 1Malaysia concept. Table 10 presents the respondents' answers.

Table 10: Changes in the Way Respondents' Behave Towards People of Different Races

Responses	Percentage (%)
Yes	36.5
Neutral	31.5
No	32.0

36.5% of the respondents said yes, 31.5% were neutral and 32% said no. During the interviews, students who answered 'no' and 'neutral' explained that their behaviour has not changed because they had always been tolerant and respectful to people of other races. Therefore, the 1Malaysia concept serves as reinforcement on their positive behaviour.

Table 11: Reasons for 'Yes' Answers:

Reasons	Percentage (%)
Respect differences	30
More positive behaviour towards others	20
Mix around / learn from different cultures	15

Students who answered yes, explained that they become more respectful of differences (30%), showed more positive behaviour towards others (20%) and 15% of the students mix around and learn from different cultures (see Table 11).

DISCUSSION

The findings show that majority of the students are aware of the 1Malaysia concept, indicating that the 1Malaysia campaign has been successful in transmitting its messages to secondary school students. Majority of the students interpreted 1Malaysia as an effort to promote ethnic relations, promote sense of respect for other cultures and instil ethnic solidarity. The students' interpretation are in line with YAB Dato' Sri Najib Tun Razak's aspiration which is to achieve a multicultural nation in which all races could accept one another and be united as a nation.

Many of the students reported that their way of thinking and behaviour have changed after learning about the 1Malaysia concept, where they become more tolerant, more accepting of differences, and more understanding of people of other cultures and races. The findings also showed a significant relationship where there is a positive correlation between the two variables (awareness of 1Malaysia concepts and students' change of thinking towards people of different races), $p < 0.001$. There was also a significant relationship where there is a positive correlation between the two variables (awareness of 1Malaysia concepts and students' change of behaviour towards people of different races), $p < 0.001$. This signifies that the awareness of the 1Malaysia concept has changed the way students think and behave towards people of different races.

Although the number of respondents who did not undergo any changes in thinking and behaviour is quite high, the reasons they gave for the lack of change showed that they have been practising multicultural tolerance even before the 1Malaysia concept was introduced.

The results of the study showed that the government has been making the young generation aware of the 1Malaysia concept. This awareness has led to some extent to the desired outcomes which are a more positive way of thinking and behavioural change after learning about the 1Malaysia concept.

It is recommended that concentrated efforts are made by the government, schools and society to conduct more activities that involve young people of all races in activities that emphasise unity at school level or community levels.

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PERCEPTIONS OF ETHNIC RELATIONS AND UNDERSTANDING OF OTHER CULTURES AFTER THE 1MALAYSIA CAMPAIGN

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ABSTRACT

Malaysia has unique compositions that are based on multi-racial, multi religious, multi-cultural and multi-lingual population. This creates challenges in forming national unity, getting every member of the society to understand other cultures and build strong ethnic relations. YAB Dato' Sri Najib Tun Razak launched the 1Malaysia concept in 2009 with the aims of building a united and progressive nation where the multicultural features of this country are used to form the 1Malaysia identity. Even though the 1Malaysia concept has been massively publicized via various modes of communication, there has been very little research on perceptions of ethnic relations and understanding of other cultures after 1Malaysia campaign especially from the perspectives secondary school students. Thus, this study attempts to close that gap. Questionnaires were distributed to 1700 secondary school students in Malaysia using stratified random sampling method. The findings showed that majority of the students felt that the relationship between different ethnic groups in Malaysia was very important, but they perceived the current situation of the relationship as moderate and they were neutral in terms of their level of satisfaction regarding the relationship. The Malay culture ranked first in terms of being understood by the secondary students, while the Chinese culture ranked second and the Indian culture ranked third. In addition, there is a significant relationship between students' ethnicity and their level of trust of other ethnic groups. Thus, it is hoped that the findings from this study will serve as indicators for the 1Malaysia campaign planning unit to strategize towards changing secondary students' perception of ethnic relations and their understanding of other cultures to further improve the level of trust between different ethnic groups.

Keywords:
1-Malaysia Concept, Ethnic Relations & Cultural Understanding

INTRODUCTION

The Prime Minister's personal website (1Malaysia, 2009) describes 1Malaysia as intending to "..provide a free and open forum to discuss the things that matter deeply to us as a Nation. It provides a chance to express and explore the many perspectives of our fellow citizens. What makes Malaysia unique is the diversity of our peoples. 1Malaysia's goal is to preserve and enhance this unity in diversity which has always been our strength and remains our best hope for the future."

1Malaysia became an extensive public relations campaign on September 16, 2008, the day it was first announced by the Prime Minister. All government agencies and civil servants were instructed to put priority on ethnic harmony, national unity and competent governance. However, even though the government has always been consistent in executing this concept by promoting the concept in various modes of communication, Malaysians are still facing a

problem to understand the concept and end up interpreting it differently. Regardless of the massive publicity and coverage of the 1Malaysia concept, there has been very little research on perceptions of ethnic relations and understanding of other cultures after the 1Malaysia campaign especially from the perspectives of the younger generation like the secondary school students.

LITERATURE REVIEW

1Maysia concept was introduced by the present Prime Minister of Malaysia, YAB Dato' Sri Mohd Najib Tun Razak with the aim of developing one nation. With the motto; "1Malaysia, People First, Performance Now", the government stressed on promoting the concept where people think and act as united Malaysians. The implementation of the 1Malaysia concept is supposed to strengthen ethnicity relationships thus uniting Malaysia as a whole. Najib Razak (2009) has explained that 1Malaysia concept would annihilate discrimination.

In his speech to celebrate the 100th day of being Malaysia, Prime Minister Dato' Sri Najib Razak explained that the introduction of the 1Malaysia concept was the backbone of his vision to move Malaysia towards achieving a developed country status. He strongly believed that unity is pertinent in creating a peaceful country with plural society like Malaysia. Citizens of Malaysia were likened as a *keluarga besar* (big family), which consists of people from various races, cultures and beliefs, are the important components in determining the successful future of the country (Mohd Najib Razak, 2009). He mentioned that the plural society in Malaysia is an 'asset and competitive advantange that has and will continue to put us head and shoulder above our global competitors.' (Mohd Najib Razak, 2009).

Dato' Sri Najib Razak explained that the 1Malaysia concept has its uniqueness as it is not trying to assimilate the various cultures and create a national identity, but it celebrates the diversity of cultures and considers it as an asset. The 1Malaysia concept focusses on the acceptance of other cultures (most prominently the Malays, Chinese and Indian) in Malaysia. Therefore, eight core values which should be practised by all the different races in Malaysia; in order "to preserve and enhance this unity in diversity which has always been our strength" were identified and listed (1Malaysia Booklet, n.d.). The eight values are perseverance, acceptance, education, integrity, meritocracy, humility, loyalty and culture of excellence.

Inter-ethnic rivalry and suspicion have been present since the British colonial rule as the local Malay population was concerned that the Chinese and Indian migrant population might outnumber the Malay population in numbers. This will put the Malays in a minority position. The Malay states (9 in total ruled by Sultans) and 3 Straits Settlements (Penang, Singapore and Malacca) made up Malaya at the time of Independence (Omar, 2009). Independence was reached in 1957 and since then, Malaysia's ruling governments were for and by parties drawn along ethnic lines. Malaysia then was ruled politically by Malay aristocrats. The economy was dominated by ethnic Chinese while the Indians worked in the rubber estates or took up administrative jobs (Saravanamuttu, 2009).

The social issue of racial harmony is being rebranded in a new way in the 1Malaysia Concept by means of advertisements on billboards, television and radio networks in a very visible manner. In addition to that, a dedicated website was set up by the Prime Minister himself so that the sense of unity can be seen and felt for the greater and more economic reason of making business and economic advances. Rahman (2009) comments that race and religion based policies have resulted in the socially divisive modes of consciousness and behaviour.

Thus, the 1Malaysia concept has been massively publicized to ensure that the message reaches everyone regardless of his or her geographic location.

Research on 1Malaysia concept has increased recently. According to Borneo Post (2012), a series of survey on 1Malaysia were been conducted in 2009, 2010 and 2011 to gauge the support of people toward 1Malaysia concept mooted by Prime Minister, Datuk Seri Najib Tun Razak in 2009. Most of the researches focus on the level of understanding and awareness about 1Malaysia concept among public, concept and values, acceptance and appreciation of the concept and media roles in promoting the concept. However, these researches concentrated on the public in general. There has been very little research on perceptions of ethnic relations and understanding of other cultures after 1Malaysia campaign especially from the perspectives of secondary school students.

METHODS

Research Instrument

The survey instrument was a two-page questionnaire. The questions relevant to this paper were in two sections consisting of nine questions. The first question was about how the respondents perceived the relationship between different ethnic groups in Malaysia. The second question asked about the respondents' level of satisfaction regarding the relationship between different ethnic groups. The third question focused on the importance of the relationship between different ethnic groups. The fourth question asked about whether Malaysian can discuss racial issues openly. The fifth question in section 1 focussed on the respondents' views on ethnic relations in Malaysia in next ten years. Section 2 began with a question on respondents' understanding of the Malay culture, Chinese and Indian cultures and customs. The last question concentrated on the respondents' level of trust towards other ethnic groups.

The completed questionnaire was pre-tested through a pilot survey using 200 respondents. The objective of the pilot survey was to test the content and clarity of the questionnaire. The questionnaire was produced in two languages, which are Malay and English. The alpha coefficient for all the items is 0.829, suggesting that the items have relatively high internal consistency.

The final version of the questionnaires was distributed to 2200 secondary school students all over Malaysia using stratified random sampling method. Out of which, 1700 questionnaires were received and used in the analysis of the data. Table 1 presents the characteristics of respondents.

Table 1: Characteristics of the Respondents

Categories	Characteristics	Percentage
Gender	Male	49.6
	Female	50.3
Ethnicity	Malay	67.6

	Chinese	20.2
	Indian	6.4
	Others	5.8
Age	13	15.4
	14	11.2
	15	8.8
	16	21.9
	17	31.9
	18	5.6
	19	5.8
State	Kuala Lumpur	22.9
	Selangor	12.8
	Negeri Sembilan	9.6
	Pahang	10.0
	Kelantan	8.4
	Johor	5.8
	Sarawak	6.0
	Sabah	6.6
	Perak	5.9
	Kedah	11.9

RESULTS

When the respondents were asked about how they perceived the relationship between different ethnic groups in Malaysia, 39.9% of them felt that the relationship between different ethnic

groups in Malaysia was neutral and 13% felt that the relationship was bad. 36.8% of the respondents felt that the relationship between different ethnic groups in Malaysia was neutral.

When the respondents were asked whether there are satisfied with the relationships between different ethnic groups in Malaysia, majority of them were satisfied. Table 2 presents the findings.

Table 2: Relationships between Different Ethnic Groups in Malaysia

	Valid Percent
Very Satisfied	10.9
Satisfied	15.8
Slightly Satisfied	20.0
Neutral	36.8
Slightly Dissatisfied	9.3
Dissatisfied	3.7
Very Dissatisfied	3.4

10.9 % of them felt very satisfied, 15.8% satisfied and 20% slightly satisfied with relationship. 16.4% felt that they were dissatisfied with the relationship between different ethnic groups. 36.8% of the respondents felt that they were neutral about the relationship between different ethnic groups in Malaysia.

Table 3:Chi-square Gender and Students' Satisfaction

	X
Gender and student satisfaction of the relationship different ethnic groups	0.001

The results of Chi-square test in Table 3 indicate that gender has a significant relationship with students' satisfaction regarding the relationship between ethnic groups.

Table 4:Chi-square Gender and Students' Perception

	X
Gender and students' perception of the importance of good relationship between different ethnic groups	0.000

There is also a significant relationship between gender and students' perception of the importance of good relationship between different ethnic groups (see table 4). 57.4% of the respondents had an opinion that good relationships between different ethnic groups in Malaysia were very important. Only 15.5% of them felt neutral and 4.4% felt unimportant.

53.6% of the respondents responded that Malaysians can discuss racial issues openly. The other 46.4% believed that Malaysian cannot discuss the racial issues openly.

The respondents of difference races were asked regarding what they think of the ethnic relations in Malaysia in the next ten years.76.2% of the Malay respondents answered that ethnic relations in Malaysia will improve, meanwhile 40.3% of the Chinese respondents answered the situation will worsen. Majority of the Indian respondents answered that the situation will remain the same while the others answered that they did not have any opinion.

Table 5: Understanding of different cultures

Malay culture and customs	Valid Percent	Chinese culture and customs	Valid Percent	Indian culture and customs	Valid Percent
Good Understanding	60.7	Good Understanding	36.4	Good Understanding	20.8
Neutral	28.5	Neutral	30.1	Neutral	31.4
Lacked Understanding	10.7	Lacked Understanding	33.4	Lacked Understanding	47.8

From Table 5, it was clear that majority of the respondents showed good understanding of the Malay culture and customs. 28.5% of them were neutral and only 10.7% lacked understanding. When it comes to the Chinese culture and customs, 36.4% of the respondents claimed to have understanding, 30.1% were neutral and 33.4% lacked understanding. Understanding of Indian culture and customs was really lacking as only 20.8% of the respondents said that they had understanding, 31.4% were neutral and 47.8% lacked understanding. From the findings, it was evident that the Indian culture and customs were the least understood by the respondents and the Malay culture and customs were the most understood.

The respondents were also asked about their level of trust in other ethnic groups. 40.5% of the respondents were neutral, 33.3% felt a distrust of other ethnic groups while only 26.2% had trust.

There is a significant relationship between the respondents' race and level of trust at p=.000 and significance at p<0.001. Majority of the Malay distrust other races, majority of Chinese slightly trust other races, and the Indian respondents strongly trust other races.

Table 6: Understanding of Other Cultures

STATE	MALAY CULTURE AND CUSTOMS	CHINESE CULTURE AND CUSTOMS	INDIAN CULTURE AND CUSTOMS
Kuala Lumpur	Do Not Understand	Understand	Understand
Selangor	Understand	Do Not Understand	Slightly Understand
Negeri Sembilan	Slightly Do Not Understand	Do Not Understand	Strongly Do Not Understand
Pahang	Do Not Understand	Strongly Understand	Neutral
Kelantan	Strongly Understand	Slightly Do Not Understand	Strongly Do Not Understand
Johor	Do Not Understand	Understand	Strongly Understand
Sarawak	Slightly Understand	Slightly Do Not Understand	Slightly Do Not Understand
Sabah	Slightly Do Not Understand	Understand	Slightly Do Not Understand
Perak	Neutral	Strongly Understand	Strongly Understand
Kedah	Strongly Understand	Do Not Understand	Do Not Understand

The findings in Table 6 show that respondents from different states had different level of understanding of the Malay, Chinese and Indian cultures and customs. This indicates the racial polarisation in different states in Malaysia.

DISCUSSION

The findings showed that majority of the students felt that the relationship between different ethnic groups in Malaysia was neutral. In terms of their level of satisfaction regarding the relationship, they perceived the current situation of the relationship as neutral. Only a small percentage of the respondents, felt that the relationship between different ethnic groups was bad. Respondents' gender has a significant relationship with their satisfaction regarding the relationship between ethnic groups.

Majority of the respondents felt that good relationship between different ethnic groups in Malaysia was very important in determining the successful future of the country. Only a very small percentage of the respondents felt that it was unimportant. There is also a significant relationship between gender and students' perception of the importance of good relationship between different ethnic groups.

The gap between the respondents believing that Malaysians can discuss racial issues openly and Malaysians cannot discuss the racial issues openly was very small. There was only a difference of 7.2%. This indicates that there is almost an equal division between the two opinions. This may be due to the respondents' level of trust in other ethnic groups where the percentages between respondents who felt neutral and those who had distrust of other ethnic groups showed a slight difference only.

The Malay culture ranked first in terms of being understood by the secondary students, while the Chinese culture ranked second and the Indian culture ranked third. The findings on different level of understanding of the Malay, Chinese and Indian cultures and customs in different states indicates the racial polarisation in different states in Malaysia. In addition, there is a significant relationship between students' ethnicity and their level of trust of other ethnic groups.

It is interesting to note that majority of the Malay respondents answered that ethnic relations in Malaysia in the next ten years will improve, meanwhile the Chinese respondents answered that the situation will worsen. Majority of the Indian respondents answered that the situation will remain the same while the others answered that they did not have any opinion.

Thus, it is hoped that the findings from this study will serve as indicators for the 1Malaysia campaign planning unit to strategize towards changing secondary students' perception of ethnic relations and their understanding of other cultures to further improve the level of trust between different ethnic groups. These youngsters will be the future generation and they will be the force in building a united and progressive nation.

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