Health and Safety Management Practices of Contractors in South East Asia: A Multi Country Study of Cambodia, Vietnam, and Malaysia

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Abstract
The construction sector is notorious for accounting for numerous occupational deaths, injuries and illnesses in many countries. In emerging economies this situation could be direr, and health and safety (H&S) management by contractors is important to tackling this. This study investigated the H&S management practices of contractors in three South East Asian countries (Malaysia, Vietnam, and Cambodia) with the view to highlighting implementation issues. A questionnaire instrument containing 40 H&S management practices was administered to contractors in the three countries. Analysis of the data revealed that in each of the three countries there are at least seven practices that are not commonly implemented by contractors. Whilst the study further suggests this to be acute in Malaysia and Cambodia, it also elucidates that the apparent situation could be due to inter alia: a significantly greater proportion of the contractors in the Malaysia sample being micro size firms; and also the effect of two national occupational H&S programmes implemented in Vietnam from 2006 to 2015. Overall, the findings offer an opportunity for contractors and key industry stakeholders (e.g. state authorities) to reflect on their approach/initiatives to improving H&S management in construction. Further studies which could offer additional empirical realities are also suggested.

Keywords: Cambodia; construction; health and safety management; Malaysia; South East Asia; Vietnam.

1.0 INTRODUCTION

In several countries, it is common to hear of tragic accidents/incidents in construction that result in injury, death or illness to workers and members of the general public. For instance, in Australia it has been reported that on average there are about 46 compensated fatalities yearly, and in USA the construction sector accounts for about 21% of all occupational deaths from injuries (see Lingard et al., 2010; Hallowell and Gambatese, 2009).The costs associated with these tragic occurrences can be huge and they are borne by the victims, their families, employers, the industry, governments and society as a whole. For instance in the UK, it is estimated that injuries and new cases of illness resulting from working conditions in construction cost society over £1.1 billion a year (HSE, 2014). In USA, based on 2002 national incidence data from the Bureau of Labor Statistics, the costs of non-fatal and fatal injuries in the construction industry were estimated at US$11.5 billion in 2002 (Waehrer et al., 2007).

Whilst accidents and their tragic consequences are commonplace in construction the world over, in emerging and developing economies (i.e. middle income and low income economies) the situation seem direr compared with the developed (high income) economies. For instance, in South Africa 162 fatalities (excluding motor-vehicle accidents) were recorded in 2007/2008 (see South Africa Construction Industry Development Board (CIDB), 2008), while in the UK 72 worker fatalities were recorded in 2007/2008 (HSE, 2015). With global construction output forecasted to increase by over 70% to US$15 trillion by 2025 (Global Construction Perspective and Oxford Economics, 2013), the health and safety (H&S) situation in emerging and developing economies could get worse if appropriate actions are not taken. Whilst H&S is multipronged and as such a myriad of actions/measures is needed to drive improvement, it is widely acknowledged that the management of H&S in the workplace plays a key role in reducing accidents, injuries and illnesses (see Lingard and

Rowlinson, 2005; Aksorn and Hadikusumo, 2008). However, in emerging and developing economies, including those in South East Asia, there is limited research evidence about the extent of implementation of H&S management by contractors. Such insight is not only helpful in obtaining a generic sense of the state of H&S maturity of contractors operating in the construction sector of those countries but more so it could be helpful in identifying elements/areas of H&S management that are lagging amongst contractors. The South East Asian region in particular is of significance as it is one of the dynamic areas of the world economically. This region is composed of 11 countries some of which have been referred to as a new generation of 'Asian Tigers' (Global Construction Perspective and Oxford Economics, 2013). In this region, countries such as Indonesia, Vietnam and Philippines have been estimated to represent a construction market of circa US$ 350 billion (over twice the output of the UK construction sector in 2013 (Rhodes, 2015)) with annual growth of over 6% (Global Construction Perspective and Oxford Economics, 2013). Despite, the economic vibrancy of this region, estimates have shown high number and rates of occupational accidents and fatalities for countries in the region (Hämäläinen et al., 2006; Takala et al., 2014 papers). For instance, global estimates of occupational accidents reported by Hämäläinen et al. (2006) show occupational fatalities rates of 28.3, 18.3 and 27.0 per 100, 0000 workers for Cambodia, Malaysia and Vietnam respectively, compared with much lower rates in countries such as the UK and Malta (0.8 per 100, 000 workers), France (3.0 per 100, 000 workers), Australia (3.2 per 100, 000 workers), Japan (3.2 per 100, 000 workers), and Germany (3.2 per 100, 000 workers). Specifically within the construction sector, occupational accidents, injuries, and deaths are also commonplace in South East Asian countries. For instance, in Malaysia, out of the 214 occupational fatalities recorded in 2015, the construction sector accounted for 88 fatalities which is the highest amongst all the sectors (Department of Occupational Health and Safety (DOSH), 2015). Whilst fewer fatalities were recorded in Singapore in 2015, the construction sector also accounted for the highest number of occupational fatalities (i.e. 27 out of 66 fatalities) (Ministry of Manpower, 2015). In Vietnam, it is reported that in 2013, the construction industry accounted for about 31% of industrial fatalities of 627 (Ministry of Labour Invalid and Social Affairs (MOLISA), 2014). In Thailand, industrial activities including construction, machine installation, and water-well digging accounted for about 155,000 accidents and diseases from 2003 – 2011 (Occupational Safety and Health Bureau, 2012).

Given the outlook of construction H&S performance in the South East Asian region, the forecasted growth in construction in the region, and the significance of H&S management to reducing accidents, injuries, and illnesses, an inquiry to ascertain the implementation of H&S management practices of contractors in the countries within this region is timely and relevant to the extent of flagging lagging areas and practices. This study therefore investigated the extent of implementation of H&S management practices by contractors in South East Asian countries, particularly Vietnam, Cambodia, and Malaysia. Besides works by Nguyen et al. (2015) and Phung et al. (2015) which offered preliminary insight into H&S management practices of contractors in separate regions of Vietnam (Nguyen et al. (2015) reported on a few practices in Northern Vietnam and Phung et al. (2015) focused on Southern Vietnam), there is a dearth of research work which offer a snapshot view of the state of H&S management amongst contractors in these countries. Whilst there are studies that have inquired into the H&S management practices of contractors, the domain of those studies are different (e.g. Kheni et al. (2008) in Ghana, and Agumba et al., (2014) in

South Africa). For this study, the rationale for selecting the above three South East Asian countries are: (1) the outlook of occupational H&S performance in the countries; and (2) the dearth of research on contractors' H&S management practices in the countries. Additionally, consideration was given to the availability of industry contacts known to the researchers in these countries to facilitate data collection.

In the next section, a review of H&S management systems/models is presented to identify key elements and associated practices to constitute the basis for an appropriate research design and instrument. The literature review and the research design are followed by the findings, discussion and concluding remarks.

2.0 HEALTH AND SAFETY MANAGEMENT

According to Lingard and Rowlinson (2005), implementing a H&S management system is an important step in ensuring that H&S is systematically managed within an organisation. Concerning H&S management system (HSMS), the International Labour Organisation (ILO) describes it as a set of interrelated and interacting elements to establish OSH [occupational safety and health] policy and objectives, and to achieve those objectives (ILO, 2001, p.19). The UK Health and Safety Executive (HSE) describes a HSMS to be a formal management system or framework that helps to manage H&S (HSE, 2013) and Griffith and Howarth (2001) describe it as simply a way of doing things. HSMS can thus be thought of as being an identified system of procedures to create a safe working environment. HSMS having just been developed since 1990s (Hasle and Zwetsloot, 2011), Lingard and Rowlinson (2005) state that the earliest efforts to prevent detrimental H&S outcomes mainly focused on solutions for safe physical environment. However, evidence of workplace organisational factors (including an organisation's H&S management activities) playing an important role in occupational H&S has given impetus to the systematic management of H&S in the workplace (Lingard and Rowlinson, 2005). Whilst the literature is replete with several HSMSs the following section attempts to capture some of the prominent ones. It also highlights the emergence of the integration of H&S management system with other management systems, e.g. quality and environment. Whilst the purpose of the review is not to draw a conclusion on which system(s) is more effective but rather to identify the elements/practices therein, the review also acknowledges the prevailing debates in that area (see Pérezgonzález, 2005).

2.1 HEALTH AND SAFETY MANAGEMENT SYSTEMS

It can be said that H&S management systems developed remarkably from the 1990s in two main streams: the development of laws which required systematic H&S management (e.g. EU framework directive); and the introduction of some H&S management models (e.g. BS OHSAS 18001) (Hasle and Zwetsloot, 2011). However, fundamentally, the prevention of accidents and their associated undesirable outcomes has been the main stimulus for their development. Amongst the prominent HSMS or models are those by the HSE (1997, 2013), British Standard BS OHSAS 18001:2007 (BSI, 2007), and International Labour Organization (ILO, 2001). These are discussed next.

2.1.1 The HSE's (1997) Successful Health and Safety Management Guidance (HSG65)

This model is widely known and it has constituted the basis for other subsequent models (see Pérezgonzález, 2005). The model has six interconnected elements as follows:

1. *Policy*: A general statement and overall guiding principle regarding H&S of an organisation.
2. *Organisation:* This covers the roles, responsibilities and provision of resources within an organisation to effectively control H&S issues.
3. *Planning and implementing:* This covers goal-setting and operating the system.
4. *Measuring performance:* This covers monitoring implementation to ensure that the set targets are being achieved.
5. *Review performance:* This covers procedures to ensure that the organisations learn from experiences at the measuring stage to improve performance
6. *Auditing:* This covers monitoring of the overall system to ensure it's effective function to achieve continuous improvement.

2.1.2 ILO's (2001) Guidelines on Occupational Safety and Health (OSH) Management Systems

The ILO's (2001) guidelines also has six elements: policy; organising; planning and implementation; evaluation; action for improvement; and audit. These elements are similar to those in the HSE's (1997) model.

2.1.3 BSI's (2007) Occupational H&S Management System (BS OHSAS 18001:2007)

The previous version of this British standard was BS 8800: 1996 (updated 2004). BS OHSAS 18001:2007 is composed of five elements which also bear resemblance to the HSE's (1997) model. The elements are: occupational health and safety policy; planning; implementation and operation; checking and corrective action; and management review. The BS OHSAS 18001:2007 has been said to be compatible with the international standards ISO 9001 (for Quality Management) and ISO 14001 (Environmental Management) and thus producing a good condition for organisations to integrate H&S management system with quality and environmental management systems in day-to-day operations . BS OHSAS 18001:2007 is however expected to be replaced by ISO/DIS 45001 which will be a new international standard for occupational H&S management systems (see BSI, 2016).

2.1.4 HSE's (2013) Managing for H&S Model

This model is a revision to the HSE's (1997) model. The revised model shifts away from the structure of the earlier HSE (1997) model (i.e. policy, organising, planning and implementing, measuring performance, reviewing performance, and auditing) to the Deming's plan-do-check-act (PDCA) structure. According to the HSE (2013) this shift gives a balance between the behavioural and systems facets of management and it also does not treat H&S management as a stand-alone system but rather as an integral part of general management. The sub-elements of the revised model however still mirror the components of the earlier HSE (1997) model. The sub-elements are as follows: policy and planning for PLAN; risk profiling, organising, and implementing for DO; measuring performance and investigating accidents/incidents/near misses for CHECK; and reviewing performance and learning lessons for ACT.

2.2 SUMMARY OF H&S MANAGEMENT MODELS

Aside the models presented above, other models which have been proposed include the model by McDonald's et al. (2000) and Pérezgonzález (2005). These models and others are largely adaptations of the HSE (1997) model and as such bear resemblance to it. Pérezgonzález (2005) in his critique of HSMS noted that the HSE (1997) model and subsequent adaptions are mainly a management procedure rather than a management system as the input, process and outputs of a system are not clearly defined and also relationship of the system to other systems in an organisation are not shown. Furthermore Pérezgonzález (2005) noted the lack of empirical validity of the models (in terms of delivering H&S success) and hence described them as being a theoretical exercise. Pérezgonzález (2005) however noted that the HSE (1997) model and its progeny are easy to use guides.

Aligned with the criticism that H&S management models do not show how they are related with other systems in an organisation, there have been emerging developments which show the integration of H&S management with quality and environmental management. Traditionally, the different areas in a business such as quality, safety and environment have been managed by different sections or departments within an organisation. This could be because each management function has been developed at different times and hence a difficulty for the organisation to thoroughly understand them quickly (Griffith & Howarth, 2001). However, as maintaining separate management systems can lead to waste of time, efforts and resources (Griffith & Howarth, 2001; Gangolells *et al.*, 2013) and also diversity of requirements from stakeholders can result in conflicts between sub-systems (Rebelo et al., 2014), integration of different management systems is becoming appealing. This is evidenced by the development of integrated safety health environment quality (SHEQ) management models such as those by Hamid *et al.* (2004) and Rebelo, et al. (2014). Gangolells *et al.* (2013) also developed an integrated health safety and enviroment management system. Regardless of these developments, stand-alone models are still very much in use and even new ones have been and are being developed e.g. the HSE's (2013) model and the forthcoming ISO/DIS 45001.

Regarding the criticism that H&S models lack empirical validity, there is a common recognition that the implementation of H&S management practices is an effective way to mitigate occupational injuries and illnesses (see Lingard and Rowlinson, 2005; Aksorn and Hadikusumo, 2008; Fewings, 2013). However, a study by Robson *et al.* (2007) on the effectiveness of H&S management (based on a systematic review and assessment of evidence by previous studies) concluded that the current body of evidence was insufficient to decide whether or not to support H&S management system. They suggest that benchmarks should be identified at the outset to assess the effectiveness of the management models. More recent work by Yoon *et al.* (2013) which involved a comparison between two groups of companies (i.e. occupational HSMS-certified companies and non-certified companies) from 2006 to 2011 showed a significant improvement of H&S performance of the certified companies in comparison with non-certified companies. Although this lends support for the implementation of H&S management, the continued implementation of H&S management interventions/practices by organisations also (though potentially driven by several factors e.g. legislation) suggests that organisations are deriving some positive H&S outcomes which may however be expensive and difficult to robustly

empirically trace to specific H&S management interventions/practices (see Shannon et al, 2001). Therefore, while leaning towards the view that H&S management is generally beneficial to mitigating the occurrence of accidents, injuries and illnesses, it is also instructive to note that the model by HSE (1997) and its subsequent adaptations collectively offer a useful framework for diagnosing the implementation of H&S management by contractors in the aforementioned three South East Asian countries. Consequently, Table 1 which draws from these models presents a summary of key H&S management elements/sub-elements, their description and associated examples of practices to guide the diagnosis.

Table 1: Key H&S Management Elements

Management Area/Element*		**Description and examples of practices***
Plan	Policy	Written in-house H&S policy statement reflecting management's commitment to H&S and detailing principles of actions to achieve H&S objectives e.g. policy document
	Planning	Planning for effective implementation e.g. preparing pre-project start H&S plans.
Do	Risk Assessment	Evaluation of risks and establishing necessary H&S measures to avoid accidents e.g. preparing risk assessments and method statements.
	Organising	The structural system to manage health and safety e.g. human resources, financial resources, communication, and competence assessment.
	Implementation	Actual implementation of programmes and control measures e.g. induction and training.
Check	Measuring and reviewing performance	Verification of the extent to which goals are achieved e.g. recording number of incidents/accidents/near-misses and investigating incidents.
Act	Auditing	Reviewing of the entire system in order to ensure continuous improvement e.g. in-house and external consultant reviews.

*Sources: (HSE, 1997; Griffith and Howarth, 2001; Lingard and Rowlinson, 2005; BSI, 2007; Boyle, 2008; Kheni et al., 2008; Cheng et al., 2012; Manu et al., 2013; Fewings, 2013; Hinze et al., 2013; HSE, 2013; Agumba et al., 2014)

3.0 RESEARCH DESIGN

Due to the research's interest in obtaining a generic/snapshot view of a phenomenon, in this case the implementation of H&S management by contractors, a quantitative research strategy, particularly a survey, was adopted (Fellows and Liu, 2008; Creswell, 2009). In order to investigate the H&S management practices of contractors in Vietnam, Malaysia and Cambodia, contractors' personnel in management roles (e.g. H&S managers, project managers, site managers, engineers, and company directors/managers) were targeted as such personnel most likely possess the relevant knowledge and experience relating to the management of H&S within their organisations.

3.1 Survey Design

Drawing on the literature review (particularly the elements of H&S management (see Table 1)) a questionnaire was designed for the data collection. The questionnaire captured information regarding:

Respondent and company: This captured respondents' and company information including respondent professional role, size of company by number of employees, type of construction work undertaken by company, and age of company.

Company H&S management practices: Forty H&S management practices were incorporated into the questionnaire. The practices covered the elements of H&S management shown in Table 1: policy; organising; planning; risk assessment; implementation; measuring and reviewing performance; and auditing. From the list of 40 practices, respondents' were asked to indicate the ones their company implement.

Following design of the questionnaire, it was translated into Vietnamese (for administering in Vietnam) and Khmer (Cambonian) (for administering in Cambodia). The English version was used for Malaysia. Obtaining participation in construction H&S research can be difficult due to the legal sensitivity of the subject. This can be further compounded by a lack of relevant information/records to facilitate research work especially when collecting data from emerging and developing economies (see Hämäläinen et al., 2006). To obtain participation in this study a pragmatic approach was thus taken involving the use of lists of companies in the three countries drawn from several sources (e.g. yellow pages and Malaysia's CIDB online directory) and industry contacts known to the researchers. The questionnaires were distributed via email to companies (where an email address was obtained) and also by hand and email through the researchers' contacts in the countries. The questionnaires that were distributed, the returned valid questionnaires, and the corresponding response rates are given in Table 2 below. The table also shows the estimated number of contractors in each country.

Table 2: Questionnaire Response Rates

Country	Estimated Number of Construction firms	Distributed Questionnaire to Contractors	Return valid Questionnaire	Response Rate
Cambodia	Circa 1100 construction and design companies (Subramaniyam, 2013)	482	68	14%
Vietnam	Circa 49,000 in 2012 (Bo, 2014)	410	100	24%
Malaysia	Circa 71,000 in 2015 (Malaysia CIDB, 2015)	1660	118	7%
Combined	Circa 120,000	2552	286	11%

Whilst the response rates for Cambodia and Malaysia are lower than the response rate norm for construction survey (i.e. 20-30%) suggested in Takim et al. (2004), they are reasonable when weighed against the difficulty in obtaining participation in construction H&S studies due to its sensitivity (see Manu et al., 2014). Similar response rates for construction surveys have also been reported in Agumba et al. (2014) and Sutrisna (2004). Furthermore, the actual numbers of valid returned questionnaires are respectable.

Data Analysis

Following screening and coding of the questionnaires in Microsoft Excel the data was exported into IBM SPSS Statistic 22 for analysis. SPSS was used do conduct descriptive statistical analysis including frequencies, mean and standard deviation. The extent to which the H&S management practices are implemented by contractors within a country was assessed by frequency and generally categorised as low (i.e. 0 - 49%), moderate (i.e. 50 - 69%), and high (70% +) (Nguyen et al., 2015 and Agbede et al., 2016). Further analysis using Pearson's Chi-square test was undertaken to explore associations between country and the implementation of H&S management practices. Also, given the reported relationship within the extant literature regarding firm size and H&S performance and management (see McVittie et al., 1997; Champoux and Brun, 2003; Fabiano et al., 2004; Hasle and Limborg, 2006; Sørensen et al., 2007; Bonafede et al., 2016), Pearson's Chi-square was again used to explore associations between company size and the implementation of the H&S management practices for each of the three countries. This was to aid the identification of categories of contractors that may be more likely not to implement a H&S management practice.

4.0 RESULTS

The results are presented below under three main headings: demographic information; level of implementation of H&S management practices; and relationship between country and implementation of practices.

4.1 Demographic Information

Table 3 provides the respondents' and companies' profile for the three countries. The table shows that for each of the three countries, a majority (i.e. 85%+) of the respondents are in construction management related roles and are thus likely to have knowledge of their company's H&S management practices. For the Malaysia and Vietnam sample, a small proportion of the respondents (i.e. 12.7% and 5% respectively) had other roles e.g. quantity surveyor, project director, quality assurance and quality control personnel, project engineer, management executive and human resource manager. Company size by number of employees has been categorised into four groups: (1) micro size firm (i.e. up to10 employees); (2) small size firm (i.e. 11 to 50 employees); (3) medium size firm (i.e. 51 to 150 employees); and (4) large (i.e. over 150 employees). The distribution of the firms in these categories shows that for all the three country samples a majority (i.e. 79%+) of the contractors are micro – medium size firms. In terms of age of company, Table 3 also shows that for all the three countries a majority of the contractors (i.e. 65%+) are up to 15 years. Regarding sector and types of works, the category of options (i.e. public works, private works, building works, civil works, and specialised works) are not mutually exclusive as it is possible for a contractor to be engaged in several categories. This is evident from Table 3 which shows the total percentage for sector and type of work in the Vietnam sample being more than 100%. Also due to non-response for some of the items by some respondents (especially in the Cambodia sample), the total percentages for the sector and type of work are less than 100%.

Table 3: Respondent & Company Demographic Information

Respondent & Company Demographic Information	Malaysia		Vietnam		Cambodia	
	Freq.	%*,a	Freq.	%*,a	Freq.	%*,a
Respondent Role						
Company director/manager	35	29.7	13	13.0	2	2.9
Site manager	13	11.0	18	18.0	3	4.4
Health and safety manager / supervisor	20	16.9	2	2.0	5	7.4

Project manager/construction manager	28	23.7	32	32.0	10	14.7
Site engineer/ civil engineer	7	5.9	30	30.0	48	70.6
Other role	15	12.7	5	5.0	0	0.0
Size of company (by adopted definition)						
Micro firm - up to 10 employees	32	27.1	4	4.0	0	0.0
Small firm - from 11 to 50 employees	67	56.8	41	41.0	26	38.2
Medium size firm - from 51 to 150 employees	9	7.6	34	34.0	30	44.1
Large firm - over 150 employees	10	8.5	21	21.0	12	17.6
Age of company						
Up to 10 years	64	54.2	46	46.0	45	66.2
11-15 years	13	11.0	24	24.0	16	23.5
Over 15 years	41	34.7	28	28.0	7	10.3
Sector of works undertaken by company						
Public works	50	42.4	65	65.0	17	25.0
Private sector works	64	54.2	52	52.0	25	36.8
Works type undertaken by company						
Building works	65	55.1	64	64.0	7	10.3
Civil engineering works	47	39.8	56	56.0	4	5.9
Specialised works (e.g. demolition, ground/foundation works, mechanical & electrical, finishing works, etc.)	50	42.4	55	55.0	15	22.1

Notes: *Sum of % could be more than 100% due to some companies undertaking several work categories.
[a]Sum of % could be less than 100% due non-response by some respondents.

4.2 Overview of Implementation of Practices

Table 4 gives an overview of the level of implementation of the practices amongst contractors in the three samples. This is further considered below under the key elements of H&S management.

Policy

Two practices (Pol1 and Pol2) were examined under policy. Whereas the Vietnam group showed *moderate* and *high* implementation for the two practices the Cambodian and Malaysian groups showed *low* and *moderate* implementation, and *low* and *high* implementation respectively. Overall, the level of implementation of policy practices amongst the sample of contractors from Vietnam is better than amongst the sample of contractors from Malaysia and Cambodia.

Planning

Five practices (i.e. Pln1 to Pln5) were examined under this element. With the exception of one practice (i.e. Pln 5 – *Setting H&S performance targets*) which has *low* implementation amongst contractors in the Vietnam sample, the other four practices recorded either *moderate* or *high* implementation. Similar to the Vietnam sample, *"Setting health and safety performance targets (Pln5)"* and *"Provision of insurance cover for sites (Pln2)*" had *low* and *moderate* implementation respectively amongst contractors in the Malaysia and Cambodia sample. However, in contrast, the other three practices recorded *low* implementation for the Malaysia group, and *low*, *moderate*, and *high* implementation for the Cambodia group. Overall, the level of implementation of practices under the planning element of H&S management is relatively better amongst the Vietnam sample.

Risk Assessment

Five practices (i.e. Risk1 to Risk5) were examined under this element. Moderate implementation is seen for "*Designing site rules and measures to mitigate assessed*

risks (Risk2)" amongst contractors in all the three samples. However, different ranges of implementation levels can be seen for the remaining practices amongst the three samples, and the situation in the Vietnam sample is relatively better overall (i.e. *moderate* to *high*) compared with *low* to *moderate* for Malaysia and *low* and *high* for Cambodia.

Organising

This element contains the most number of practices (i.e. 12). A similar level of implementation (i.e. *low*) is seen for one practice (i.e. *"A designated H&S department" – Org6*) for the three groups. Apart from this practice which recorded a *low* implementation, the levels of implementation of the other practices within the Vietnam group range from *moderate* to *high*. That for the Malaysia group ranges from *low* to *moderate* and that for the Cambodia group ranges from *low* to *high*. Taken together, the level of implementation of practices under the *organising* element of H&S management is relatively better amongst the Vietnam sample of contractors.

Implementing

Ten practices were examined under this element. Table 4 shows that "*Rewarding workers for safe work behaviour (Impl3)*" is not commonly implemented (i.e. *low* implementation) by contractors in each of the three groups. Whereas for the remaining practices the levels of implementation in the Vietnam group are two "*low*", four "*moderate*" and three "*high*", that for the Malaysia group are four "*low"* and five *"moderate"*; and that for the Cambodia group are four *"low"*, three *"moderate",* and two *"high".* Taken together, the level of implementation of practices under this element of H&S management is relatively better within the Vietnam sample than within the Malaysia and Cambodia samples.

Measuring and reviewing performance

Five practices were examined under this element. Two practices (i.e. *Measuring H&S performance (Meas1), and reviewing and updating H&S plans after projects completion – (Meas2)*) recorded *low* implementation in each of the three samples. For the remaining 3 practices, whereas the levels of implementation in the Vietnam group are only *high,* those for the Cambodia group are only *low,* and those for the Malaysia group is *one "high"* and two *"low".* Like the previous practices, overall, the level of implementation of practices under this element is relatively better amongst contractors in the Vietnam sample.

Table 4: Implementation of Health And Safety Management Practices

Health and Safety Management Elements & Practices		Malaysia			Vietnam			Cambodia		
		Freq.	%	Extent of Implementation	Freq.	%	Extent of Implementation	Freq.	%	Extent of Implementation
Policy										
Pol1	A formal company health and safety policy statement	92	78.0	High	65	65.0	Moderate	35	51.5	Moderate
Pol2	A company director with overall responsibility for health and safety	23	19.5	Low	74	74.0	High	32	47.1	Low
Planning										
Pln1	Preparing health and safety plans for every construction project	56	47.5	Low	59	59.0	Moderate	65	95.6	High
Pln2	Provision of health and safety insurance cover for sites	61	51.7	Moderate	67	67.0	Moderate	44	64.7	Moderate
Pln3	Pricing to cover health and safety requirements for projects	46	39.0	Low	54	54.0	Moderate	8	11.8	Low
Pln4	Preparing method statements	52	44.1	Low	71	71.0	High	35	51.5	Moderate
Pln5	Setting health and safety performance targets	28	23.7	Low	43	43.0	Low	15	22.1	Low
Risk Assessment										
Risk1	Undertaking overall project risk assessments before projects starts	70	59.3	Moderate	69	69.0	Moderate	26	38.2	Low
Risk2	Designing site rules and measures to mitigate assessed risks	66	55.9	Moderate	69	69.0	Moderate	41	60.3	Moderate
Risk3	Undertaking risk assessments for work packages/operations before they start	42	35.6	Low	52	52.0	Moderate	33	48.5	Low
Risk4	Reviewing and updating risk assessments during construction	42	35.6	Low	99	99.0	High	31	45.6	Low
Risk5	Informing employees about hazards on sites before work starts	53	44.9	Low	83	83.0	High	64	94.1	High
Organising										
Org1	Providing health and safety supervisors on sites	66	55.9	Moderate	85	85.0	High	43	63.2	Moderate
Org2	Communicating health and safety information to workers through newsletters, leaflets, posters, etc.	44	37.3	Low	70	70.0	High	44	64.7	Moderate
Org3	Engaging with workers on health and safety issues e.g. health and safety meetings and suggestion schemes	66	55.9	Moderate	67	67.0	Moderate	27	39.7	Low
Org4	Networking with other companies' / institutions' (insurance companies, government offices) about health and safety issues	31	26.3	Low	52	52.0	Moderate	47	69.1	Moderate
Org5	Propagating health and safety practices to external stakeholders e.g. clients	24	20.3	Low	65	65.0	Moderate	16	23.5	Low
Org6	A designated health and safety department	34	28.8	Low	37	37.0	Low	11	16.2	Low

Org7	Assessing the competence of workers and subcontractors	56	47.5	Low	64	64.0	Moderate	41	60.3	Moderate
Org8	A company designated H&S budget	73	61.9	Moderate	50	50.0	Moderate	19	27.9	Low
Org9	Display of regulatory health and safety posters on construction sites	60	50.8	Moderate	54	54.0	Moderate	68	100.0	High
Org10	Open display of company health and safety policy on construction sites, company website, and head/branch offices	23	19.5	Low	74	74.0	High	2	2.9	Low
Org11	Provision of health and safety annual reports	31	26.3	Low	69	69.0	Moderate	6	8.8	Low
Org12	A designated health and safety manager	28	23.7	Low	53	53.0	Moderate	4	5.9	Low
Implementation										
Impl1	Implementing site health and safety rules and measures	61	51.7	Moderate	67	67.0	Moderate	64	94.1	High
Impl2	Amending and correcting health and safety plans during construction	33	28.0	Low	43	43.0	Low	40	58.8	Moderate
Impl3	Rewarding workers for safe work behaviour	29	24.6	Low	28	28.0	Low	10	14.7	Low
Impl4	Site inductions for workers	64	54.2	Moderate	45	45.0	Low	6	8.8	Low
Impl5	Training programmes for site workers	61	51.7	Moderate	53	53.0	Moderate	3	4.4	Low
Impl6	Carrying out site health and safety inspections regularly	54	45.8	Low	74	74.0	High	65	95.6	Moderate
Impl7	Provision of sanitation and welfare facilities on sites (e.g. toilets, canteens, drinking water)	49	41.5	Low	86	86.0	High	68	100.0	High
Impl8	Provision of personal protective equipment	72	61.0	Moderate	87	87.0	High	8	11.8	Low
Impl9	Provision of first aid equipment on sites	68	57.6	Moderate	67	67.0	Moderate	26	38.2	Low
Impl10	Disciplining workers for unsafe work behaviour	57	48.3	Low	60	60.0	Moderate	44	64.7	Moderate
Measuring & Reviewing Performance										
Meas1	Measuring health and safety performance	51	43.2	Low	46	46.0	Low	21	30.9	Low
Meas2	Reviewing and updating health and safety plans after projects completion	37	31.4	Low	38	38.0	Low	19	27.9	Low
Meas3	Keeping incident records on every project	52	44.1	Low	71	71.0	High	33	48.5	Low
Meas4	Investigating the causes of incidents, accidents and near-misses	51	43.2	Low	70	70.0	High	30	44.1	Low
Meas5	Reporting accidents to an external institution/body/agency	111	94	High	90	90	High	16	23.5	Low
Auditing										
Aud1	Undertaking periodic safety management auditing	55	46.6	Low	51	51.0	Moderate	6	8.8	Low

Malaysia Summary: Low = 26; Moderate = 12; High = 2. **Vietnam Summary**: Low = 7; Moderate = 20; High = 13. **Cambodia Summary**: Low = 24; Moderate = 11; High = 5

Auditing

Under this element, *"Undertaking periodic safety management auditing"* was examined. The results show *moderate* level of implementation amongst the contractors in the Vietnam sample, but low implementation amongst the contractors in the Malaysia and Cambodia samples.

In summary, the range of implementation of practices amongst the three groups is: for Malaysia, *low* = 26 practices, *moderate* = 12 practices, and *high* = 2 practices; for Vietnam, *low* = 7 practices, *moderate* = 20 practices, and *high* = 13 practices; and (3) for Cambodia, *low* = 24 practices, *moderate* = 11 practices; and *high* = 5 practices). Overall, the results show that the level of implementation of the practices is relatively better amongst the contractors in the Vietnam sample than those in the Malaysia and Cambodia samples.

4.3 Association between Country and Implementation of Practices

Table 5 shows the results of Pearson Chi-square test conducted to diagnose potential associations between country and the implementation of practices. Overall, the Chi-square test revealed significant relationship between country and implementation of 33 H&S management practices. However, amongst these, a further examination of the standardised residuals in the contingency table to ascertain which cells contribute the most to the significant associations revealed that for 3 of the practices, all the standardised residuals are not significant at $p < 0.05$ (i.e. they fall within ±1.96). The associations between country and these practices were thus deemed insignificant. The practices with the insignificant Chi-square statistic or insignificant residuals are the ones shaded in Table 5 for ease of identification.

For the 30 practices which showed significant association with the country variable, the Cramer's statistic (which is a measure of the association or effect size (Field, 2013)) range from 0.21 to 0.69 at p values ranging from $p < 0.001$ to $p < 0.01$. The following sections take a look at the contingency table to work out the relationship between country and implementation of the practices. Given the number of practices, for the purpose of brevity attention is mainly placed on highlighting where the standardised residuals indicate that significantly more contractors than expected do not implement a practice (i.e. $z > 1.96$), and thereby suggesting that contractors are more likely not to implement that practice.

Policy

For Pol1, the relationship is mainly driven by when the countries are Malaysia and Cambodia. The standardised residuals (of -2.1 for Malaysia and 2.3 for Cambodia) mean that for Malaysia significantly fewer contractors than expected do not implement Pol1, and for Cambodia significantly more contractors than expected do not implement Pol1. As previously mentioned the examination of the contingency table will focus on highlighting where standardised residuals suggest that contractors are more likely not to implement a H&S management practice. Regarding Pol1, the standardised residual of 2.3 for Combodia, thus suggests that contractors operating in Cambodia are more likely not to implement Pol1. The z-score of 3.8 for Pol2 also suggests that contractors in Malaysia are more likely not to implement this practice.

Planning

Under planning, Pln3 is the only practice with a standardised residual (z-score) greater than 1.96 (i.e. 2.7) for non-implementation and that corresponds with the Cambodia column. The z-score means that significantly more contractors than expected do not implement Pln3, and thus suggesting that contractors in Cambodia are more likely not to implement this practice.

Risk

The standardised residuals of 2.5 for Risk1 (Cambodia) and 5.0 Risk5 (Malaysia) suggest that contractors in Cambodia are more likely not to implement Risk1, and also contractors in Malaysia are more likely not to implement Risk5.

Organising

The standardised residuals of 2.3 for Org1 (Malaysia), 2.9 for Org 2 (Malaysia), 2.8 for Org4 (Malaysia), 2.2 for Org5 (Malaysia), and 2.3 for Org9 (Malaysia) imply that significantly more contractors than expected do not implement these measures. These suggest that contractors in Malaysia are more likely not to implement these practices. The z-scores of 2.0 for Org 3 (Cambodia), 2.5 for Org8 (Cambodia), 2.9 for Org11 (Cambodia) and 2.3 for Org12 (Cambodia) also suggest that contractors in Cambodia are more likely not to implement these practices. For Org10 the z-scores of 2.0 (Malaysia) and 3.2 (Cambodia) suggest that in both countries contractors are more likely not to implement this practice.

Implementing

The z-scores of 2.9 for Impl1 (Malaysia), 4.1 for Impl6 (Malaysia), and 5.9 for Impl7 (Malaysia) suggest that contractors in Malaysia are more likely not to implement these practices. On the other hand the z-scores of 3.3 for Impl4 (Cambodia), 3.9 for Impl5 (Cambodia), 6.0 for Impl8 (Cambodia), and 2.3 for Impl9 (Cambodia) suggest that contractors in Cambodia are more likely not to implement these practices.

Measuring and reviewing performance

Under this element, the standardised residual of 8.8 for Meas5 (Cambodia) suggest that contractors in Cambodia are more likely not to implement this practice.

Auditing

The z-score of 3.2 for Aud1 (Cambodia) implies that significantly more contractors than expected do not implement this practice and thereby suggesting that contractors in Cambodia are more likely not to implement this practice.

Table 5: Chi-square Test And Contingency Table for H&S Management Practices x Country

H&S Management Practice		Vietnam				Malaysia				Cambodia				Chi-Square	Cramer's V
		Count	Exp. Count	% Within practice	Std. Residual	Count	Exp. Count	% Within practice	Std. Residual	Count	Exp. Count	% Within practice	Std. Residual	$X^2(df=2)$	
Pol1	Yes	65	67.1	33.9%	-.3	92	79.2	47.9%	1.4	35	45.7	18.2%	-1.6	14.042**	0.22**
	No	35	32.9	37.2%	.4	26	38.8	27.7%	-2.1	33	22.3	35.1%	2.3		
Pol2	Yes	74	45.1	57.4%	4.3	23	53.2	17.8%	-4.1	32	30.7	24.8%	.2	65.09***	0.48***
	No	26	54.9	16.6%	-3.9	95	64.8	60.5%	3.8	36	37.3	22.9%	-.2		
Pln1	Yes	59	62.9	32.8%	-.5	56	62.9	31.1%	-.5	65	42.8	36.1%	3.4	43.864***	0.39***
	No	41	37.1	38.7%	.6	62	37.1	58.5%	.6	3	25.2	2.8%	-4.4		
Pln2	Yes	67	60.1	39.0%	.9	61	71.0	35.5%	-1.2	44	40.9	25.6%	.5	6.065†	0.15†
	No	33	39.9	28.9%	-1.1	57	47.0	50.0%	1.5	24	27.1	21.1%	-.6		
Pln3	Yes	54	37.8	50.0%	2.6	46	44.6	42.6%	.2	8	25.7	7.4%	-3.5	30.849***	0.33***
	No	46	62.2	25.8%	-2.1	72	73.4	40.4%	-.2	60	42.3	33.7%	2.7		
Pln4	Yes	71	55.2	44.9%	2.1	52	65.2	32.9%	-1.6	35	37.6	22.2%	-.4	16.393***	0.24***
	No	29	44.8	22.7%	-2.4	66	52.8	51.6%	1.8	33	30.4	25.8%	.5		
Pln5	Yes	43	30.1	50.0%	2.4	28	35.5	32.6%	-1.3	15	20.4	17.4%	-1.2	12.282**	0.21**
	No	57	69.9	28.5%	-1.5	90	82.5	45.0%	.8	53	47.6	26.5%	.8		
Risk1	Yes	69	57.7	41.8%	1.5	70	68.1	42.4%	.2	26	39.2	15.8%	-2.1	15.914***	0.24***
	No	31	42.3	25.6%	-1.7	48	49.9	39.7%	-.3	42	28.8	34.7%	2.5		
Risk2	Yes	69	61.5	39.2%	1.0	66	72.6	37.5%	-.8	41	41.8	23.3%	-.1	3.964†	0.12†
	No	31	38.5	28.2%	-1.2	52	45.4	47.3%	1.0	27	26.2	24.5%	.2		
Risk3	Yes	52	44.4	40.9%	1.1	42	52.4	33.1%	-1.4	33	30.2	26.0%	.5	6.517∓	0.15∓
	No	48	55.6	30.2%	-1.0	76	65.6	47.8%	1.3	35	37.8	22.0%	-.5		
Risk4	Yes	49	42.7	40.2%	1.0	42	50.3	34.4%	-1.2	31	29.0	25.4%	.4	4.291†	0.12†
	No	51	57.3	31.1%	-.8	76	67.7	46.3%	1.0	37	39.0	22.6%	-.3		
Risk5	Yes	83	69.9	41.5%	1.6	53	82.5	26.5%	-3.2	64	47.6	32.0%	2.4	62.157***	0.47***
	No	17	30.1	19.8%	-2.4	65	35.5	75.6%	5.0	4	20.4	4.7%	-3.6		
Org1	Yes	85	67.8	43.8%	2.1	66	80.0	34.0%	-1.6	43	46.1	22.2%	-.5	21.824***	0.28***
	No	15	32.2	16.3%	-3.0	52	38.0	56.5%	2.3	25	21.9	27.2%	.7		
Org2	Yes	70	55.2	44.3%	2.0	44	65.2	27.8%	-2.6	44	37.6	27.8%	1.0	26.656***	0.31***
	No	30	44.8	23.4%	-2.2	74	52.8	57.8%	2.9	24	30.4	18.8%	-1.2		
Org3	Yes	67	55.9	41.9%	1.5	66	66.0	41.3%	.0	27	38.0	16.9%	-1.8	12.234**	0.21**
	No	33	44.1	26.2%	-1.7	52	52.0	41.3%	.0	41	30.0	32.5%	2.0		

Org4	Yes	52	45.5	40.0%	1.0	31	53.6	23.8%	-3.1	47	30.9	36.2%	2.9	34.6***	0.35***
	No	48	54.5	30.8%	-.9	87	64.4	55.8%	2.8	21	37.1	13.5%	-2.6		
Org5	Yes	65	36.7	61.9%	4.7	24	43.3	22.9%	-2.9	16	25.0	15.2%	-1.8	53.141***	0.43***
	No	35	63.3	19.3%	-3.6	94	74.7	51.9%	2.2	52	43.0	28.7%	1.4		
Org6	Yes	37	28.7	45.1%	1.6	34	33.8	41.5%	.0	11	19.5	13.4%	-1.9	8.584$^{\mp}$	0.17$^{\mp}$
	No	63	71.3	30.9%	-1.0	84	84.2	41.2%	.0	57	48.5	27.9%	1.2		
Org7	Yes	64	56.3	39.8%	1.0	56	66.4	34.8%	-1.3	41	38.3	25.5%	.4	6.601$^{\mp}$	0.15$^{\mp}$
	No	36	43.7	28.8%	-1.2	62	51.6	49.6%	1.5	27	29.7	21.6%	-.5		
Org8	Yes	50	49.7	35.2%	0.0	73	58.6	51.4%	1.9	19	33.8	13.4%	-2.5	19.866***	0.26***
	No	50	50.3	34.7%	0.0	45	59.4	31.3%	-1.9	49	34.2	34.0%	2.5		
Org9	Yes	54	63.6	29.7%	-1.2	60	75.1	33.0%	-1.7	68	43.3	37.4%	3.8	51.21***	0.42***
	No	46	36.4	44.2%	1.6	58	42.9	55.8%	2.3	0	24.7	0.0%	-5.0		
Org10	Yes	74	34.6	74.7%	6.7	23	40.8	23.2%	-2.8	2	23.5	2.0%	-4.4	110.602***	0.62***
	No	26	65.4	13.9%	-4.9	95	77.2	50.8%	2.0	66	44.5	35.3%	3.2		
Org11	Yes	69	37.1	65.1%	5.2	31	43.7	29.2%	-1.9	6	25.2	5.7%	-3.8	72.865***	0.51***
	No	31	62.9	17.2%	-4.0	87	74.3	48.3%	1.5	62	42.8	34.4%	2.9		
Org12	Yes	53	29.7	62.4%	4.3	28	35.1	32.9%	-1.2	4	20.2	4.7%	-3.6	46.474***	0.40***
	No	47	70.3	23.4%	-2.8	90	82.9	44.8%	.8	64	47.8	31.8%	2.3		
Impl1	Yes	67	67.1	34.9%	.0	61	79.2	31.8%	-2.0	64	45.7	33.3%	2.7	35.188***	0.35***
	No	33	32.9	35.1%	.0	57	38.8	60.6%	2.9	4	22.3	4.3%	-3.9		
Impl2	Yes	43	40.6	37.1%	.4	33	47.9	28.4%	-2.1	40	27.6	34.5%	2.4	17.418***	0.25***
	No	57	59.4	33.5%	-.3	85	70.1	50.0%	1.8	28	40.4	16.5%	-2.0		
Impl3	Yes	28	23.4	41.8%	.9	29	27.6	43.3%	.3	10	15.9	14.9%	-1.5	4.136†	0.12†
	No	72	76.6	32.9%	-.5	89	90.4	40.6%	-.1	58	52.1	26.5%	.8		
Impl4	Yes	45	40.2	39.1%	.8	64	47.4	55.7%	2.4	6	27.3	5.2%	-4.1	38.475***	0.367***
	No	55	59.8	32.2%	-.6	54	70.6	31.6%	-2.0	62	40.7	36.3%	3.3		
Impl5	Yes	53	40.9	45.3%	1.9	61	48.3	52.1%	1.8	3	27.8	2.6%	-4.7	49.197***	0.42***
	No	47	59.1	27.8%	-1.6	57	69.7	33.7%	-1.5	65	40.2	38.5%	3.9		
Impl6	Yes	74	67.5	38.3%	.8	54	79.6	28.0%	-2.9	65	45.9	33.7%	2.8	51.783***	0.43***
	No	26	32.5	28.0%	-1.1	64	38.4	68.8%	4.1	3	22.1	3.2%	-4.1		
Impl7	Yes	86	71.0	42.4%	1.8	49	83.8	24.1%	-3.8	68	48.3	33.5%	2.8	88.452***	0.56***
	No	14	29.0	16.9%	-2.8	69	34.2	83.1%	5.9	0	19.7	0.0%	-4.4		
Impl8	Yes	87	58.4	52.1%	3.7	72	68.9	43.1%	.4	8	39.7	4.8%	-5.0	94.87***	0.58***
	No	13	41.6	10.9%	-4.4	46	49.1	38.7%	-.4	60	28.3	50.4%	6.0		
Impl9	Yes	67	56.3	41.6%	1.4	68	66.4	42.2%	.2	26	38.3	16.1%	-2.0	13.757**	0.22**
	No	33	43.7	26.4%	-1.6	50	51.6	40.0%	-.2	42	29.7	33.6%	2.3		
Impl10	Yes	60	56.3	37.3%	.5	57	66.4	35.4%	-1.2	44	38.3	27.3%	.9	5.575†	0.14†

	No	40	43.7	32.0%	-.6	61	51.6	48.8%	1.3	24	29.7	19.2%	-1.0		
Meas1	Yes	46	41.3	39.0%	.7	51	48.7	43.2%	.3	21	28.1	17.8%	-1.3	4.136†	0.12†
	No	54	58.7	32.1%	-.6	67	69.3	39.9%	-.3	47	39.9	28.0%	1.1		
Meas2	Yes	38	32.9	40.4%	.9	37	38.8	39.4%	-.3	19	22.3	20.2%	-.7	2.064†	0.09†
	No	62	67.1	32.3%	-.6	81	79.2	42.2%	.2	49	45.7	25.5%	.5		
Meas3	Yes	71	54.5	45.5%	2.2	52	64.4	44.1%	-1.5	33	37.1	21.2%	-.7	17.138***	0.25***
	No	29	45.5	22.3%	-2.4	66	53.6	55.9%	1.7	35	30.9	26.9%	.7		
Meas4	Yes	70	52.8	46.4%	2.4	51	62.3	33.8%	-1.4	30	35.9	19.9%	-1.0	18.273***	0.25***
	No	30	47.2	22.2%	-2.5	67	55.7	49.6%	1.5	38	32.1	28.1%	1.0		
Meas5	Yes	90	75.9	41.5%	1.6	111	89.5	51.2%	2.3	16	51.6	7.4%	-5.0	134.022***	0.69***
	No	10	24.1	14.5%	-2.9	7	28.5	10.1%	-4.0	52	16.4	75.4%	8.8		
Aud1	Yes	51	39.2	45.5%	1.9	55	46.2	49.1%	1.3	6	26.6	5.4%	-4.0	34.9***	0.35***
	No	49	60.8	28.2%	-1.5	63	71.8	36.2%	-1.0	62	41.4	35.6%	3.2		

Notes: 0 cells (0.0%) have expected count less than 5.

*$p \leq 0.05$; **$p < 0.01$; ***$p < 0.001$; †$p > 0.05$; ∓ means that $p < 0.05$ however all the standardised residuals in the cross tabulation are not significant i.e. lie within ± 1.96

4.4 Association between firm size and implementation of practices

The results of a within-country chi-square analysis of the association between firm size and implementation of H&S management practices are shown by Tables 6 and 7. For the sake of brevity, statistically insignificant associations as well as significant associations but with insignificant z-scores (i.e. where z-scores lie within ± 1.96) are not shown by the tables. Table 6 shows the results for the Malaysia sample and Table 7 shows the results for the Vietnam sample. No statistically significant associations were obtained for the Cambodia sample. To facilitate interpretation of the significant associations revealed by the Chi-square analysis, the z-scores from the contingency tables have mainly been reported. Once again, for the purpose of conciseness, attention is placed on highlighting where z-scores indicate that significantly more contractors than expected (within a particular firm size category) do not implement a practice (i.e. z-score > 1.96).

Maylasia

From Table 6, Org 8 (i.e. A company designated H&S budget) is the only practice with a z-score greater than 1.96 (i.e. 2.2) for non-implementation and that corresponds with the micro firm column. This means that significantly more micro firms than expected do not have a designated H&S budget, and thus suggesting that micro contractors in Malaysia are more likely not to have a designated H&S budget. From Table 6, none of the z-scores for non-implementation of practice within the small, medium, and large firm categories is greater than 1.96. This means that there is no suggestion from the data that small, medium or large contractors are more likely not to implement any of the practices.

Vietnam

From Table 7, Risk5, Impl8, and Meas5 have z-scores greater than 1.96 for non-implementation and that corresponds with the micro firm column. This means that significantly more micro firms than expected do not implement these practices, and thus suggest that micro contractors in Vietnam are more likely not to implement these practices. Additionally, Org12 has a z-score greater than 1.96 and thus suggest that small contractors in Vietnam are more likely not to implement this practice. From Table 7, none of the z-scores for non-implementation of practice within the medium and large firm categories is greater than 1.96. This means that there is no suggestion from the data that medium or large contractors are more likely not to implement any of the practices.

Table 6: Chi-square Test for H&S Management Practices x Firm Size (Malaysia Sample)

H&S Management Practice		Micro firm - Std. Residual	Small firm - Std. Residual	Medium size firm - Std. Residual	Large firm - Std. Residual	Fischer's Exact Test[a]	Cramer's V
Org1	Yes	-0.7	-0.1	-0.5	1.9	10.518*	0.283*
	No	0.8	0.1	0.5	-2.1		
Org5	Yes	-1.8	0.1	2.3	0.7	10.857**	0.311*
	No	0.9	-0.1	-1.2	-0.3		
Org6	Yes	-1.4	-1.2	2.7	3.0	24.866***	0.488***
	No	0.9	0.8	-1.7	-1.9		

Org8	Yes	-1.8	0.7	1.0	0.3	11.877**	0.325**
	No	2.2	-0.9	-1.3	-0.4		
Org10	Yes	-1.7	-0.6	1.7	2.9	15.747**	0.391**
	No	0.8	0.3	-0.8	-1.4		
Org12	Yes	-1.3	-0.5	1.3	2.4	10.845**	0.318**
	No	0.7	0.3	-0.7	-1.3		

Notes: [a] Fisher's Exact Test is reported where more than 0 cells have expected count less than 5. df = 3.
*$p \leq 0.05$; **$p < 0.01$; ***$p < 0.001$.

Table 7: Chi-square Test for H&S Management Practices x Firm Size (Vietnam Sample)

H&S Management Practice		Micro firm - Std. Residual	Small firm - Std. Residual	Medium size firm - Std. Residual	Large firm - Std. Residual	Fischer's Exact Test[a]	Cramer's V
Pol1	Yes	-0.4	-1.3	-0.2	1.7	15.131**	0.37**
	No	0.5	1.8	-0.3	-2.3		
Pln2	Yes	-0.4	-1.0	-0.2	1.8	17.569***	0.377***
	No	-6	1.5	0.2	-2.6		
Pln5	Yes	-0.5	-1.1	-0.7	2.7	15.664**	0.398**
	No	-5	1.0	-0.6	-2.3		
Risk5	Yes	-1.3	-0.2	0.5	0.1	8.676*	0.338*
	No	2.8	0.4	-1.2	-0.3		
Org6	Yes	-0.4	-1.3	-0.4	2.6	13.394**	0.375**
	No	0.3	1.0	0.3	-2.0		
Org7	Yes	-1	-0.8	-0.2	1.8	14.923**	0.368**
	No	1.3	1.1	0.2	-2.4		
Org8	Yes	0	-1.9	0	2.6	22.148***	0.456***
	No	0	1,9	0	-2.6		
Org12	Yes	-0.1	-1.9	0.9	1.5	13.947**	0.373**
	No	0.1	2.0	-1	-1.6		
Impl3	Yes	-1.1	-0.4	-0.8	2.1	7.749*	0.299*
	No	0.7	0.3	0.5	-1.3		
Impl4	Yes	0.1	-1.3	-0.6	2.5	14.727	0.382
	No	-0.1	1.1	0.5	-2.2		
Impl5	Yes	-0.1	-0.8	-1.4	3.0	28.909**	0.493***
	No	0.1	0.8	1.5	-3.1		
Impl6	Yes	-0.6	-0.8	0	1.4	13.294**	0.331*
	No	0.9	1.3	0.1	-2.3		
Impl8	Yes	-0.8	-0.1	-0.1	0.6	7.666*	0.286*
	No	2.1	0.3	0.3	-1.7		
Meas1	Yes	-0.6	-1.1	-0.4	2.4	13.687**	0.37**
	No	0.6	1.0	0.4	-2.2		
Meas2	Yes	0.4	-1.4	-0.3	2.1	10.737**	0.33**
	No	-0.3	1.1	0.2	-1.7		
Meas5	Yes	-0.8	-0.1	0.4	0.0	20.749***	0.435***
	No	2.5	0.4	-1.3	-0.1		
Aud1	Yes	-0.7	-1.1	-0.3	2.2	14.206**	0.371**
	No	0.7	1.1	0.3	-2.3		

Notes: [a] Fisher's Exact Test is reported where more than 0 cells have expected count less than 5. df = 3.
*$p \leq 0.05$; **$p < 0.01$; ***$p < 0.001$.

5.0 Discussion

As previously noted the fact that most of the respondents are in construction management related roles lends credence to their responses as they are likely to be aware of the H&S management practices of their companies. Manu (2012) made a similar observation in a H&S survey which yielded a similar profile of respondents. The majority of firms being micro-medium firms is consistent with what pertains in other countries, where micro-medium size firms constitute the bulk of firms in the construction sector (e.g. in the UK (ONS, 2011)). In contrast with the study by Kheni et al. (2008) on H&S management practices of SME contractors in Ghana in which over 75% of firms were over 15years, the results in this study rather shows a majority of firms being up to 15 years. The data analysis revealed some intriguing results that are the focus of the discussion below.

From Table 4, it appears (in all three samples) there is a greater emphasis amongst the contractors on punishing bad H&S behaviour than on rewarding good H&S behaviour. Regarding rewarding good H&S behaviour, the level of implementation is categorised as *low* for Vietnam, *low* for Malaysia, and *low* for Cambodia. In contrast the level of implementation for punishing bad H&S behaviour is *moderate* for Vietnam, *low* for Malaysia, and *moderate* for Cambodia. It is noteworthy that even for the *low* category for Malaysia, the actual percentage (i.e. 48.3%) is quite close to falling in the moderate category. The Pearson Chi-square test (Table 5) further confirms that there is no association between the two practices and the country variable implying that the emphasis in terms rewarding and punishing H&S behaviour in each country is similar. Referring to the use of the “carrot and stick” approach to induce desired behaviours, the “stick” approach seems to prevail in the three countries. Neither of both approaches is however perfect as for example an overemphasis on either approach could lead to under-reporting of incidents for fear of being punished or for fear of losing a reward due to an act that led to an incident (Miozza and Wyld, 2002). It is therefore desirable to strike an appropriate balance between how both approaches are used so that good behaviours can be recognised/celebrated and enforced, and bad behaviours can be discouraged.

Overall, Tables 4 and 5 suggest that the implementation of H&S management practices by contractors in Vietnam is generally better than in Malaysia and Cambodia. This runs counter to expectation based on hints given by previous research. Hämäläinen et al. (2006) in their report on global accidents revealed fatality and accident rates of 28.3 and 21,157 respectively for Cambodia; 27 and 20,605 respectively for Vietnam; and 18.3 and 14,000 respectively for Malaysia. These suggest that H&S management would be better in Malaysia than in Vietnam, and it would be better in Vietnam than in Cambodia. Takala et al. (2014) reported an inverse relationship between competitiveness of countries and rate of occupational fatalities, implying that countries with better competitiveness would have better H&S performance and by inference better H&S management. Going by this and the 2015/16 global competitiveness indices for Malaysia (18), Vietnam (56) and Cambodia (90), one would expect that the implementation of H&S management practices by contractors would again be generally better in Malaysia than in Vietnam, and also better in Vietnam than in Cambodia. The following discussion considers plausible reasons for this observed divergence from the expected.

One plausible reason for the observed divergence is that there are more micro to small firms in the Malaysia sample than in the Vietnam and Cambodia samples. As shown by Table 3 whilst micro to small firms account for approximately 84% of the Malaysia sample, micro to small firms account for approximately 45% and 38% of the Vietnam and Cambodia samples respectively. The proportional difference is confirmed by the results of Pearson Chi-square test (see Table 8) which revealed significant association between firm size and country i.e. X^2 *(6)* = 71.389, $p < 0.001$. An examination of the standardised residuals in the contingency table reveals that the Malaysia-micro size firm cell (z-score = 4.4) and the Malaysia-medium size firm cells (z-score = -3.8) both significantly contribute the most to the overall significant chi-square statistic. The z-scores imply that significantly more firms than expected are micro size firms and significantly fewer firms than expected are medium size firms. Past studies have reported a relationship between firm size and H&S performance where by smaller firms are more likely to have weaker H&S performance (McVittie et al., 1997; Champoux and Brun, 2003; Fabiano et al., 2004; Hasle and Limborg, 2006; Sørensen et al., 2007). A more recent study by Bonafede et al. (2016) involving a survey of Italian companies also reported that employers of micro-enterprises are less persuaded of the value of occupational risk assessment and management activities and that they often perceived H&S as a legal duty than an added value.

The significantly greater proportion of micro size firms in the Malaysia sample therefore suggests that the Malaysia sample had a greater proportion of firms that would be less inclined to implementing H&S management. This thesis is to an extent supported by the chi-square test of association between firm size (for the Malaysia sample) and H&S management practices shown by Table 6. Table 6 showed that none of the z-scores for non-implementation of practice for the small, medium and large firm categories is significant. However, one of the z-scores for non-implementation of practice for the micro firm category is significant (i.e. Org 8). Taken together, the results of the study coupled with evidence from the literature give some hints that the observed divergence from the expected (discussed above) may have been due to a significantly greater proportion of micro-firms in the Malaysia sample.

Apart from the above explanation, literature may be able to offer some additional insights. Aligned to this, another plausible reason for the divergence is that (as suggested in Kheni et al. (2008) some respondents (possibly in the Vietnam sample) may have given socially desirable responses as a means to portray their company's concern for H&S and thereby potentially resulting in overstated implementation of H&S management practices. Whilst this is plausible, a counter argument is that since identifiable information (e.g. name of company) was not requested there would be very little motivation for respondents to overstate implementation of practices by their companies.

Table 8: Chi-square Test and Contingency Table for Size of Company x Country

			Country		
			Vietnam	Malaysia	Cambodia
Size of company	Micro firm - up to 10 employees	Count	4	32	0
		Expected Count	12.6	14.9	8.6
		% within Country	4.0%	27.1%	0.0%
		Std. Residual	-2.4	4.4	-2.9
	Small firm - from 11 to 50 employees	Count	41	67	26
		Expected Count	46.9	55.3	31.9
		% within Country	41.0%	56.8%	38.2%
		Std. Residual	-.9	1.6	-1.0
	Medium size firm - from 51 to 150 employees	Count	34	9	30
		Expected Count	25.5	30.1	17.4
		% within Country	34.0%	7.6%	44.1%
		Std. Residual	1.7	-3.8	3.0
	Large firm - over 150 employees	Count	21	10	12
		Expected Count	15.0	17.7	10.2
		% within Country	21.0%	8.5%	17.6%
		Std. Residual	1.5	-1.8	.6

Pearson Chi-Square X^2 (*df* = *6*) = 71.389, p < 0.001. Cramer's V = 0.353, p < 0.001
0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.56.

Another plausible explanation for the observed level of implementation of practices amongst contractors in the Vietnam sample could be tied to two consecutive 5-year national H&S programmes implemented in Vietnam since 2006 (MOLISA, 2012). The first national programme (2006-2010) had 5 keys objectives (MOLISA, 2012):

1. *"Reduce number of serious and fatal occupational accidents; reduce by 5% of annual occupational accident frequency rate in particularly hazardous sectors (including mining, construction and use of electricity)".*
2. *"Reduce by 10% of the number of new cases with occupational diseases; ensure that more than 80% of workers in production units with high risk of occupational diseases [are] provided with health check - up service for detecting occupational diseases."*
3. *"Ensure 100% of workers who [are] confirmed and certified with occupational accidents and occupational diseases are treated and provided with health care and rehabilitation services."*
4. *"Over 80% of workers in sectors with strict requirements on OSH and OSH officers are trained in OSH."*
5. *"Ensure 100% of serious and fatal occupational accidents are investigated and handled."*

The programme was implemented through several projects and activities, and it is reported to have received state funds of 179 billion Vietnamese Dong (VDN) (approx. US$ 9.4 million, based on 2010 average interbank exchange rate), over 100 billion VND (approx. US$ 5.3 million) from international organisations, and over 210 billion VND (approx. US$ 11.1 million) worth of contributions from enterprises (MOLISA, 2012). Amongst the activities implemented under the programme are: review of hundreds of legal documents; the setting up of a labour protection division by the Ministry of Construction; the provision of specialised inspection, testing, and

monitoring equipment to labour inspectors; mass communication of occupational H&S information (e.g. weekly dissemination of H&S information on national television and radio); publication of thousands of articles about H&S in newspapers and journals; distribution of free leaflets, posters, books and disc to employers and workers; provision of nationwide training activities with a focus on sectors including construction; intensification of research into several aspect of H&S (e.g. protective equipment and working conditions); and strengthening international cooperation on H&S.

Amongst the impacts attributed to the 2006-2010 programme (see MOLISA, 2012) are:

- Increased awareness amongst enterprises about the importance of H&S to production and productivity.
- Increased attention amongst enterprises to the development of H&S management system.
- Reduction in the rate of fatal accidents by approximately 9% in construction from 2006-2008.
- Reduction in the number of new cases of occupational diseases per insured people by approximately 6%.
- 100% of workers confirmed and certified with occupational accidents and diseases, received treatment, healthcare and rehabilitation in accordance with laws.
- Over 73% of workers in sectors with strict requirements on H&S were trained in H&S
- Over 92% of reported and detected accidents were investigated.

Following the 2006-2010 programme, the second programme (2011-2015) was launched in December 2010 with the ultimate goal of achieving further improvements in H&S. Amongst the specific targets of the 2011-2015 programme were:

- 5% annual reduction of fatal accident rate in hazardous sectors including construction.
- An annual average increase of 2,000 SMEs which effectively apply H&S management system.
- Dissemination of appropriate H&S information to over 1,000 craft villages, 5,000 cooperatives, and 30,000 SMEs by 2015.
- Annually providing H&S information to an average of: over 40,000 people who are working in occupations, jobs with strict H&S requirements; 10,000 people who are doing hard, hazardous or dangerous occupations and jobs; and 40,000 H&S officials in enterprises.

Activities that had resemblance to the 2006-2010 programme were also planned for implementation under the 2011-2015 programme with a total budget of 1,466 billion VND (approx. US$ 77.5 million). Whilst an evaluation report is probably still underway, it is anticipated that the 2011-2015 programme would also yield H&S benefits given the impact attributed to its forerunner. In fact a third iteration of the programme (i.e. for 2016-2020) launched in January 2016 (see legal document - Decision No. 05/QD-TTg) suggests that is likely the case. The third iteration has also set targets including fatal

accidents reduction, an increase in the number of SMEs applying H&S management systems, and training of workers.

Inferring from the objectives and activities of the 2006-2010 and 2011-2015 programmes and the attributed impacts of the 2006-2010 programmes, it is therefore plausible that these programmes served as power stimuli for the levels of implementation of H&S practices observed amongst contractors in the Vietnam sample. This plausible effect is to an extent corroborated by the impact of a similar national H&S initiative implemented in the UK from 2000-2010. This was called, "Revitalising Health and Safety (RHS)" which later instigated a construction sector-specific version called, "Revitalising Health and Safety in Construction" (Department of the Environment Transport and the Regions, 2000; HSE, 2002). Similar to the Vietnam programmes, the UK RHS initiative set specific targets to reduce occupational fatalities, injuries and illnesses in all industries. The construction sector version which was introduced 2 years into the implementation of the national RHS initiative set more ambitious targets beyond the national RHS initiative. An evaluation by the HSE Construction Division (2009) showed that major and fatal injury rates in construction persistently met the national RHS targets. This and the impact attributed to the Vietnam national programme suggest that a joined-up national H&S programme/initiative (if well implemented) could help to improve workplace H&S.

Regarding the with-country analysis of the association between firm size and implementation of H&S management practice, overall the results align with the extant literature (see Bonafede et al., 2016). It is thus not surprising that for both Malaysia and Vietnam analysis, there was no indication that large firms are more likely not to implement any of the H&S management practices. On the contrary, for a few of the practices, the results suggests that micro and small firms are more likely not to implement the practices. The results thus bring to the fore, the notion of smaller-sized firms particularly needing more support/guidance to enable them strengthen their management of H&S. Programmes/intiatives by industry or state agencies to improve the management of H&S by contractors should therefore take this into account. In view of this, it is noteworthy that the Vietnam national H&S programme (2011-2015) included targets focussing on SMEs e.g. to achieve an annual average increase of 2,000 SMEs that effectively apply H&S management system; and to disseminate appropriate H&S information to over 30,000 SMEs by 2015.

6.0 Conclusions

Given the significance of H&S management to addressing H&S issues in the workplace, identifying elements and practices of H&S management that need to be strengthened amongst contactors is worthwhile. This study through a survey has examined the H&S management practices of contractors in three countries in South East Asia: Malaysia; Vietnam; and Cambodia. While the study has shown that in each country there are practices that are not commonly implemented by contractors (and hence need attention from contractors and relevant bodies/institutions in the countries) it further suggests that the situation could be more acute in Malaysia and Cambodia. Regarding Malaysia, the study particularly highlights: 1 practice under the policy element of H&S management; 1 practice under the risk assessment element; 6 practices under organising; and 3 practices under the implementing element. Regarding Cambodia, the study particularly highlights: 1 practice under policy; 1 practice under planning; 1 practice under risk assessment; 5 practices under

organising element; 4 practices under implementing; and 1 practice under measuring and reviewing performance. Overall, the above observations present an opportunity for contractors and industry stakeholders in Vietnam, Malaysia and Cambodia to direct their efforts towards enhancing implementation of the practices that are lagging.

Whereas the observed levels of implementation of practices amongst the Malaysian contractors could have been influenced by a significant proportion of those contractors being micro-enterprises, the level of implementation of practices amongst the Vietnam-based contractors could have been influenced by the two consecutive national H&S programmes implemented in Vietnam from 2006 – 2015. Parallels can be drawn between these programmes and the UK's *Revitalising H&S* initiative. The impact attributed to these programmes signals that a multi-pronged, joined-up and long-term effort at the national level could be a potent stimulus for improvement in H&S. The results also suggest that, particularly for Malysia and Vietnam, implementation of some H&S management practices could be associated with contractor size. Efforts to stimulate effective H&S management amongst contractors ought to take this into account so that appropriate attention is given to those categories of firms who would benefit the most.

In order to further substantiate the intriguing findings revealed by this study, it is desirable that additional work is undertaken. In that regard the use of qualitative strategies (e.g. phenomenology and case study) would be useful in providing deeper meanings which quantitative analysis may be unable to offer. Furthermore, whilst the H&S management practices investigated are wide-ranging and founded on prominent H&S management models, they are by no means exhaustive as H&S regulations in a country may require additional practices/measures not covered by this study.

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