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The Significant Effect of Occupational Safety and Health Management System Towards Contractor Engagement in the Engineering Construction

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ABSTRACT

Water services in Malaysia is a crucial element whereby there is an aggressive demand every year. Among the areas of concern are the water supply coverage and volume, sustainability of water quality, high operation and maintenance cost, high non-revenue water (NRW) and operational efficiency of the water industry. In this paper, the main objective is to analyse the occupational safety and health management system implementation towards contractor engagement related to the water industry in Malaysia, in relations to the management capability, knowledge resources and risk assessment. This paper provides preliminary overview of the OSH Management System related issues in water services through the interviews with 10 employees at different company levels, addressing perceptions of various safety management activities according to managers and operational personnel. The interview shows that managers and operational personnel at engineering construction agree that the significant effect measures aimed to improved safety continuously. At the end of this paper, the improvements including involving operational personnel in the design of procedures, contractor engagement, considering all risk dimensions that may affect OSH and challenging the value of specific OSH activities based on a detailed knowledge if the distinctive characteristics of workplace in engineering construction.

Keywords: OSH Management System, Management Capability, Resources Knowledge, Risk Assessment, Contractor Engagement.

1. INTRODUCTION

The current trade and industry growth in the state of Selangor and Federal. Territories has a prominent impact on water services industry operations where the population served increase by 100 percent in urban area despite of the other area such as rural almost have 99.5 percent and state by 99.8 percent which almost 100 percent demand on water services that will lead the supply factor will impact directly and indirectly for both costs. Beside that the other state such as in Kelantan the percentage of coverage are low because of other alternative sources are used although there is accessibility.

Apart from that, increases the number of new registered account in the company based on state, especially Selangor, Kuala Lumpur, and Johor. The rapid economy growth that links closely with the high-speed development has resulted to water services industry to expand its operation largely better by upgrading the current system through the advance system such as Customer Information System (CRIS) which are responsible to capture the complaint from consumers, for instance, big factories producing high end products and government agencies. water operator

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employs new workers and third party such as registered contractor by SPAN, while acquire new equipment such as system of SCADA which are responsible to monitor the balancing of water through reservoir, pump house, ponds, and elevated tank. Numbers of new job opportunity and a lot of projects has been increased every year and many new workers have been recruited to maintain the water distribution performance based on concessions agreement between water operator and federal government of Malaysia.

Selangor as a most development state in Malaysia requires more demand shown by water consumption statistics by state between year 2016 and 2017 that divided by two categories in domestic area by 0.7% percent and non-domestic area are increased by 2%. At the end of the 10th Malaysia Plan, Malaysia recorded clean water coverage and more widely maintained. The number of people who get water supply clean and well maintained increased by 0.4% to 14,157 (mld) compared to year 2016 is 14,0101 (mld). All states reach water supply coverage clean and well maintained more than 99% in the city, the recorded 59.5%. Coverage in rural areas of Kelantan, Sabah and Sarawak remains below 80% as shown in display 7-5.

On top of that, the 11th Malaysian Plan under strategic thrust 5 that paves the way for Malaysia to strengthen infrastructure to support economic expansion with the raising the financial sustainability of the water services industry, expanding the network and treatment plant capacity, increasing efficiency and productivity of water services, and strengthening the regulatory framework.

Despite various efforts to improve management water supply and its distribution, the NRW rate improved from 36.3% in 2010 to 33.4% in 2017. This situation occurs due to lack of enforcement, a regional metering zone limited to monitoring water pressure and detecting pipe leakage, as well as slow pipe and meter replacement rates. NRW rate is highest in Perlis, which is 62.4% and in Sabah 53.2%. Services water supply and sewerage have been well developed in the city, but rural services need to be improved. A total of 24 new water treatment plants have been completed and operated temporarily 38 water treatment plants have been upgraded to upgrade production capacity to 18,421 million litres per day. This initiative has contributed to expansion coverage of clean water networks and ensuring supply safety.

The Occupational, Safety and Health Management System (OSHMS) is a framework that allows an organization to consistently identify and control its health and safety risks, reduce the potential for incidents, help achieve compliance with health and safety legislation and continually improve its performance. The importance of OSHMS is that it allows an organisation to systematically eliminate the possibility of accident, illness, injury or fatality caused by workplace hazards. Not only is this obviously beneficial for anyone working in the organisation, it is also beneficial for the organisation as a whole.

In the previous studies, it is found that the implementation of OSHMS towards contractor engagement, particularly in the engineering construction industry, is moving towards intermediate stage. This is because the client and the contractor are two (2) separate entities, with different focus, objective, job scope and target. The implementation of OSHMS in a certain organisation is already a difficult task, what more to implement it on an external outsourced party working with the organisation. It does not only take a lot of effort, but also a lot of procedures need to be done, a lot of work need to be carried out and a lot of issues that need to be addressed. Nevertheless, since the construction industry can be considered as risky and hazardous from certain aspects, more and more companies are trying very hard to implement OSHMS towards its contractors and ensure they strictly comply. Challenges and barriers certainly do not prevent organisations – especially large ones like those of engineering construction companies, to implement OSHMS on their organisations as well as on their contractors due to the high level of awareness towards the importance of OSH.

This paper will analyse the implementation towards contractor engagement related to the engineering construction in Malaysia, in relations to the management capability, knowledge resources and risk assessment.

2. LITERATURE REVIEW

This section discusses the level of occupational safety and health management system implementation towards contractor engagement related to the engineering construction in Malaysia, in relations to the management capability, knowledge resources and risk assessment.

From the data derived, it shows that the current implementation of OSHMS towards contractor engagement within the engineering construction industry in Malaysia is in a good condition. This is because in the engineering construction industry, the OSHMS is very crucial since it deals with a lot of people, machineries, equipment and vehicle in its day-to-day operations. Managing the OSHMS itself in a certain organisation is already a difficult task, what more in implementing it towards contractor engagement. Nevertheless, companies in the engineering construction industry have done a tremendously great job in implementing it towards contractor engagement by having excellent management capability, in-depth knowledge resources, as well as consistent risk assessment.

Table 1 Number of Construction Projects Awarded by Sector and Type of Project (value in RM Million)

Sector and Type of Project	Number			
	2013	2014	2015	2016
Total Private Sector	**6,276**	**5,643**	**5,091**	**1,645**
Residential	2,161	1,929	1,762	597
Non-Residential	2,677	2,316	2,005	665
Social Amenities	257	250	263	81
Infrastructure	1,181	1,148	1,061	302
Total Government Sector	**1,800**	**1,901**	**1,764**	**488**
Residential	160	164	92	45
Non-Residential	342	376	404	97
Social Amenities	445	476	414	127
Infrastructure	853	885	854	219
Grand Total	**8,076**	**7,544**	**6,855**	**2,133**

Table 2 Registered Construction Personnel by Category of Worker

Category of Worker	2015		2016	
	Local	Foreign	Local	Foreign
Construction worker	295,560	135,997	304,167	148,025
Skilled construction worker	50,855	1,675	91,637	2,939
Manager and site assistant manager	51,410	1,462	58,646	1,052
Construction supervisor	50,933	272	116,579	1,566
Administrative personnel	126,716	1,662	42,814	138
Total	575,474	141,068	613,843	153,720

Table 1 shows the Number of Construction Projects Awarded by Sector (value in RM million). There are two (2) types of sector, which are the Private Sector and Public Sector. Under each sector, there are four (4) categories. They are Residential, Non-Residential, Social Amenities and Infrastructure, respectively. The engineering construction fall under the Infrastructure category, which means there is an approximate of RM 302 million worth of projects in the private sector and RM 219 million worth of projects in the public sector in 2016. There is a very drastic decrease in the number of construction projects awarded from 2013-2016. It may be due to the economic downfall, drop in the price of crude oil and recession that affected not only the country, but also the whole world. Nevertheless, this figure takes up 18.36% from the private sector and a good 44.88% from the public sector, that shows it contributes to a large portion from all the projects. In fact, infrastructure has always been the largest portion from all the sectors in the public sector all the while.

Table 2, on the other hand, shows the Registered Construction Personnel by Category of Worker. Construction Worker and Skilled Construction Worker takes up the highest figure from overall, which is 304,167 local construction workers, 148,025 foreign construction workers, 91,637 local skilled construction workers and 2,939 foreign skilled construction workers in 2016 respectively. These construction workers work in various industries, and this includes infrastructure and engineering construction. From this figure, it shows that these workers take up a very large percentage from the overall number. This clearly depicts those contractors are the most people in all industries and their presence are important since they are the ones who get the work done.

Therefore, in all industries, particularly the engineering construction, it is very important for the client to have a holistic and comprehensive implementation of OSHMS towards contractor engagement. OSHMS implementation in the organisation itself is insufficient because they are not the one does the work, but the contractors. Thus, to ensure that the contractors adhere to the regulations and requirements in terms of occupational safety and health, there must be a good implementation of OSHMS towards the contractors.

Nevertheless, how do one know that the OSHMS is correctly implemented towards contractor engagement in all of the industries, especially the engineering construction industry? This can be seen by looking at the accident and fatality rate and statistics.

Table 3 National Occupational Accident and Fatality Rate

Year	2014	2015	2016	2017	2018	2019	2020
Accident Rate	3.10	2.81	2.88	2.93	2.40	2.71	2.18
Fatality Rate	4.21	4.84	4.84	4.90	4.14	3.83	2.09

Notes:
1. Occupational accident rate per 1,000 workers
2. Occupational fatality rate per 100,000 workers

Table 3 above shows the National Occupational Accident and Fatality Rate. This rate is shown per 1,000 workers for accident and per 100,000 workers for fatality. Table 3 shows the figures for a duration of seven (7) years from year 2014 to 2020. What can be seen here is that there is a significant reduction in the accident rate from 3.10 to 2.18 per 1,000 workers, and from 4.21 to 2.09 in the fatality rate per 100,000 workers. This strongly indicates that something must have been done right in terms of occupational safety and health very significantly. And therefore, it must definitely be the implementation of OSHMS towards contractor engagement that is put into place.

To add further, Table 4 below shows the Occupational Accident Statistics by Sector Until Dec 2020 (investigated) and there were two hundred fourteen (214) non-permanent disability and three (3) death reported under the Utilities sector for a duration of six (6) months from a total of accident rate of 2.18 per 1,000 workers and fatality rate of 2.09 per 100,000 workers.

Table 4 Occupational Accident Statistics by Sector Until Dec 2020 (reported)

OCCUPATIONAL ACCIDENT STATISTICS BY SECTOR UNTIL DECEMBER 2020 (REPORTED TO DOSH ONLY)

SECTOR	NPD	PD	DEATH	TOTAL
Hotel and Restaurant	137	1	2	140
Utilities (Electricity, Gas, Water and Sanitary Service)	214	3	3	220
Finance, Insurance, Real Estate and Business Services	312	7	8	327
Construction	137	3	66	206
Transport, Storage and Communication	294	6	11	311
Manufacturing	4202	231	73	4506
Wholesale and Retail Trade	126	1	1	128
Public Services and Statutory Authorities	73	1	3	77
Mining and Quarrying	35	1	3	39
Agriculture, Forestry and Fishery	916	20	43	979
TOTAL	**6446**	**274**	**213**	**6933**

Legend:
NP – Non-permanent disability
PD – Permanent disability

3. METHODOLOGY

For this preliminary data collection, a Google Form comprising of twenty-three (23) questions consists of nineteen (19) in a Likert Scale form and four (4) open-ended questions was distributed among one hundred and seventy-three (173) respondents from various companies and levels in engineering construction, but all within the same industry which is Occupational Safety and Health. However, only one hundred and fifty (150) responds were accepted for this study. From this one hundred and fifty (150) responds, five (5) respondents from the managerial level and five (5) respondents from the non-managerial level were carefully selected to be personally interviewed for more in-depth and elaborated feedback. The interviews were based on an interview guide designed to gather information about health, safety, and safety management. Questions were open-ended ones, and respondents are allowed to freely express their opinions on the topics to be explored. All interviews were conducted online due to the current Covid-19 pandemic.

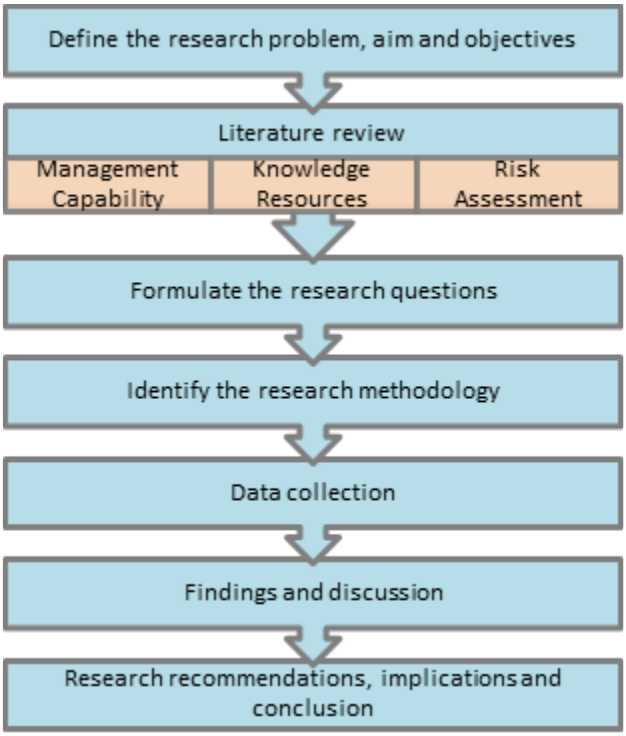
The target group for this interview are the operational personnel and managers. At each engineering construction, there is a group of employees who perform daily inspection and operations such as assessment of pipeline systems (to reduce non-revenue water). Each engineering construction has a project manager who is responsible for both the progress of the projects and the safety of workers. The engineering construction management team plays an important part in safety management. Some companies may have employees who work full time with OHS, whereas others have employees who have this role as one of the several areas of responsibility. Thirty-five (35) of the interviewees worked as operational personnel at the engineering construction sites. They included Project Manager, Construction Managers, Quantity Surveyor, Executive, Consultant, and Technician. Eight (8) of the interviewees worked engineering construction, with OHS as one of their main responsibilities. When discussed as a group, these participants will be referred to a project manager.

The data were analysed to identify patterns related to the research questions (prominent hazards, views on practical relevance of safety management and implementation). Perceptions of five (5) main safety management activities were described: risk assessments, procedures including contractor management, resources, involvement of personnel, and well-informed personnel. To identify similarities and differences between managers and employees, the results were analysed separately for each group. To present the findings in the informants' own words, illustrative quotes were used. When it comes to generalization of the findings, the number of informants must be taken into consideration.

The methodologies used in this study are a case study and multi-method approach to research (Groat and Wang, 2002). There are two types of case study research introduced by Groat, (1) Literal Replication and (2) Theoretical Replication. Literal replication is precisely tests the same outcome and principle or prediction establish by initial case study, whereas theoretical replication is a case study that produces contrasting result but for predictable reasons. A variety of data collection and analysis tactic used, results to a holistic investigation (Linda 2002).

In order to achieve this objective, the researcher adopted a method of collecting data for the study. The target resource for the study is the number of contractors in Malaysia, engaged to the engineering construction companies in Malaysia.

Figure 1 The flow of the proposed method



4. FINDINGS AND DISCUSSION

In this study, a total of five (5) managers and five (5) non-managers were interviewed. The interviews were conducted online due to the current Covid-19 pandemic situation. A total number of twenty-three (23) questions were asked, including four (4) subjective questions. In the open-ended questions, the following questions were asked:

1. How do you evaluate the OSHMS in your organisation and what are the aspects of OSHMS which you have found insufficient or in need of improvement?
2. From the perspective of enabling a safe and healthy workplace, in your opinion, what are the reason(s) for the lack of efficiency in the relationship between the contractors and clients?
3. In your opinion, what are the areas most vulnerable for interference by employers?
4. Do you think that risk assessment at the workplace is an effective mean to prevent occupational accidents and occupational diseases? What other important elements do you think need to be in place?

Table 5 Open-Ended Interview Answer Breakdown (in percentage (%))

Question 1	**Top Management**	**Level of Understanding**	**Awareness**	**Legal Compliance**	**Audit Reports**
How do you evaluate the OSHMS in your organisation and what are the aspects of OSHMS which you have found insufficient or in need of improvement?	30%	40%	15%	5%	10%
Question 2	**Communication & Coordination**	**Client's Concern**	**Budget Issue**	**Awareness**	**Fulfil Obligations**
From the perspective of enabling a safe and healthy workplace, in your opinion, what are the reason(s) for the lack of efficiency in the relationship between the contractors and clients?	35%	10%	30%	10%	15%
Question 3	**Lack of Support from Employer**	**Lack of OSH Elements**	**Cost Incurred**	**Procedure Adherence**	**Business Operations & Company Reputation**
In your opinion, what are the areas most vulnerable for interference by employers?	20%	10%	45%	5%	20%
Question 4	**Answered: Yes**	**Communication**	**Strict Enforcement**	**Budget Allocation**	**Support from Top Management**
Do you think that risk assessment at the workplace is an effective mean to prevent occupational accidents and occupational diseases? What other important elements do you think need to be in place?	100%	20%	5%	55%	20%

From the Table 5 shows that in the first question, the managers have mixed opinions. Among the answers received are visible commitment from the top management (30%), the level of understanding among the stakeholders (40%), monitoring and measuring aspect (10%), more awareness and training for the subcontractors (15%), and OSH and legal compliance (5%) among the subcontractors. As for the monitoring and measuring aspect, a manager elaborated on the are two primary purposes of monitoring and measuring. The first is to see if the OHSMS is working as intended. The second is to make sure any safety and health problems are identified and then fed back into the OHSMS planning process with the goal of eliminating and/or controlling them. It is important to identify and track leading indicators that predict risk as well as lagging indicators such as injuries and illnesses. He added that leading indicators may include things like near misses, non-conformance, and complaint. These are the major aspect that cause incident/accident at workplace.

Nevertheless, from the non-managers point of view, they pointed out a few ways on how OSHMS are evaluated in their organisation. Among them are by scheduled and unscheduled inspection at sites and through progress reports such as staff interviews, certification body audit reports such as SIRIM, NIOSH Certification Body and the yearly Safety, Health, Security, Environmental and TMP (SHSET) audit. Apart from that, they also agree that OSHMS is good for the organisation only that most companies are afraid to invest on this aspect and are very underbudgeted.

As for the second question, most managers agree that the reasons for the lack of efficiency (10%) in the relationship between the contractors and clients are the lack of communication and coordination (35%). It is either the client is not concerned on the contractor's safety issues (10%) or the client focuses more on the work progress rather than safety issues. Other than that, there are also answers that touch on the issue of budget (30%), whereby there is no proper budget on OSH in a contract. Therefore, with this, it results to inefficient relationship between the contractors and the clients (15%).

As for the non-managers, they strongly believe on having awareness and support from the management for relationship to be efficient between the client and contractors. Apart from that, it is also crucial to fulfil the obligation between one another and have synchronization. As one of the executives stated, safe and healthy workplace need a certain cost to be included together into the project cost. This cost is taken for granted, there will be a problem for the contractor to comply to the safety obligations.

Next, in the third question whereby the area's most vulnerable for interference by employers were questioned, the managers answered the lack of visible support from the employer (20%), the lack of OSH elements (10%) clearly stated in the procurement, the OSH requirements are not stated in the contract (5%), costs that are incurred (45%) directly or indirectly, and about working at height, confined space, chemical health risk assessment (CHRA), noise monitoring exposure, pertaining Covid-19 tests and the welfare of the workers. The non-managers, on the other hand, are confident that the areas are business operation, company reputation (20%), contract matters and safety issues.

In the fourth question, the managers opinions are asked on whether they thought risk assessment at the workplace is an effective mean to prevent occupational accidents and occupational diseases and what are the other important elements do they think needed to be in place. All managers agree that risk assessment is very important. But it must happen with communication, strict enforcement, and budget allocation. A manager added that risk assessment must be a planned or predicting on the events that were not intended to happen and a way to counter it without additional cost. Otherwise, it will cause risk assessment prepared is not as effective and practical. In normal circumstances, it will only come into the picture after

the cost of contract is being confirmed, and any additional/addendum that may affect the cost is put as last resolution. Therefore, for it to be efficient, important elements need to be in place as a safe design stage and this includes all necessary safety equipment/method as mandatory and not under accessories that can be removed or reduced.

Finally, in the same question, the non-managers settled with a yes. All of them agreed that risk assessment is important along with a firm support from the top management to ensure effective preventive measure can be implemented at the workplace. In addition to that, according to them, HIRARC, HIRADC, HEMP, HER and JSA (Job Safety Analysis) should be an additional element to be in place

5. CONCLUSION

The Occupational, Safety and Health Management System (OSHMS) is a framework that allows an organization to consistently identify and control its health and safety risks, reduce the potential for incidents, help achieve compliance with health and safety legislation and continually improve its performance. The importance of OSHMS is that it allows an organisation to systematically eliminate the possibility of accident, illness, injury, or fatality caused by workplace hazards. Not only is this obviously beneficial for anyone working in the organisation, but it is also beneficial for the organisation as a whole.

Risk assessments has become increasingly critical in mitigating accidents, improving safety, and improving outcomes. Risk assessment consists of an objective evaluation of risk in which assumptions and uncertainties are clearly considered and presented. This involves identification of risk (what can happen and why), the potential consequences, the probability of occurrence, the tolerability or acceptability of the risk, and ways to mitigate or reduce probability of the risk.

In this study, one hundred and fifty (150) responds were accepted. From this one hundred and fifty (150) responds, five (5) respondents from the managerial level and five (5) respondents from the non-managerial level were carefully selected to be personally interviewed for more in-depth and elaborated feedback. The interviews were conducted online due to the current Covid-19 pandemic situation. A total number of twenty-three (23) questions were asked, including four (4) subjective questions.

From the findings, it is obvious that although the OSHMS in organisations are well-implemented, there is still so much room for improvement. According to the respondents, there is a need for a more transparent communication, coordination between the contractor and client, awareness on OSHMS and its implementation, fulfilling obligations to ensure work is smoothly running, legal aspects, and most importantly – budget. According to most respondents, budget is always the most important but least considered when it comes to OSH in the engineering construction.

There may be limitations to this study due to the pandemic, but it is hoped that this humble study could be a significant reference to other researchers in the future.

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