SAFETY CULTURE & PERFORMANCE MEASUREMENT IN AN OIL & GAS ORGANIZATION

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SAFETY CULTURE & PERFORMANCE MEASUREMENT IN AN OIL & GAS ORGANIZATION

ABSTRACT

Most of the oil major companies in Malaysia have implemented Health, Safety and Environment Management System in the company which aim to guide and improve the overall Health, Safety and Environment culture in the organization. However, it seems like the implementation of Health, Safety and Environment has reach a plateau where incidents still happened despite the countless Health, Safety and Environment related initiatives conducted in the company. Hundreds of researches was done and models are proposed to measure the Health, Safety and Environment culture level in the organization, but there are no one satisfy model that can be used to identify the areas for improvement and action plan. Therefore, the focus of this study is to identify the current Health, Safety and Environment culture level in most of the oil and gas organization in Malaysia where a survey research is conducted on workers who work in the oil and gas company. A measurement matrix which are able to examine the level of the Health, Safety and Environment culture based on the Health, Safety and Environment Management System (HSE MS) is generated. With the proposed measurement matrix on culture, organizations are able to identify both the overall culture level and the specific areas that required improvement. Strategic plan can be assigned to these areas to achieve a mature Health, Safety and Environment culture in the oil and gas organization.

Keywords: Health, Safety and Environment, culture, oil and gas industries, measurement matrix, Health, Safety and Environment Management System

BUDAYA DAN PENGUKURAN PRESTASI KESELAMATAN KERJA DALAM ORGANISASI MINYAK DAN GAS

ABSTRAK

Kebanyakan syarikat minyak dan gas yang terunggul di Malaysia telah melaksanakan Sistem Pengurusan Kesihatan, Keselamatan dan Alam Sekitar. Tujuannya adalah untuk meningkatkan tahap kesihatan, keselamatan dan alam sekitar secara menyeluruh dalam organisasi. Walau bagaimanapun, nampaknya pelaksanaan Kesihatan, Keselamatan dan Alam Sekitar telah mencapai dataran di mana insiden terus berlaku walaupun inisiatif berkaitan kesihatan, keselamatan dan alam sekitar yang tidak terkira banyaknya diaturkan di syarikat. Beratus-ratus penyelidikan telah dilakukan dan model dicadangkan untuk mengukur tahap kebudayaan, Keselamatan dan Alam Sekitar dalam organisasi, tetapi tidak ada sesiapa yang memuaskan model yang dapat digunakan untuk mengenal pasti kawasan untuk penambahbaikan dan pelan tindakan.Tumpuan kajian ini adalah untuk mengenal pasti tahap Kesihatan, Keselamatan dan Alam Sekitar semasa dalam organisasi minyak dan gas di Malaysia di mana tinjauan dijalankan ke atas pekerja yang bekerja di syarikat minyak dan gas. Matrik pengukuran yang dapat mengkaji tahap Kesihatan, Keselamatan dan Alam Sekitar berdasarkan Sistem Pengurusan Kesihatan, Keselamatan dan Alam Sekitar (HSE MS) telah dihasilkan dalam kajian ini. Dengan matrik pengukuran yang dicadangkan, budaya organisasi dapat mengenal pasti tahap kebudayaan secara keseluruhan dan bidang spesifik yang memerlukan perbaikan. Pelan strategik boleh diberikan kepada bidang-bidang ini untuk mencapai budaya yang matang, sihat dan mesra alam.

Keywords: Kesihatan, Keselamatan dan Alam Sekitar, kebudayaan, industri minyak dan gas, matriks pengukuran, Sistem Pengurusan Kesihatan, Keselamatan dan Alam Sekitar

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The field of research which I worked in is an interesting field for me as currently I am working in one of the oil and gas organization in Malaysia and in the company that I currently work at, we faced issue where the Health, Safety and Environment culture stagnant after two years of implementation. Choosing this field as my research study has been helping to gain more understanding as well as clearer direction on how to break thru the stagnant environment in the company and move to a right direction.

My sincere thanks also go to my parents, Chow Yoke Kow and Lim Yoke Heong for all the sacrifices and support that both of you have made for me. Thank you my fellow sisters who have been supporting me spiritually in this journey. Last but not the least, I would like to thank my fiancé, Leow Wei Neng, who has been assisting and helping me in conducting the survey in this research and for keeping me motivated.

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CHAPTER 1: INTRODUCTION

In the earlier days, Health, Safety and Environment discipline did not get high attention and focus from the industries until a series of major incidents happened in 1970 to 1980. In 1974, Flixborough Disaster happened where a nypro cyclohexane oxidation plant in UK exploded and causes 28 fatalities and 36 injuries (Flixborough (Nypro UK) Explosion 1st June 1974, 2017). This huge vapor cloud explosion had caused the small town in the area wrecked and the public can feel the blast waves four miles away in Scunthorpe (Lashmar, 2000). It was later discovered that the incident happened due to failings in technical measures where the plant is modified without a full assessment on the consequences. Another significant incident that happened during 1980's was the Bhopal disaster that happen in India in 1984 where the Union Carbide pesticide plant released 30 tons of methyl isocyanate, toxic gas (Taylor, 2014). The toxic gas drifted to the densely populated area and killed thousands of people and caused more than 600,000 thousand people exposed to the toxic gas (Taylor, 2014) and (Britannica, 2017). Public exposed to the toxic gas suffered from respiratory problem, blindness, eye irritation and give birth to physically and mentally disabled children after 30 years the incident happened.

These 2 major incidents have triggered the alarm to all the authorities that the safety, health and environment regulations have to be further strengthen and revised to prevent similar disaster to happen again. A more comprehensive concept which include health, working environment, and occupational safety is established to address the rounded mindset of the company to achieve a high level of social responsibility and at the same time safeguard the safety of the people, asset, environment and reputation of the company (Hoivik, 2009). Over the last twenty years, literature in global trend adopting Health, Safety and Environment has increased tremendously where the society believe that the objective to have a systematic Health, Safety and Environment system is to identify the

root cause of injuries and illness in early process and apply preventive measure before the injury or illness occurs (Zanko, 2012).

1.1 Background

According to (Helmreich, 1998), culture in an organization is a complex system that involved national, organizational and professional values and behaviors of individuals function'. The similar theory is supported by (Reason, 2000) where he mentioned that safety culture is the ability of the individuals to manage risk and hazards and are still able to achieve the goal.

Today, Health, Safety and Environment discipline has become a vital element of an organization especially the oil and gas industry. With Health, Safety and Environment implement in an oil and gas company, the productivity of the company can increase where high quality of works are produced and the workforce morale can be increased (Med, 2008). Although the framework of guiding how Health, safety and environment are established either locally in respective country or internationally by Occupational Health and Safety association, there is no consensus on how to measure the safety culture in an organization (Wamuziri, 2014). Safety culture has always been popular concept in identifying the underlying cause of all incident, however, until today there is no general satisfactory models which can be used by both HSE practitioner and operational staff to measure the safety culture as a whole in an oil and gas company (Guldenmund, 2000).

1.2 Objectives

1. To determine the elements that can directly impact the safety culture in an oil and gas organization.
2. To establish a set of measurement matrix to measure safety culture in an oil and gas organization based on the elements.

CHAPTER 2: LITERATURE REVIEW

Safety culture is complex and at the same time substantial as it is hard to be understand and be practice in an essential way (Alvesson, 2002). According to Clarke (1999), measuring safety culture in the organization is effective in reducing the accident in oil and gas industry where it emphasis on the role and responsibilities played by social forces in an organization where the safety culture will eventually become equal in every aspect of organization system and exert a constant effect. According to theory proposed by Reason (1998), improvement in terms of safety culture is more effective compare to improvement in guidelines and procedures as at times, accident rate in an organization will reach a stagnant state where no improvement can be achieved further. The stagnant state is known as the plateau where the basis requirements for safety for example the procedures and barriers are all met.

Researchers had introduced different theories to categorize the safety culture level in an organization. One of the earliest theory is introduced by Schein (1985) where he mentioned that there are three levels of culture. The first level is Artefacts where it is the most visible level of culture and is often unidentifiable (Schein, 1985). The next level of the culture is values where it shows a sense of the basic item to be contrasted (Schein, 1985). Besides, the next culture level is assumption where the culture is undistinguishable and are taken for granted (Schein, 1985). This 3 different culture level basically summarize the different stage of culture present in the workplace.

In the twentieth, Reason (1998) has proposed his theory on safety culture where he highlight the criterias of an organization with effective safety culture. He mentioned that an organization with effective safety culture should have a well established safety information system where information on incident and near mises are collected, analyzed and distributed to all staff in the organization. Mature culture of reporting and trust are

present in the organization where the staff can report the errors and mistakes and violations to the procedures.

Social and psychological relationship are normally used to determine the safety culture in the workplace (Wamuziri, 2014). This theory is further supported where Dordi (2009) stated that culture is shared between people with some elements shared among each other for example, similar language or attitude practiced by the group of people. To create a culture, there are 3 essential elements which are system, behavior and attitudes where systems defined the culture needed and align to the goals whereas the behavior reduce or eliminate the conflicting demand and the attitudes helps to embed the culture by motivating the staff (Watts, 2011). These 3 elements are tied closely to each other as after all, the culture are enabled by creating a system.

The safety culture in an organization has to be measured as the safety culture is considered as a sub element of organization culture where if the safety culture is not matured in an organization, the organization culture is also unable to progress (Hoivik, 2009). Haukelid (2008) also supported the theory where the safety culture in an organization should not be separated from the organization and it should be the more advance part of the organization culture. Safety culture should be the focuses aspect of the organization culture (Richter, 2004).

2.1 HSE Management System

Safety culture in an organization is often implemented and guided with HSE management system (HSE MS) framework. The HSEMS framework is models to make sure that the health, safety and environment issues in an organization are identified, assessed and controlled in a proper manner (Inc., 2010). The common basis for HSEMS is the PDCA loop where the PDCA stands for Plan, Do, Check and Act as shown in Figure 2.1. Under the plan part, there are the strategy, policy and planning where the

organizations have to develop their strategy or objective in HSE, draft a policy to show the commitment of the management to safe guard the safety and health of the employees and plan for HSE activities in the company (PETRONAS, 2017). Next, the do part are the implementation of the program and plan and for the check part is the monitoring and measurement part where the result or outcome for implementing the HSE plan is reviewed. Examples of HSE KPI that can be monitored are the performance KPI where the number of injuries, number of Lost Time Injuries are recorded. Finally, act part is management review where the top management of the company will review the HSE performance and amend the objectives or HSE plan when necessary.

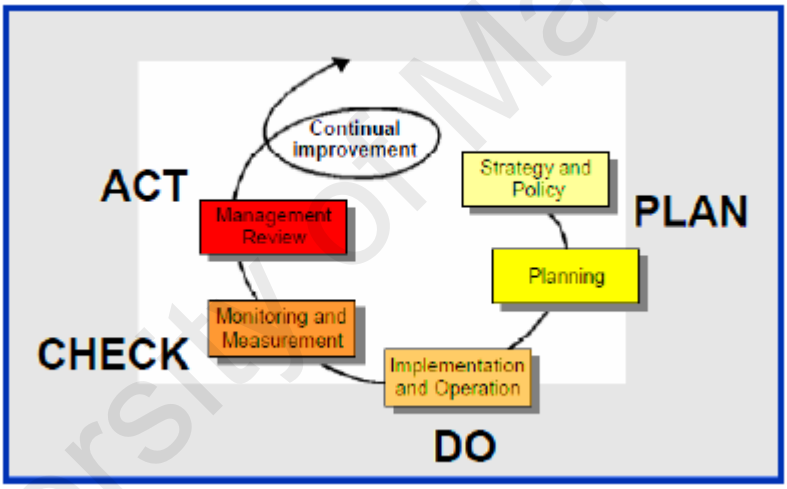

Figure 2.1: The PDCA loop

In HSEMS, there are 8 sub elements which provide guidance to ensure that the HSE Management system establish worked (PETRONAS, 2017). The 8 sub elements are as per Table 2.1:

Table 2.1: HSE MS Elements based on Plan, Do, Check, Act Loop

Plan	i.	Leadership and Commitment
	ii.	Policy and Strategic Objectives
	iii.	Organization, Responsibilities, Resources, Standards and Documents

	iv.	Hazard and Effect Management
	v.	Planning and Procedures
Do	vi.	Implementation and Monitoring
Check	vii.	Assurance
Act	viii.	Management Review

Table 2.1 continued.

Most organizations have implemented these 8 HSE MS elements in their HSE management where most of the employers thought that the ultimate goal of a mature safety culture in an organization is where the elements of HSE MS are executed with passion and the employees believe that the elements are required in order to execute a task safely which eventually contribute to quality works. Holstvoogd (2006) supported this theory and detailed in his research that the focus area to establish a mature safety culture evolved as time passed, where in the beginning phase of an organization, the "hardware" had to be in place where all standard operating procedures, guidelines and rules are established in accordance with risk assessment. Later, an effective system which provide a platform for the employees to report non- compliance and assurance had to be in place in order to drive a mature safety culture. When the system and procedures are well established in an organization, behavior of the employees should be focus in order to build a mature safety culture as the safety culture are not solely depend on the hardware or mechanically to improve the HSE Culture but also the "liveware" – the people.

This theory also applicable to organization which was established and wish to improve the safety culture. According to Holstvoogd (2006), to reduce the incident rate in an organization in a short period of time, technology and guidelines are the most efficient method. When the technology for example the alarm or pressure relieve valve are present in the organization, a system has to be developed to guide the standards and monitor the guidelines that are implemented. However, if an organization wish to

reduce the incident rate in a long term basis, the safety culture in the organization has to be improved.

2.2 Culture Models

Studies and researches have been conducted to come out with a road map measure the safety culture in an organization with reference of the 8 HSE MS elements. A road map enables both the employees and the management to be able to visualize their present reality of the culture and at the same time provide a clear vision of the problem that the organizations are having and help to solve the issue by identifying a path or a goal and the organization toward the goal (Watts, 2011). It is vital to have the measuring tools for HSE safety culture in order for the organizations to continuously improve on the level of safety performance, reduce accident rate and thus achieved cost saving (Watts, 2011). There are a total of 7 culture models that was developed by different researchers in evaluating the level of safety culture in the organizations. There are Culture Radar, Culture Barometer, Safety Culture Maturity Model, Safe Culture Survey, Parker Hudson Model, Occupational Safety Climate Assessment report and Hearts and Minds.

2.3 The Hearts and Minds Culture Ladder

Of all these 7 models, Hearts and Minds model are the most well-known as it was adopted by SHELL. The Hearts and Minds is a toolkit that can help to improve the HSE culture through leadership, process and behavioral change. Leadership is focus in Hearts and Minds program as the leaders are the people who lead the way to the top of the ladder (Watts, 2011). Parker (2006) mentioned in one of her research that safety culture in an organization is closely related to the safety attitudes and actions among management. It is important to note that the perception of the employees has on the management attitudes and behavior related to safety culture in the organization.

There are a total of 5 different levels in HSE culture ladder where each level symbolizes different stage of culture level as shown in Figure 2.2. The first level of safety culture is known as the pathological stage where nobody in the organizations cares about safety as long as the lawyer or the regulator started that it was fine and if accidents happened, it is considered as a dangerous business and the company will retrench the employees that cause or had the accident (Hodkinson, 2008). The second level of safety culture is the reactive stage where safety culture is important in the organization and the staff only pick up the safety culture where there is an accident happened. Endless discussion is held to rectify the cause of accidents happened (Hodkinson, 2008). The third stage is known as the calculative level where systems for example the HSE management system is in place to manage all the risks include operational risk, financial risk, HSE risk and legal risk (Rob Holstvoogd, 2006). Audits and inspections are conducted and everyone is particular with the statistics. Most of the organizations are in this stage where system is in place to reduce the incident rate. The fourth stage is the proactive stage where the organization works on the problems and mitigate the problem and identify method to prevent the incident. Resources are prepared and provided to prevent accident to happen, however the staff are very particular with the statistics and the procedures and preventive measures are done by the safety people in the organization. The final and mature stage in the safety culture ladder is the generative stage where safety is the core business in the organization as safety is the profit center and everyone in the organization practice HSE while conducting business activities (Hodkinson, 2008). Trust and accountability in staff increase when move from the pathological stage to the generative stage.

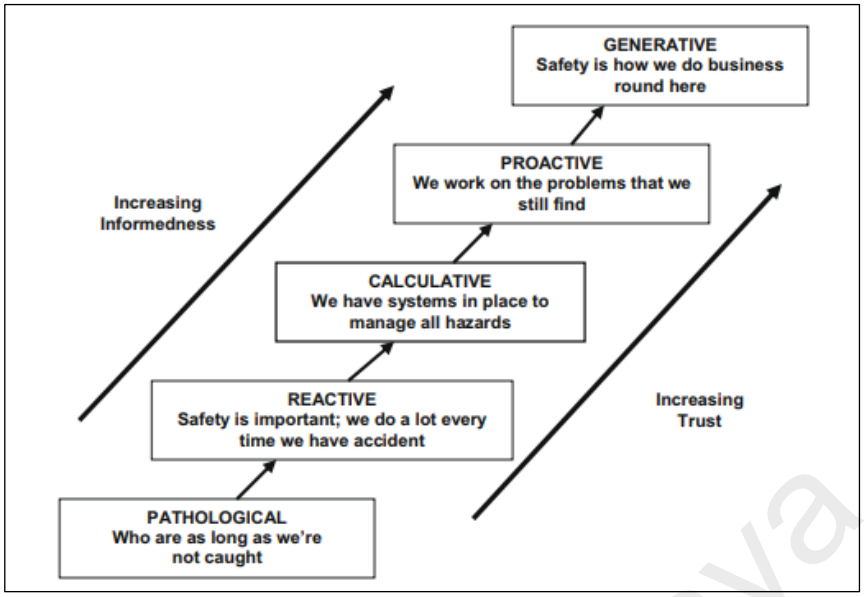

Figure 2.2: The HSE Culture Ladder

2.4 Phases of Safety Performance

Taylor (2002) believe that generally, high performing organizations share the common cultural items and the HSE performance can be improved through cultural change (HSE, 2000). Although it seems like some of the organizations have achieved a very high levels of safety performance with millions of accident free man-hours, the underlying cause of the incident still remain where the safety is not properly manage (Fitzgerald, 2003). 3 phases of safety performance change is classify where the first phase is accidents that go with the job, second phase is dramatic improvement and the third phase is the roller coaster phase (Taylor R. , 2002). These three phases basically reflect the transition part where at the first phase, accident still happened with all the safety risks identified and lead to a non – zero accident level with focused improvement and well- defined issues. However, the last stage is the roller coaster which indicate that the safety performance is not under control and new approach is required to improved.

2.5 IOSH Model

Taylor's theory is similar to the Hearts and Minds model where both the theory stated that during the initial stage, organizations may have established the system and structure, however, the underlying cause if the accident may not have been fully controlled. Taylor's theory is focus on general idea where new ideas or approach has to be engaged from time to time in an organization to ensure the safety performance of an organization as people may be very focus at the initial part, however, it is the normal process where people get overwhelmed with the current practice and did not take seriously of the safety culture after the practice was implemented sometimes. At this stage, new ideas and interventions have to be introduced to create the awareness again and this process is a loop.

IOSH also come out with a theory where a positive culture has three key elements where the first element is working practice and rules to control the hazard effectively. Standard safe working procedure that comply with law and industries best practice can be developed by the organization (IOSH, 2015). The second element is a positive attitude in dealing with risk management and compliance in the control process where the leaders are the one who lead the staff to comply with the working procedure established. The last element is the eagerness to learn from accidents happened and near miss incident for continual improvement (IOSH, 2015). This element is important as when accident happened, it means that part of the control measures is fail or missed out during the risk assessment. By analyzing the cause of accident happened, the organization can develop suitable strategy to maintain a safety working environment. The theory introduced by IOSH also consist of 5 levels like Hearts and Minds model, however, the key elements to differentiate different stage is different. Figure 4 shows the safety maturity model proposed by IOSH.

In the safety maturity model proposed by IOSH, Level 1 is the emerging part where the safety culture just emerge in the organization. Level 2 is the managing part where the management commitment is developed and look in to the HSE culture in the organization. Level 3 is the involving part where the organization realize the importance of frontline staff and developed personal responsibility in the staff. When the staff aware of their responsibilities in maintaining a safe culture in the organization, the staff can cooperate with other to improve safety. At the last stage which is the continually improving where a consistence practice is developed in the organization. This safety maturity model can be further combined with quality management to build a changing process in safety culture.

2.6 Westrum's Theory

A typology that identifies the three basis characteristic of organization are developed where the three basic characteristic are pathological, bureaucratic and generative (Westrum, 2004). Basically, the pathological environment in an organization is mainly focus based on personal needs, power and glory whereas the bureaucratic environment are developed when there is fix rules, and procedures. Generative environment in an organization focus on the mission of the company, more than on individual or position. Westrum's theory is adapted by Reason (1998) where he includes elements of proactivity and reactivity in the theory where reactivity organization only respond when accident happened and proactive organization inforce preventive measure before accident happened (Reason, 1998).

2.7 Key Elements in Measuring Safety Culture

Comparing all of these safety culture model, it can be noted that is a constant trend of themes focused. Leadership and Management is one of the themes that is focused in all of the safety culture model. Commitment from the top management is vibrant in

driving the safety culture in an organization as management are actively involved in determining the safety culture policies and strategies to operationalize the safety culture in organization (PETRONAS, 2017). According to Hoivik (2009), management played an important role in driving the safety culture as the employees will look up on the managers who portrait good safety culture practices as role model.

Procedures and guidelines are mentioned in most of the safety culture model where most of the researchers believes that guidelines and procedures are the fundamental element in order to improve the safety culture in an organization. However, according to a study done by Dordi (2009), employees highlight that in most organizations, there are too many and too difficult procedures which lead to confusion on which procedures to comply with when performing the job. When too many procedures are available to comply with, the employee will eventually have lost their ability to perform critical thinking and loss of ownership on the job they performed.

Studies done on improving safety culture have shown that information is one of the key elements in improving the safety culture in an organization. According to Filho & Andrade (2010), to inculcate the correct safety culture in an organization, a proper system should be introduced where employees can report any unusual events for examples accidents or near misses incident happened at the workplaces. It can be a form of indicator whether an organization has reach a mature state of safety culture if all the unusual events occurred at the workplace are reported by the employees regardless the severity or rating of the incident. In addition, leading and lagging performance indicators for accident and work related illness statistics like Unsafe Act Unsafe Condition report, lost time injuries, fatality incident, first aid treatment case are established in the organization where these data are reported to the management

and at the same time shared among the employees thru bulletin board, email or internal portal (Filho & Andrade, 2010).

Most of the safety culture model highlight collaboration and communication as the key element on driving mature safety culture in the organization. It is the collaboration among the management and employees from different department to drive the safety culture and this collaboration is closely tie with the attitudes as attitudes are the basis for a person's behavior and practices. During the planning or drafting stage of the organization's safety policies, plans and guidelines, the team should consist of both management representatives and employee's representatives to ensure an extensive plan are developed and implemented in the company.

To enhance collaboration, open and honest communication are important as in an organization, you can have a lot of facilities to run the operation, however, the most important part is where discussion are held to discuss on the work situation before the commencement of any operation as the risk tolerance level among the individual are distinct according to their background and common practices (PETRONAS, 2017). Formal system should be made available in the organizations where both the employees and management are able to communicate and exchange ideas and thought on incidents or near misses incident. In addition, effective communication on incidents and near misses are also important as it serve as awareness and lesson learnt to the rest of the employees to not replicate the same mistakes.

Parker (2006) stated that auditing is vital in driving an effective safety culture as during audit, non-compliance to safety standards, feedback on performance, gaps on safety culture can be identified and action plan can be identified for improvement. When gap assessment is performed, the employees are aware and clear on the non-compliance to the procedures and improvement plan can be developed.

In determining the culture level of Health, Safety and Environment in an organization, different models proposed different areas of focus which failed to give an overall rating of the implemented Health, Safety and Environment culture in the organization. The widely used model is the Hearts and Minds model by Du Pont where a list of descriptors are identified in the five stage of culture ladder. The survey is able to provide a general rating of the level of Health, Safety and Environment in an organization, however, no action plan or improvement plan can be generated from the survey as the survey did not address the weak area which the organization did not do well and just provide the general rating.

There is also a questionnaire at the Health, Safety and Environment Management System (HSE MS) module which can be used to identify the Health, Safety and Environment Culture level. However, most of the measuring criteria are based on number of activities conducted in the organization. It is insufficient and inaccurate if the monitoring and measuring of Health, Safety and Environment performance and level of culture are done by ticking off activities that have been implemented (Rob Holstvoogd, 2006). The effectiveness of the program to instill the safety culture could not be measured by just organizing program or activities. Programs and activities conducted are not necessarily to assure that safety culture and a good HSE performance exist. Thus, a set of measuring tools which are able to measure the overall Health, Safety and Environment Culture by focusing on the key areas need to be created in order to sustain the Health, Safety and Environment culture in an organization as the weak areas are able to be identified and improvement plan can be executed.

CHAPTER 3: METHODOLOGY

A set of questionnaires that tackle from three different aspects which are the academic, analytical and pragmatic aspects are developed in this study. The key objective of developing the questionnaire is to determine the 5 main key areas to be focused in order to measure the Health, Safety and Environment culture effectively. Detailed descriptors for each key areas at different culture level will be assigned at the end of this study. With the presence of the descriptors for each focus areas, the overall health, safety and environment culture in an organization can be identified where at the same time, both the management and the employees are able to identify the lagging area and action plan for continuous improvement can be developed.

Minimum 50 participants are targeted to completed the questionnaire where the target participants for the questionnaire are divided into four different group which are:

a) Workers from oil and gas industries with 24 years old and below
b) Workers from oil and gas industries with age between 25 to 35 years old
c) Worker from oil and gas industries with age between 36 to 45 years old
d) Worker from oil and gas industries with age between 46 to 55 years old

These four groups of participants are selected as in different age group who work in the oil and gas industries which allow a comprehensive coverage in term of the result of the study as people would have different opinion and judgement on the key areas to be focused on in order to improve the Health, Safety and Environment culture in the organization as they progress in the career path from young executive at mid-twenties to early thirty, manager at mid thirty to mid forty and the Management level at late forty to mid fifty.

The questionnaires will be distributed to the participants via both hardcopy and softcopy via social media like email. The study will be carried out in a month and the results will be collected and analyzed. Based on the results collected, five keys areas that are vital in order to improve the Health, Safety and Environment culture in the organizations will be identified and detailed descriptors for each key areas will be assigned based on the Hearts and Minds culture ladder.

3.1 Work Schedule

This research study is carried out based on the proposed work schedule below as shown in Table 3.1 which targeted to be carried out for 6 months. This research project will start with research on previous studies and models proposed by other researchers in order to have an overall idea on the current practices. Preparation and drafting of the survey questionnaire are done in the second month where questionnaire from other studies are compared and referred. The survey questionnaires are circulated to all the participants in third month where the data collection are expected in the following month. Finally, the last two months are for analyzing data and report writing where throughout the process, reference on previous studies are done along the way.

Table 3.1: Work Schedule

Activity	Month					
	1	2	3	4	5	6
Literature Review						
Material Preparation						
Experiment & Testing						
Data Collection						
Analyze Data						
Report Writing						

CHAPTER 4: DISCUSSION

70 responses are received from the survey questionnaire (Appendix A) distributed to the participants via email and hardcopy. Respondents who are working in the oil and gas industry and respondents that are not working in the oil and gas industries are segregate by the first question in the questionnaire which required the respondent to identify if they are working in the oil and gas industry. Responses from respondent who are not working in the oil and gas industries will not be taken into account as this do not meet the scope and objective of this research which is to identify the current Health, Safety and Environment culture in the oil and gas industries in Malaysia.

Respondents at age group between 25 years old to 35 years old constitutes the largest portion in this survey questionnaire with 28 of them, around 50.9% and follow by 25.5% respondents, 14 of them at age group between 36 years old to 45 years old. There are 13 respondents at age group between 46 years old to 55 years old and 5 of them who are 24 years old and below. The distribution of the age group of respondents who are working in the oil and gas industries is shown in Figure 4.1.

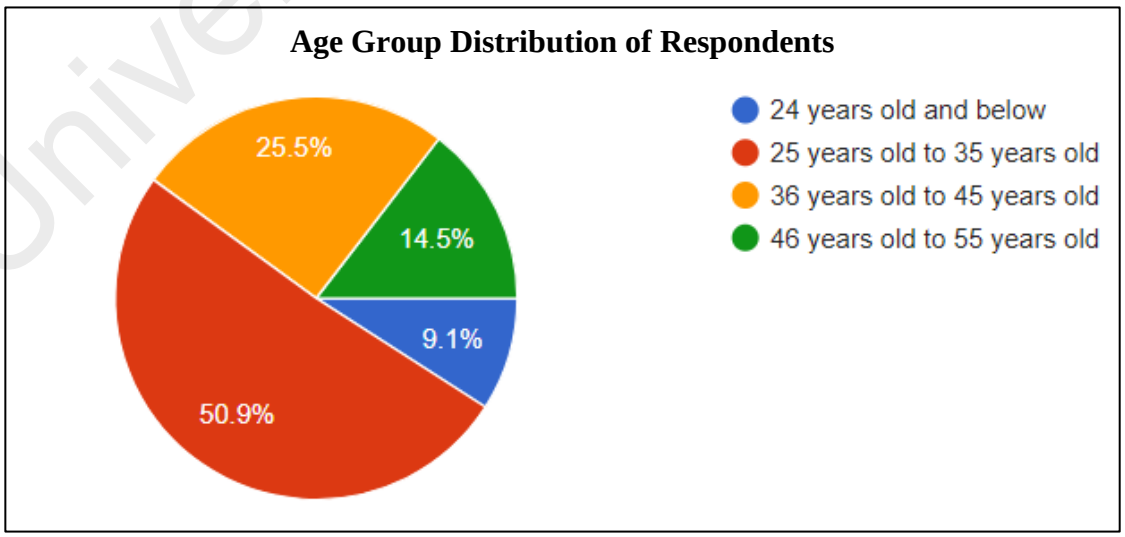

Figure 4.1: Distribution of age group of respondents who are working in the oil and gas industries.

Working position of the respondents in the oil and gas industries are determined in the survey questionnaire as people has different perspective toward the importance care for Health, Safety and Environment culture in the organization when they are in different level in the career ladder. As a young executive, the responsibilities, risk awareness and hazard alertness level are still developing as they are just exposed to working environment and are just introduced to the Health, Safety and Environment culture in the organization. In this initial level, they do not really appreciate the vitality of the Health, Safety and Environment implementation in the organization and are just following the rules and procedures which the organization request them to obey and comply. As they progress in the career path, being a manager or a leader, they are responsible for not only their own safety, but also their subordinate or colleagues' safety. During this point of time, the appreciation level on the objective to implement Health, Safety and Environment guidelines in the organization, which is to safe guard people, environment, asset and reputation will increase tremendously and the appreciation level will continue to increase when they are one of the decision maker in the organization. Based on the 55 responses received, the population of the respondents are:

i) 13 respondents who are Non- Executive,
ii) 28 respondents who are Executive,
iii) 9 respondents who are Manager, and
iv) 5 respondents who are Senior / General Manager

Figure 4.2 shows the general population of the respondents.

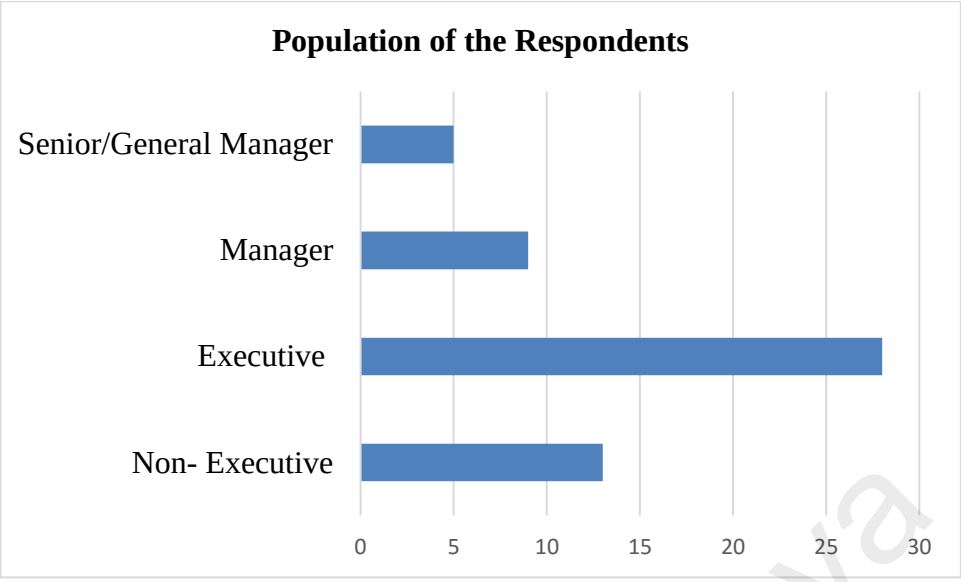

Figure 4.2: General population of the respondents

Familiarization of the worker work in the oil and gas industries with Du Pont's Heart and Minds Program are determined in the survey questionnaire as in most of the Major oil and gas industries, the Heart and Minds Program is usually the basis of the Health, Safety and Environment Culture of the organization (PETRONAS, 2017). The HSE policies, plan and initiatives are usually design according to the Hearts and Minds framework and the effectiveness of the implementation of the Health, Safety and Environment Culture are measured using the Hearts and Minds ruler. From the responses received through the survey questionnaire, 60% of the workers, as shown in Figure 4.3 are aware and have heard about the Hearts and Minds program in their organization which validate that the Hearts and Minds Program are implemented in most of the oil and gas industries.

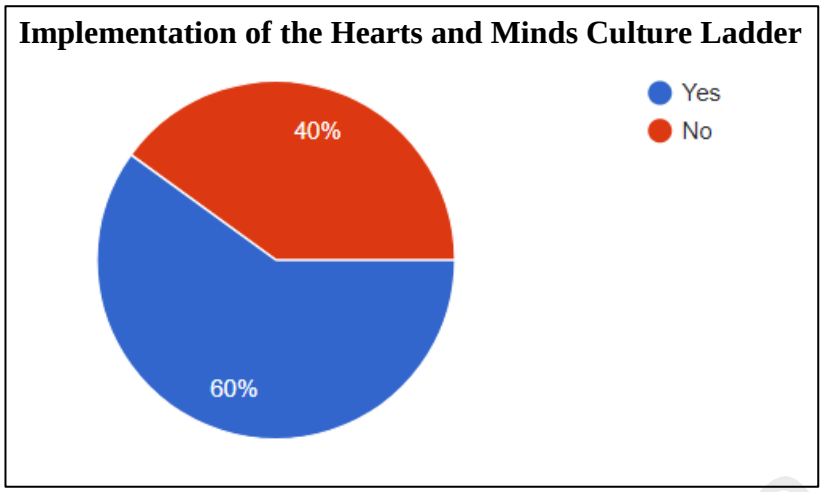

Figure 4.3: Implementation of the Hearts and Minds Culture Ladder in the oil and gas organization

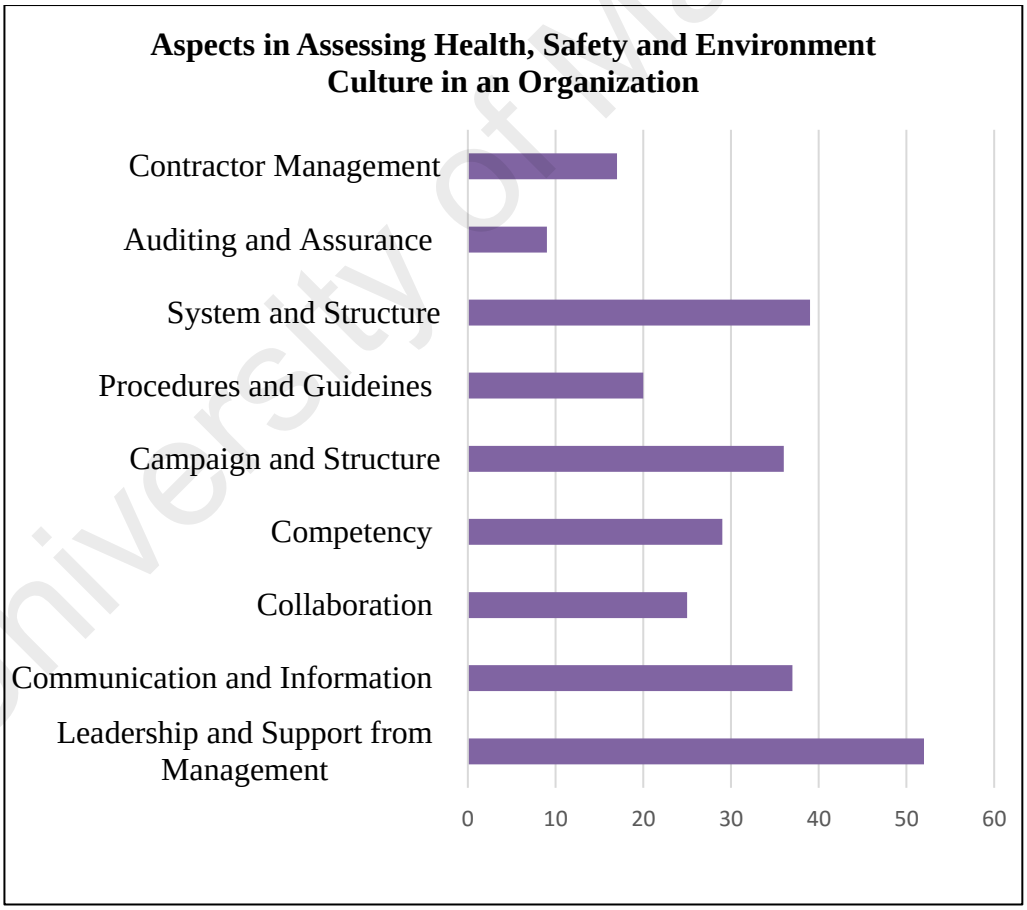

Figure 4.4: Aspects in Assessing Health, Safety and Environment Culture in an Organization

As discussed earlier, researches and studies done by different researchers has different views on the aspects or elements that are important in order to implement and improve the Health, Safety and Environment Culture in an organization. In the survey questionnaire, the respondents are required to fill in the top 5 aspects or elements which they think that are crucial in assessing the Health, Safety and Environment Culture in the organization. Figure 4.4 shows the overall result received from the respondents on the aspects in assessing the Health, Safety and Environment Culture in the organization. The responses received have shown a significant result where 94.5% of the respondents think that Leadership and support from Management is crucial in driving the Health, Safety and Environment Culture in the organization. This indicate that the key success to have a mature Health, Safety and Environment Culture in an organization is very much dependent on the commitment from the management.

The second aspect that are vital in driving Health, Safety and Environment Culture is system and structure present in the organization. This include the standard operating procedures, guidelines, safety rules, safe system of work as well as the policies of the organization. Safety system implemented in an organization is critical in driving the Health, Safety and Environment Culture as it affect the overall attitude or behavior of the staff when executing the operation. Although there might be some argument where the organization may have splendid safety system but the implementation part plays an important role. However, echoing the research by Filho & Andrade (2010) where the key to inculcate the correct safety culture in an organization is to introduced a proper system in the organization. The system and structure implemented in the organization is closely linked to the third aspect that are important in assessing the Health, Safety and Environment Culture, which is the communication and information.

Safety system or guidelines implemented in the organization should be communicated efficiently and effectively to all the worker in order to inculcate the right Health, Safety

and Environment Culture. For example, there is a new operation activity and management only allowed the worker to start work after risk assessment has been done and the potential risk, safety measure and mitigation are communicated to all the worker prior start work. This can create the type 1 experience to all the worker where safety is the priority in the organization and eventually the Health, Safety and Environment Culture are inculcated and the workers will take Health, Safety and Environment related issue seriously. In addition, sharing of information on the organization's monthly Health, Safety and Environment performance should be made available, and easily access by all the staff for example, in the notice board or the internal portal. Near miss incidents and lesson learnt from incidents can be communicated or shared with all the workers during department meeting or discussion. This helps to alert the staff on the possibility and probability of the incidents to happen and at the same time create the awareness.

Based on the responses from the survey questionnaire, 65.5% of the respondents thinks that Campaign and Culture is crucial in measuring the Health, Safety and Environment Culture in an organization. Campaign is closely linked to the culture as conducting or organizing campaign is one of the tools used to sustain the Health, Safety and Environment Culture. Organizing Health, Safety and Environment related campaign is considered as the "fun" part in the effort of cultivating the Health, Safety and Environment Culture in the organization where the whole idea of Health, Safety and Environment Culture can be plant in easily to all workers while having fun. An organization can implement or rolled out safety guidelines or safety rules to all workers, however, most of the workers will find it hard to visualize the importance of implementing those guidelines as no or only a few incidents happened before and the impacts are low. By organizing campaign, with games, activities or booths set up to educate the workers on the consequences and related incidents happened in the industries, workers are more easily to bind in the concept of Health, Safety and Environment Culture.

The fifth element where the respondents thinks that is vital in analyzing the Health, Safety and Environment Culture in the organization is competency which include knowledge and awareness level of the staff. To ensure an effective and efficient Health, Safety and Environment Culture in the organization, the staff have to be educated first. Health, Safety and Environment related training like First Aid Training, Emergency Response Training, Firefighting training and basic Health, Safety and Environment management system implemented in the organization. By attending training, staff are well verse with the theory part of Health, Safety and Environment system and are able to link and practice during the operation part. Health, Safety and Environment critical positions has to be identified where the staff should attend appropriate training before execute the work. Training records and training matrix should be made available and readily assess by the staff where each and every one of them are clear on the necessary training that they are required to attend. By increasing the knowledge and competency of the staff, the staff appreciate Health, Safety and Environment system implemented by the organization and the organization are able to inculcate the right and mature Health, Safety and Environment Culture.

In the survey questionnaire, the respondents are required to evaluate the current level of each aspect in assessing the Health, Safety and Environment culture in the organization. In this studies, we will focus on the top 5 aspects chosen by the respondents, which are:

i) Leadership and Support from Management

ii) System and Structure

iii) Communication and Information

iv) Campaign and Culture

v) Competency

4.1 Leadership

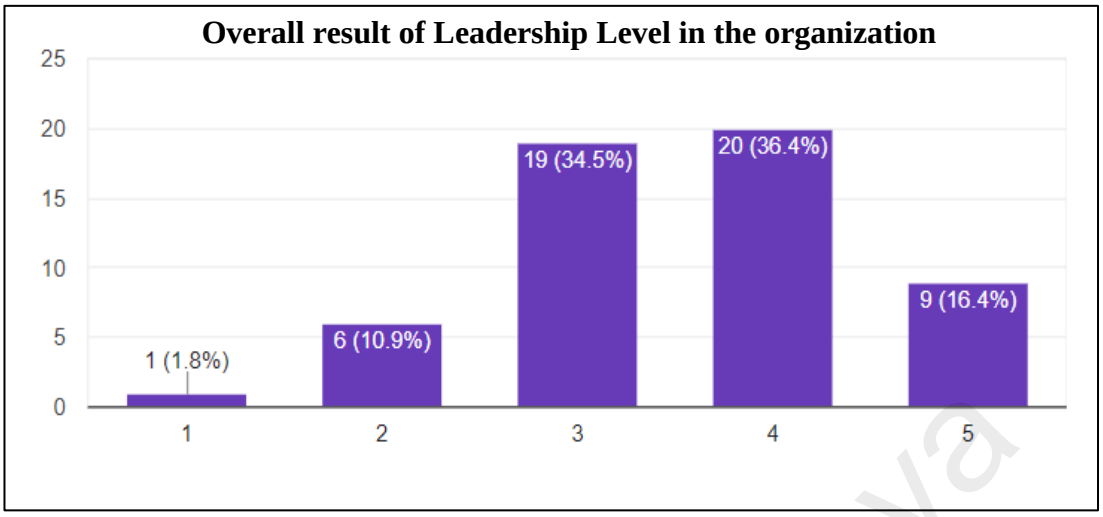

Figure 4.5: Overall result of leadership level in the organization

The respondents are required to assess the Leadership level in the organization from Level 1, which is poor to Level 5, which is mature. Analysis had been done on the response where the grading assigned by the respondents are matched with Health, Safety and Environment culture ladder proposed by The Hearts and Minds Program by Du Pont and the overall results is as per Figure 4.5. From the survey questionnaire, it can be noted that the overall Leadership level in the organization in the oil and gas industry is at Level 3 and Level 4, which is Calculative and Proactive Level in the Health, Safety and Environment culture ladder. This result show that generally, the management team in the organization provide adequate support and resources in implementing Health, Safety and Environment program. Resources like manpower, budget and equipment are provided by the management in conducting the operation.

However, measuring the result of the level of Leadership as a whole for all respondents are not sufficient. The result is further break down according to the position of the respondents in the organization in order to have a more accurate and realistic analysis.

Figure 4.6 show the result of the Leadership level in the organization which is break down according to the respondents' position in the organization.

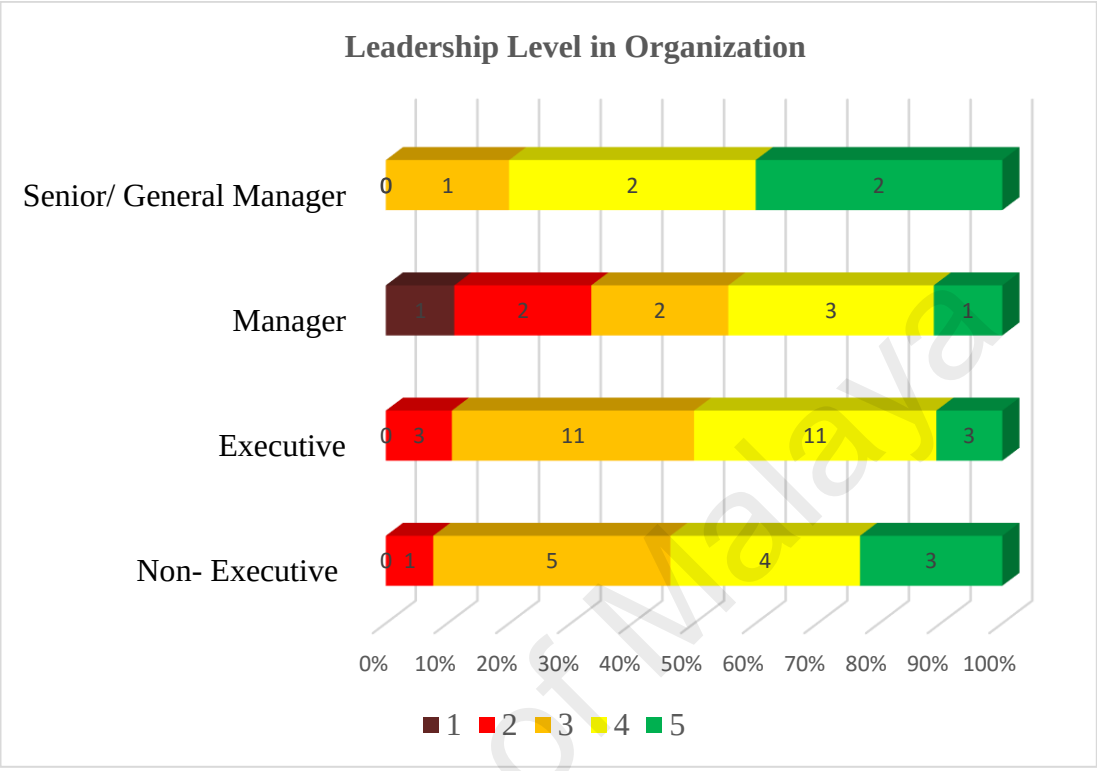

Figure 4.6: Leadership level in the organization

From the breakdown analysis, it is observed that generally the senior management in the organization, for example the Senior Manager or General Manager grade that the leadership level in the organization is relatively high, which is from Level 3, Calculative level onward. This indicate that commonly the senior management believe that there are support or care toward the Health, Safety and Environment aspects in the organization and there are still room for improvement where they can support Health, Safety and Environment culture even more. Nevertheless, the middle management and the working team, comprises of the executive and the non-executive reflect that the leadership level or support from the management are poor or not sufficient where almost 50% of them

rated that the leadership level of the management on Health, Safety and Environment aspect in the organization is at Level 3, Calculative level and below.

This significant reverse phenomenon from the management and the worker has to be addressed utterly as this reflect there are difference in opinion or understanding among the workers and the management where the management feels that they had been contributing and supporting the Health, Safety and Environment aspect in the organization while the working level do not observe or realized on the effort. This may indicate that the effort done by the management did not meet or address the needs of the working level. In the past, the exact reason of this reverse phenomenon could not be identified as there are no breakdown in section on the Leadership part in all Health, Safety and Environment culture survey including the Hearts and Minds culture survey which is the fundamental basis for most of the Health, Safety and Environment culture survey available in the market and one of the objective of this research is to establish a matrix where the lagging part in the particular elements can be identified.

Area of focus when assessing the Leadership culture in the organization are identified in the survey questionnaire as shown in Figure 4.7 where 47.3% of the respondents believe that leadership by the leaders are best portrait when there is frequent sharing on Health, Safety and Environment information. This show that the leaders are care and are serious on Health, Safety and Environment related matters. 34.5% of the respondents found that leaders can show their support and commitment on Health, Safety and Environment aspects when they frequently discussed Health, Safety and Environment related issue during internal meeting or department meeting.

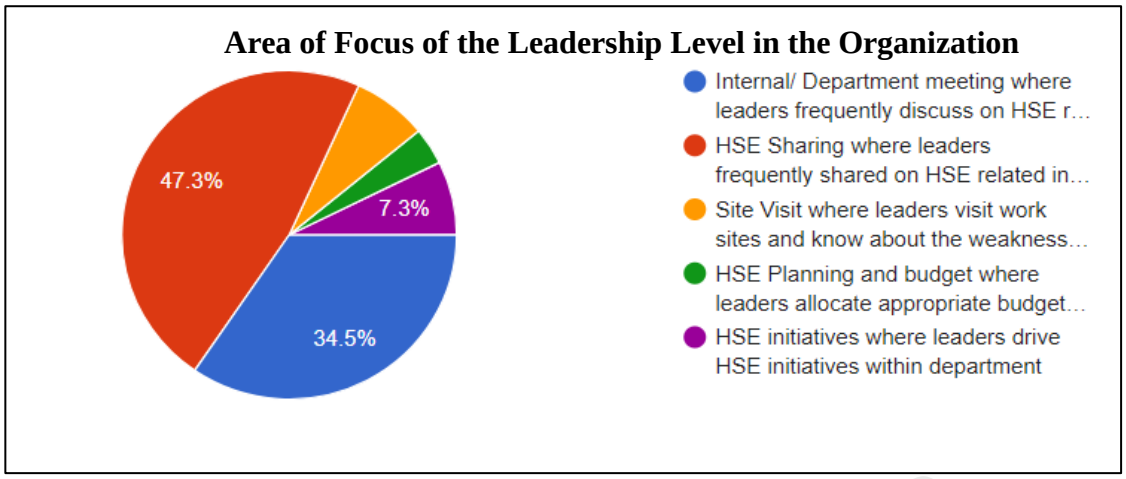

Figure 4.7: Area of focus of the leadership level in the organization

4.2 System and structure.

Next, the respondents are required the access the level of system and structure in the organization using the same level indicator. The result is as shown in Figure 4.8. From the result, it reflected that more than 75% of the respondents' rate that the system and structure in the oil and gas organization are generally at level 3, Calculative level to Level 4, Proactive level. This show that most of the organization have well established safe system of work, where operating procedures, guidelines and safety rules are present to guide the operation and day to day work in the organization.

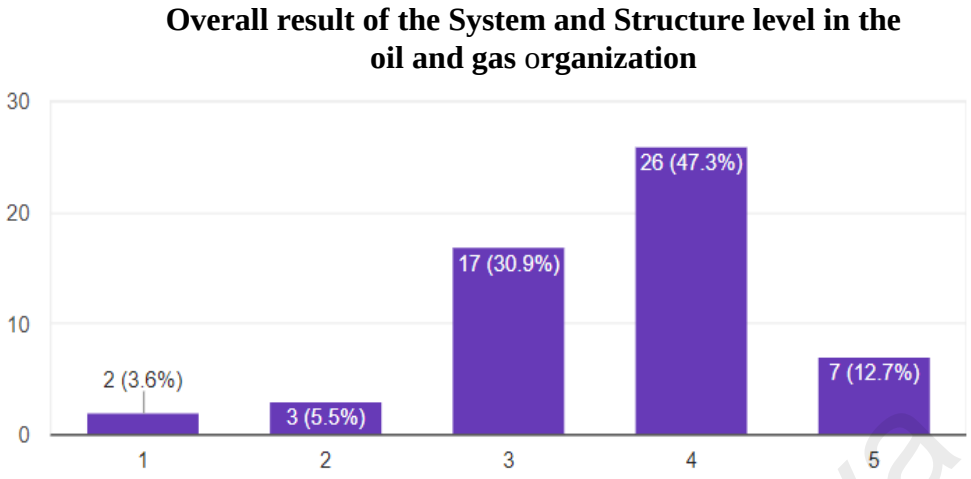

Figure 4.8: Overall result of the system and structure level in the oil and gas organisation

Details analysis according to the respondents' position in the organization is conducted where generally both the senior management and the non-executive think that the system and structure level in the organization are between level 3 to level 4, which are at Calculative level and Proactive level in the Du Pont Hearts and Minds Health, Safety and Environment culture ladder as shown in Figure 4.9. This reflect that the system and procedures in the organization are well established and updated where only minimum improvement are needed in order to improve the system. However, for the middle level, for example the middle management and executive, there is a portion of the respondents who thinks that the system and structure in the organization are still under development and require efforts in order to improve. This can be the middle working level might think that the safe system of work available in the organization are too generic in basis and are not customize according to the operation, which create window for the user to self-interpret the guidelines.

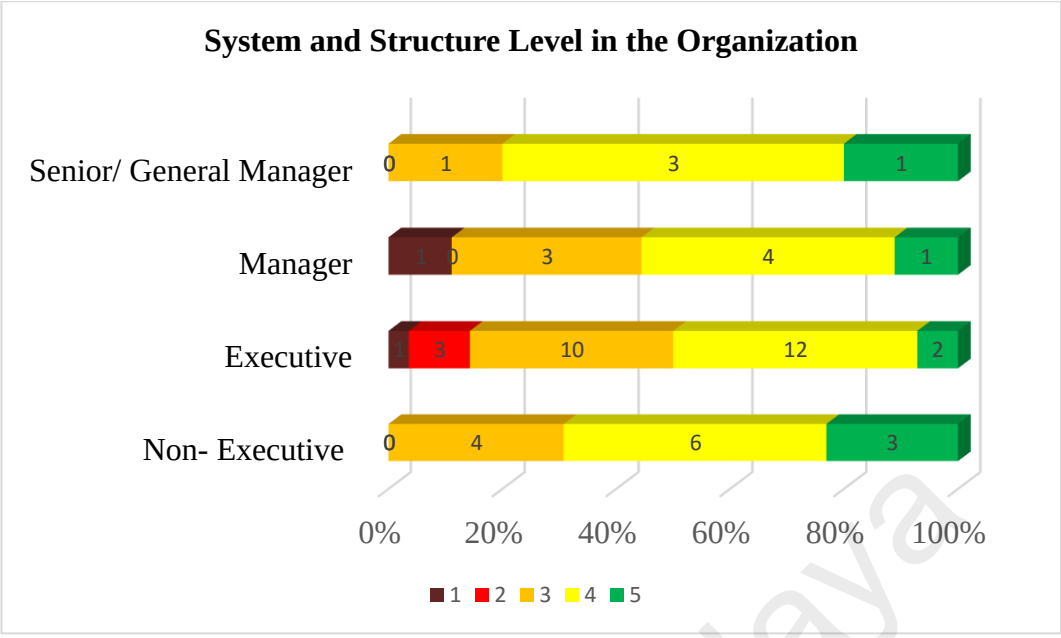

Figure 4.9: System and structure level in the organization

Area of focus when assessing the System and Structure culture in the organization are identified in the survey questionnaire as shown in Figure 4.10 where 47.3% of the respondents believe that a well establish system and structure in the organization is where Health, Safety and Environment aspect is the first priority and all business model are based on Health, Safety and Environment whereas 29.1% of the respondents thinks that there should be a Health, Safety and Environment Management System present in the organization where the policies and safety rules and guidelines are available. These distinct areas of focus in assessing the System and Structure level in the organization can be as part of the indicator in assessing the System and Structure culture level in the organization which can give a detailed analysis for area for improvement in the future.

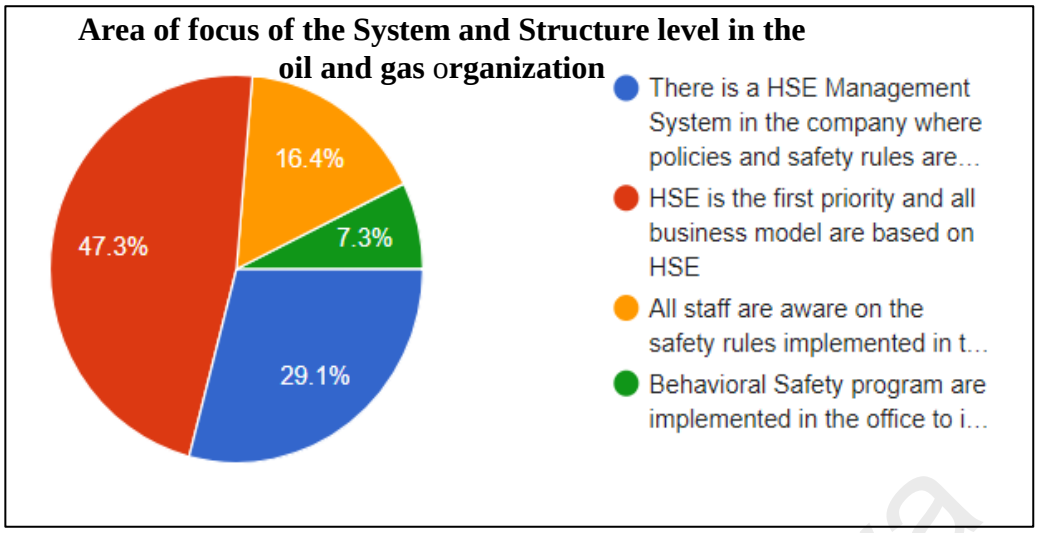

Figure 4.10: Area of focus of system and structure level in the organization

4.3 Communication and information

Level of Communication and Information in the organization are identified in the survey questionnaire as shown in Figure 4.11 where more than 70% of the respondents believe that the level of communication and information in the organization in the oil and gas industries are at level 3 and level which is at the calculative level and proactive level in the Health, Safety and Environment culture ladder.

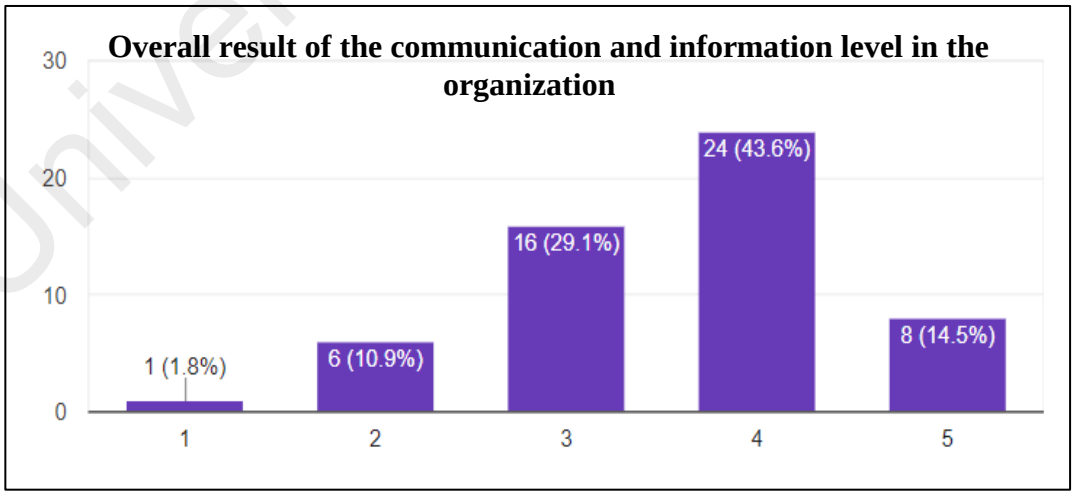

Figure 4.11: Overall result of the communication and information level in the organization

This indicate that information related to Health, Safety and Environment are communicated and are made available for the worker and there is frequent communication in the organization on Health, Safety and Environment related information.

Analysis on the respondents' position in the organization is conducted and the result is as shown in Figure 4.12. This analysis is critical as it can help to identify the exact scenario on the culture level. Generally, the senior management believe that the communication and information level are at Level 3 and above where system for communication and information are present in the organization and minimum effort are required in order to improve the culture. However, there are a huge difference in opinion from the working level and the management level as most of the working level thinks that the communication and information aspects in the organization are still under development where a huge improvement is needed in order to improve the overall Communication and Information culture level in the organization. Sometimes, information on the incident, investigation reports and Health, Safety and Environment performance matrix are only discussed in high level meeting and are not cascade down to the working level. This can lead to confusion and misunderstanding on the working level on the expectation of the management.

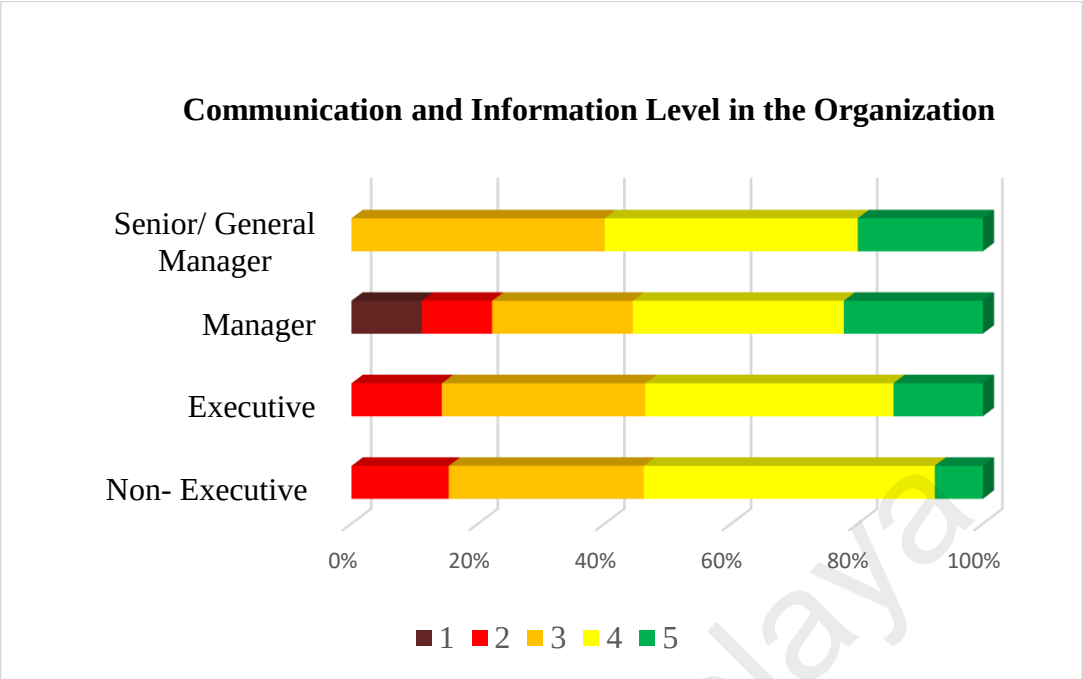

Figure 4.12: Result of the communication and information level in the organization by position of the respondents

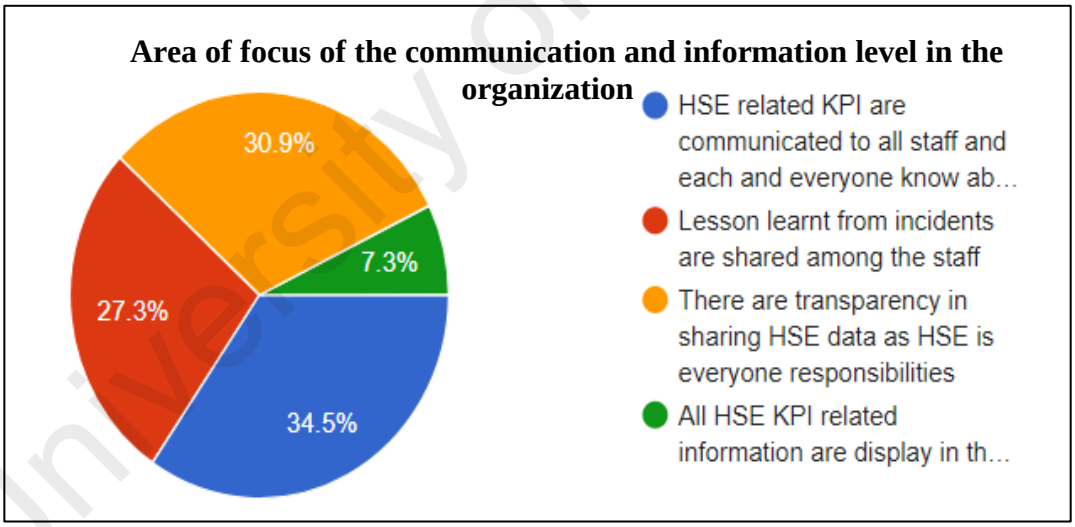

Figure 4.13: Area of focus of the communication and information level in the organization by position of the respondents

Area of focus when assessing the Communication and information culture in the organization are identified in the survey questionnaire as shown in Figure 4.13. 34.5% of the respondents believe that in a mature Communication and Information culture level, Health, Safety and Environment related Key Performance Indicators are communicated

to all staff and everyone are clear on their roles and responsibility in improving the overall Health, Safety and Environment culture in the organization. 30.9% of the respondents believe that in a mature culture of Health, Safety and Environment, there are transparency in sharing the Health, Safety and Environment related data as Health, Safety and Environment is everyone responsibility. 27.3% of the respondents are certain that lesson learnt from the incidents should be shared among the staff as a reflection and reminder to learn on the root cause and eliminate the possibility of the incidents to happen again.

4.4 Campaign and culture

Level of Campaign and Culture in the organization are identified in the survey questionnaire as shown in Figure 4.14 where 80% of the respondents believe that the campaign and culture level in the organization in oil and gas industries is at Calculative level, level 3 to Proactive level, Level 4. This indicate that in most of the organization, Health, Safety and Environment related campaign like Permit to Work, safety briefing and Health, Safety and Environment Day are implemented. There are areas for improvement where not only work related Health, Safety and Environment campaign can be conducted, home related Health, Safety and Environment campaign can also be conducted where families can be invited to join the campaign. By doing this, the Health, Safety and Environment culture can be inculcated easier not only on workers but also to their family members as the appreciation on Health, Safety and Environment culture has been built in.

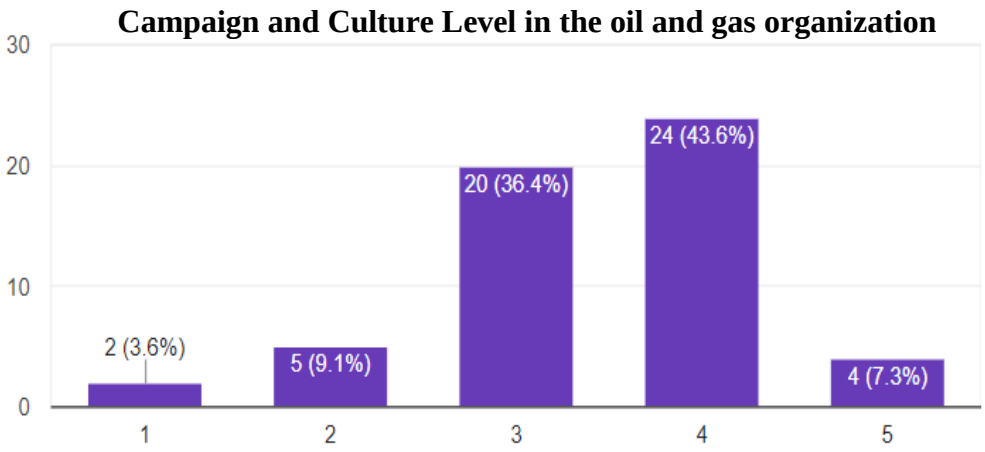

Figure 4.14: Overall result of the campaign and culture level in the oil and gas organization

Comprehensive analysis on the respondents' position in the organization is conducted and the result is as shown in Figure 4.15. Consistent result is observed in this section where both the management and the working level commented that the campaign and culture level in the organization varies from Level 1 to Level 5, which is from Pathological Level to Generative Level.

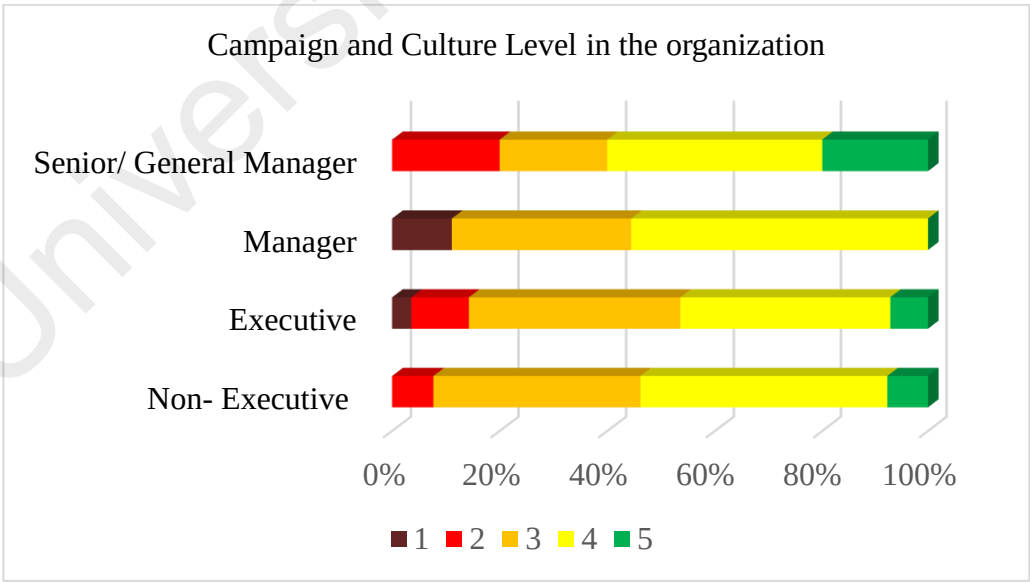

Figure 4.15: Result of the campaign and culture level in the organization by positions of the respondents

This could be the difference in the implementation of the culture plans or initiative from one organization to another organization where normally the campaign is tailored according to the nature of business of the organization.

Area of focus in assessing the Campaign and Culture are identified as per Figure 4.16 38.2% of the respondents think that in a mature culture level, staff will initiate Health, Safety and Environment program within department which in another word is where all the initiatives and program are self- initiate without the present of Health, Safety and Environment department. 30.9% of the respondents think that in a mature level, all staff are aware on Health, Safety and Environment plan in the organization whereas the remaining think that in a mature campaign and culture state, staff report on the Health, Safety and Environment performance like the unsafe act or unsafe condition in the office.

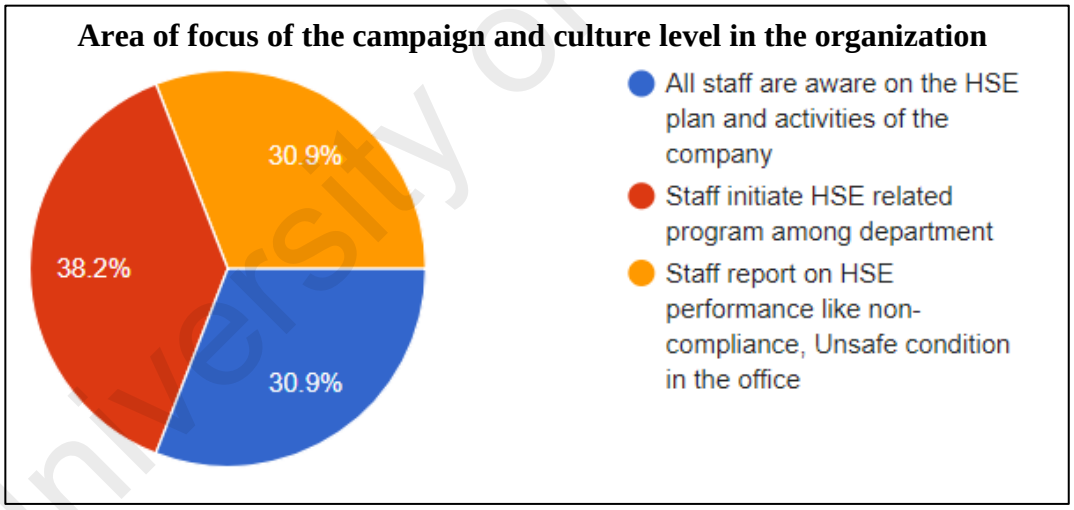

Figure 4.16: Area of focus of the campaign and culture level in the organization

4.5 Competency

Level of Competency culture are identified in the survey questionnaire where the result is shown in Figure 4.17. more than 80% of the respondents believe that the general culture level of competency in the oil and gas organization is at level 3, calculative level to level 4, proactive level. Trainings on Health, Safety and Environment are conducted to the staff

to ensure that the staff are aware on the preventive and mitigation measures implemented in the organization. Training records and training matrix are present to track the training records of the staff.

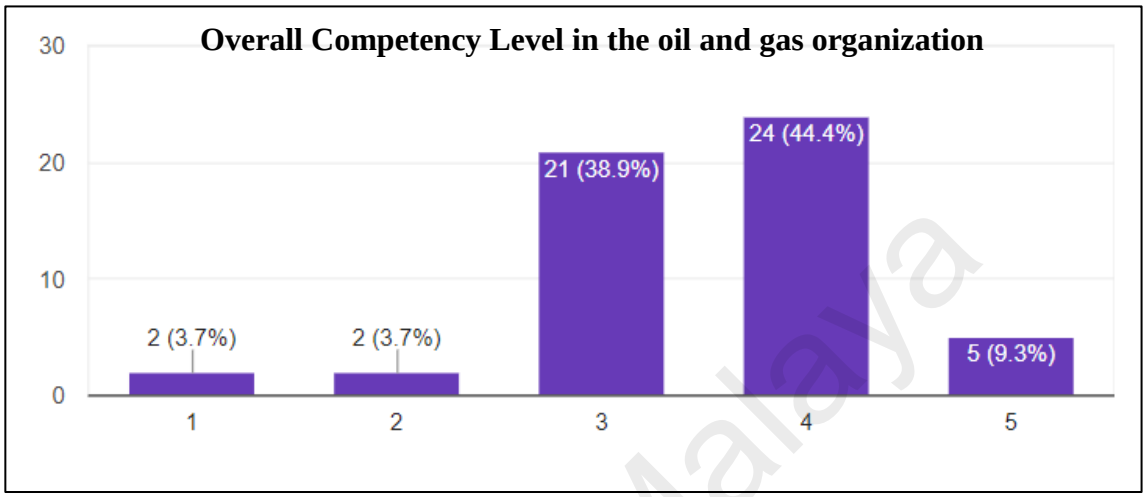

Figure 4.17: Overall result of the competency level in the oil and gas organization

Detailed analysis is done based on the position of the respondents as shown in Figure 4.18 where generally all the non- executive worker believes that the competency level in the organization are well establish ranging from level 3 onwards, where the competency level of the staff is adequate for them to execute the day to day activities. For the remaining respondents, which are the executives, managers and senior management, they reflect that the competency level in the organization is still under development where action plan or improvement plan are required in order to improve the culture.

The area of focus while assessing the competency level are identified as per Figure 4.19 where 49.1% of the respondents believe that in a mature competency culture state, all staff are well equipped with basic Health, Safety and Environment related knowledge thru trainings and workshop whereas 27.3% of the respondents reflect that there should be a proper documented procedure on the recruitment and management of the personnel in the organization. 16.4% of the respondents believe that baseline test should be

conducted to all staff where appropriate Health, Safety and Environment related training are assigned to the workers and staffs according to the job scope.

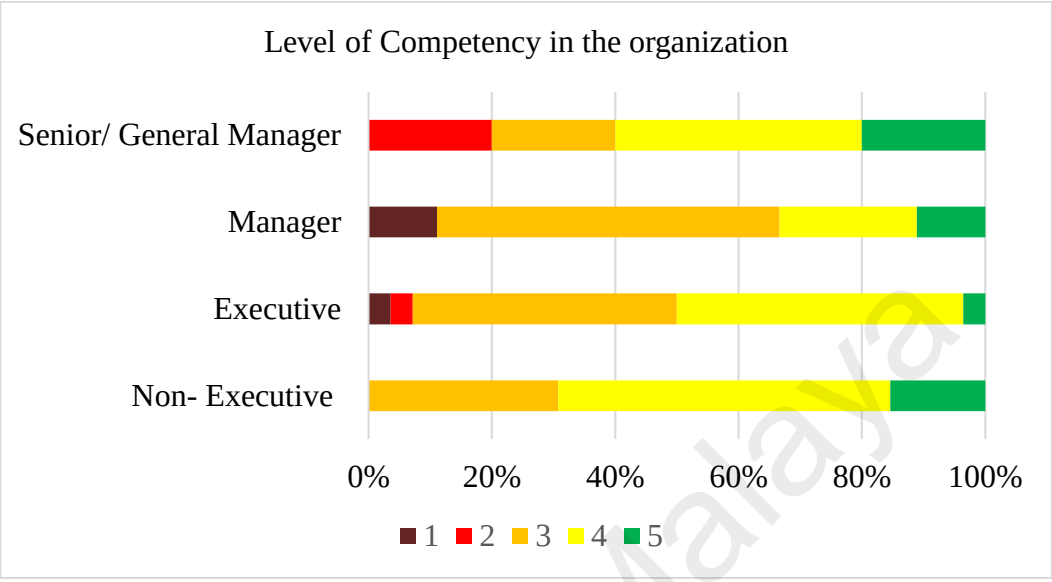

Figure 4.18: Result of the competency level in the organization by positions of the respondents

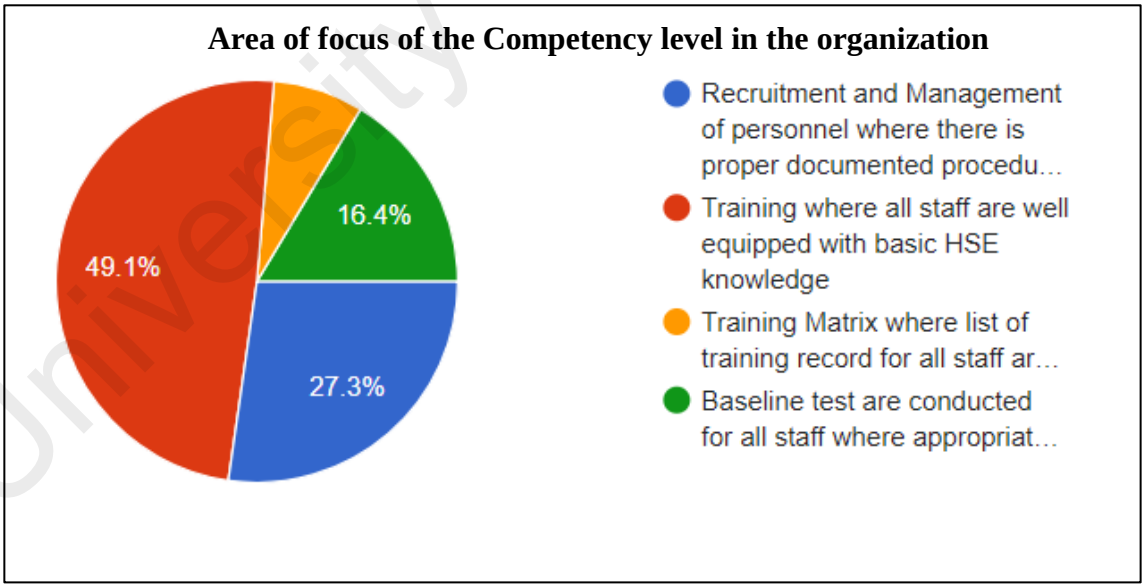

Figure 4.19: Area of focus of the competency level in the organization

Analysis on the top 5 aspects in assessing the Health, Safety and Environment has shown that most of the organization in the oil and gas industry score well in most of the

aspects, however, the overall Health, Safety and Environment culture level has yet to reach a mature or generative stage, as per Figure 4.20. Aspects where the organization are still lagging with should be identified and improvement plan should be established based on the discussion which involved both the management and working level in order to achieve the desired expectation by both the management and working level. In the survey questionnaire, key roles that can impact and improve the Health, Safety and Environment culture are divided into two groups, which are the hardware group like for example the people, behavior and risk tolerance level and the software group for example the procedures, systems and guidelines. As per the result collected, Figure 4.21, 70.9% of the respondents believe that effort should be focused on the hardware part which is the people part as generally in the oil and gas industries, we are not short of procedure and guidelines, however, major incident still happened in the industries and after investigation, most of the common root causes of these major incidents are due to negligence of people. Thus, it is firmed that the focus areas should be targeted to the people behavior instead of keep coming out with new procedures or guidelines when incident happened in order to improve the Health, Safety and Environment culture in the oil and gas industries.

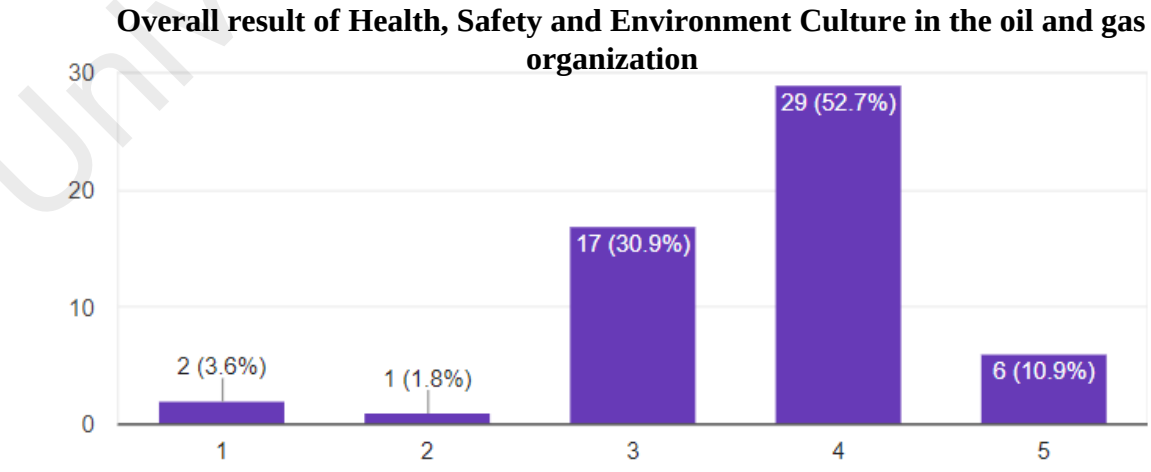

Figure 4.20: Overall result of Health, Safety and Environment culture in the oil and gas organization

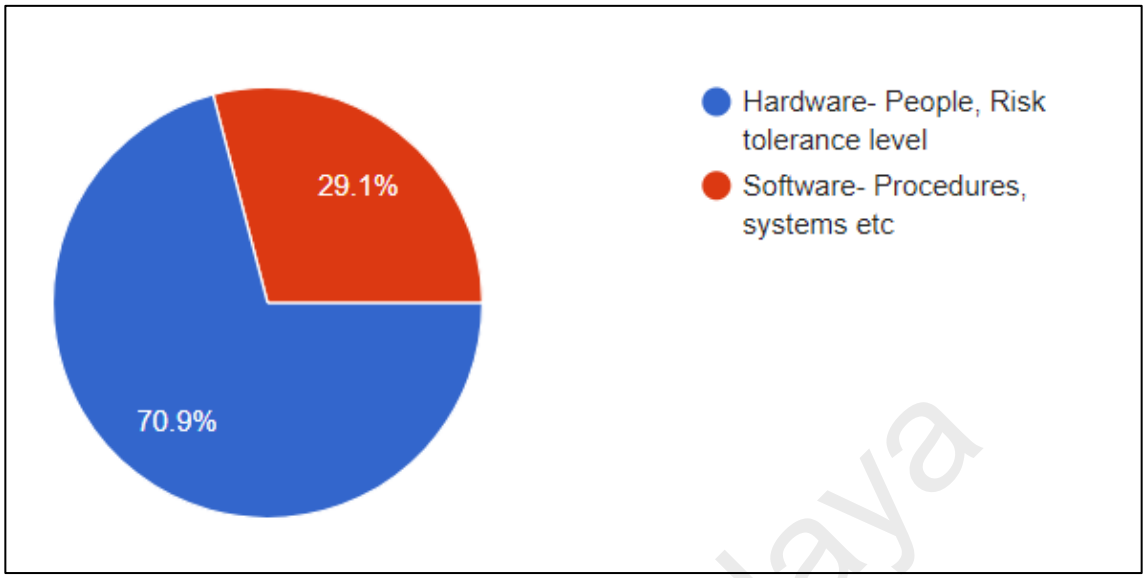

Figure 4.21: Result of key elements to improve Health, Safety and Environment culture in the oil and gas organization

4.6 Proposed measurement matrix

A set of measurement matrix is proposed in order to measure the Health, Safety and Environment culture in the oil and gas organization after analyzing the data collected from the 55 respondents. The proposed measurement matrix is established by incorporating both the Health, Safety and Environment Management System (HSE MS) and the Hearts and Minds Health, Safety and Environment Culture ladder where after descriptors are assigned to different level and different elements of the HSE MS and at the end of the measurement, the organization are able to identify both the overall Health, Safety and Environment culture in the organization as well as the weak area which need improvement. This proposed measurement matrix is able to solve the weakness where the current measurement matrix available in the market currently which is only able to determine the overall Health, Safety and Environment Culture in the organization without listing down the areas where the organization are doing well and areas where the organization needs improvement. The proposed measurement matrix is as per Table 4.1.

Table 4.1 Proposed Measurement Matrix

Dimension		Pathological	Reactive	Calculative	Proactive	Generative
Leadership & Commitment	How interested is management in communicating HSE issues with the workforce?	Management communicates by reminding workers not to cause HSE problems/issues	HSE messages are communicated down after an accident occurs.	Management shares a lot of information and has frequent HSE initiatives.	There is 2-way communication about HSE issues.	The 2-way communication about HSE issues are frequent, allowing management to receive more information than they give.
	Commitment level of workforce and level of care for colleagues	Everyone looks out for themselves without care for other colleagues.	Statements and memos about caring for other colleagues are made just after an accident.	Management's awareness on the consequences of accidents increases and spreads down the organization.	The workforce is proud of their HSE performance and strives for improvement.	Commitment and care is very high at all levels of the organization.

	What are the rewards of good HSE performance?	No rewards are given for good HSE performance. Instead, there is punishment for failure.	There is punishment for poor HSE performance. Rewarding positive behaviours is uncommon.	Good HSE performance is said to be very important. There are safety competitions and quizzes with rewards.	Good HSE performance is rewarded and considered in promotion reviews.	Being recognized for good HSE performance is highly valued. The workforce is motivated without the need for extra rewards.
Policy & strategic objectives	In the eyes of management, who causes accidents?	It is believed that accidents are a part of the job. Individuals are blamed and hold accountable for them.	Management considers the lower levels of the organization as the cause to these problems	Faulty machinery, poor maintenance and people are seen as cause of accidents. Accidents are blamed on the "system".	Management looks at the whole HSE system, including processes and procedures when considering accident causes.	There is no "blame" culture. Management and individuals have a broad view of HSE, looking at the overall interaction between systems and people.
	Balance between HSE and costs/profitability	Making money is the only concern. HSE is seen as additional cost.	Saving money by cost-cutting is important. Money is spent only to make HSE improvements enough to meet the legal requirements.	It is not clear how HSE and profitability is balanced. Line focus most of its time on operational issues.	The company tries to make HSE the top priority with the understanding that HSE contributes to making profits.	Management strongly believes that HSE make money. So, balancing HSE and making good profits is not an issue.

Organization responsibilities, resources, standards & document	How do we manage Contractor HSE?	Contractors are expected to complete the job with minimum effort and cost.	Contractor HSE management becomes important only after an incident.	Contractors have to meet extensive pre-qualification requirements through questionnaires and good HSE track record.	Contractor pre-qualification requires evidence that they have an HSE management system in place.	No compromises are made for contractor HSE capability. HSE problems are solved together with contractors.
	Are workers interested and involved in training and competency development?	Workers are not interested in training but don't mind attending because they can take some time off from work.	After an incident, some extra money is allocated for specific training programs, but the initiative reduces after a while.	Training needs are identified, compiled into training matrices and tracked for workers.	Management acknowledges the importance of on-the-job skills assessment and workers are proud to demonstrate their skills.	Leadership and soft-skills training is as important as technical training. Competence development is a continuous cycle.
	What is perceived of the HSE department?	If there is a HSE department, it consists of only one person or organizationally placed under the HR department.	The HSE department is small and doesn't have much power.	HSE positions are given to people with good backgrounds who cannot be placed elsewhere in the organization. HSE department is big with same status but mainly analysing HSE statistics.	HSE positions are seen as an important job and are given to high-fliers. HSE provides advices and implementation is carried out by the line.	HSE roles are embedded into the line functions and HSE accountability is owned by everyone in the company.

Hazards & effect management	Is HSE considered in work planning?	There is no HSE consideration in work planning.	HSE consideration is based on what went wrong in the past.	There is a lot of emphasis on Job Hazard Analysis and PTW.	HSE concerns are integrated into work planning. The plans are followed through and evaluation is done by supervisor and management.	There is a thorough planning process with anticipation of problems and possibility of reviewing the plan.
	Are work-site job safety techniques implemented on-site?	Work-site job safety techniques are not used.	Work-site job safety techniques were not done systematically. Enforcement typically done after an incident occurs.	Specific and more comprehensive risk assessments identifies for work activities. Compliance to the actions in the work-site job safety techniques is still a concern.	Workers are competent and fully involved in the execution of the work-site job safety techniques.	Effectiveness of work-site job safety techniques continuously analysed, including adopting lessons learned and best practices from other sites
Planning & procedures	What is the purpose of HSE procedures?	The company writes HSE procedures only when really required.	The purpose of HSE procedures is to prevent incidents from happening again.	There are many HSE procedures which serve as barriers to prevent incidents.	HSE procedures describes best practice but sometimes seen as inconvenient by a competent workforce.	There is trust in employees that they can recognize situations, where the rules should be challenged. Procedures are continuously improved for efficiency.

Implementation & monitoring	How effective is incident reporting investigation and analysis?	Many incidents are not reported. Investigation only takes place after a serious accident.	There is an informal incident and investigation reporting system. The investigation does not uncover root causes and is done as a paper exercise to show that investigation has taken place.	There are incident investigation procedures producing lots of data and action items but opportunities to address the real issues are often missed.	Incident investigators are trained to follow-up systematically and to check that required changes have taken place and maintained.	Investigation and analysis is driven by a good understanding of how accidents happen. Issues are identified by compiling information from a wide range of incidents.
	How do we react to incidents/accident-ts?	After an accident, the focus is on the employees involved and they are often taken disciplinary actions.	Line management is annoyed by stupid accidents. Investigation reports are not submitted to senior management if it can be avoided.	The workforce reports their own incidents but distance themselves from contractor's incidents.	Management is genuinely concerned and asks about the well-being of workers involved in the accident. Investigation focuses on the root causes and the results are shared with the supervisory level.	Top management involves directly after an incident. They show personal interested in the individuals involved and the investigation process.
	Who checks HSE on a daily basis?	There is no formal system for checking HSE problems on a daily basis.	External specialists are engaged to identify HSE problems. Checks are conducted as a	Site activities are regularly checked by the line for HSE issues, but not on a daily basis.	Supervisors encourage work teams to check HSE for themselves. Managers doing	Everyone checks for HSE hazards looking out for themselves and their colleagues. Supervisor

			paper exercise when supervisors/management visits the work.		walkabouts are seen as sincere.	inspections are largely unnecessary.
	How are HSE/Toolbox meetings perceived?	There are no HSE meetings and even if there is, they are seen as a waste of time.	HSE meetings are unpopular and most workers don't attend as they are perceived as non-value added.	HSE/Toolbox meetings are seen as standard practice. 2-way communication is practiced	HSE meetings feel like a genuine forum for interaction across the company involve employee and contactors	HSE meetings can be called for by any employee, with managers attending by invitation.
Audit	How effective are HSE assurance and reviews?	Company is unwilling to comply with HSE legal inspection requirements.	People accept that HSE assurances cannot be avoided especially after a serious or fatal accident.	There is regular and scheduled HSE assurance program. Assurances are structured and it concentrated on known high risk areas.	There is an extensive assurance program which includes cross auditing within the organization.	HSE aspects are integrated into the assurance system that is implemented effectively with good follow-up.
Review	How are HSE trends & statistics analysed against others?	There is compliance with HSE reporting meeting legal requirements.	Management worries about the cost impact of accidents and the company's position among industry players.	Benchmarking is done on a wide variety of HSE data. Management displays HSE statistics openly.	Benchmarking is against others in the same industry and is driven by management trying to be the best in the industry.	Benchmarking is against others outside the industry. All levels of the organization are involved in identifying areas and actions for improvement.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.1 Proposed measurement matrix

Health, Safety and Environment Culture has always been a common idea in determining the underlying and root cause of the incident. Researches has been carried out by different researchers to identify the method in determining the Health, Safety and Environment Culture in the organization especially in the oil and gas industries as it is a high risk industry where the consequences of the incident are generally high which impacted the people and environment. However, until today, there are no satisfactory models that are able to measure the Health, Safety and Environment Culture as whole and at the same time identify the areas of improvement for the organization.

The objectives of this study are achieved where aspects or elements that directly impact the Health, Safety and Environment culture in the oil and gas organization are determined through survey questionnaire for respondents that works in the oil and gas industries in Malaysia. Top 5 elements that can directly impact the Health, Safety and Environment Culture are:

a) Leadership and Support from Management
b) System and Structure
c) Communication and Information
d) Campaign and Culture
e) Competency

Respective level for each of the elements for the organization are identified and analysis was done based on the position of the respondents in the organization. Based on the survey questionnaire, it can be concluded that generally, the Health, Safety and Environment Culture in the organization in the oil and gas industry in Malaysia is at Level 3, Calculative level to Proactive level.

In addition, a set of measurement matrix to measure the Health, Safety and Environment Culture are proposed in this study which include the identified 5 elements that have direct impact on the Health, Safety and Environment Culture in the organization of the oil and gas industries. The measurement matrix is established by incorporating both the elements in the Health, Safety and Environment Management System and the Hearts and Minds Program which is the basis for all culture survey. Detailed descriptors are assigned for each of the elements from Level 1, Pathological level to Level 5, Generative level. Organizations in the oil and gas industry can use the proposed measurement matrix in this study to identify the Health, Safety and Environment Culture level in the organization. The key result obtained from this measurement matrix are:

a) The overall Health, Safety and Environment Culture in the organization
b) The areas in the Health, Safety and Environment Management System where the organization are currently doing great at
c) The areas in the Health, Safety and Environment Management System where the organization are currently weak at
d) Improvement plan and action plan can be easily identified from the measurement matrix as there is basis or example of the elements looks like in the mature culture

Overall, the objectives of this study are achieved and there are some recommendations which can helps to improve this study.

5.2 Recommendation

In this study, the measurement matrix proposed is to ease the organization in the oil and gas industry to determine the current Health, Safety and Environment culture and identify areas for improvement. To further enhance the integrity and independently of the measurement matrix, the future recommendations are:

a) To conduct the survey to a bigger pool of respondents who work in a same oil and gas organization. With the data, cross checking can be done to the result collected in this study in order to determine the culture level of the oil and gas organization.

b) Pilot this measurement matrix with one of the oil and gas company in Malaysia with the company's Health, Safety and Environment's practitioners to identify if there are any further improvement or customization needed in order to be used in both upstream and downstream business in the organization.

c) To conduct face to face interview survey with the proposed measurement matrix in order to make sure that all the participants are understands and are well verse with the elements mentioned in the measurement matrix as parts of the elements in the measurement matrix may be too technical to non-Health, Safety and Environment practitioners.

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