RELATIONSHIPS BETWEEN SAFETY CLIMATE FACTORS AND OCCUPATIONAL SAFETY AND HEALTH LEVEL OF AWARENESS IN MALAYSIAN GOVERNMENT AGENCIES

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FACULTY OF ENGINEERING
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KUALA LUMPUR

2014

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**THESIS SUBMITTED IN FULFILMENT
OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY**

**FACULTY OF ENGINEERING
UNIVERSITY OF MALAYA
KUALA LUMPUR**

2014

UNIVERSITY OF MALAYA

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Matric No :

Name of Degree : DOCTOR OF PHILOSPHY

Title of Project Paper/Research Report/Dissertation/Thesis ("this Work") :

RELATIONSHIPS BETWEEN SAFETY CLIMATE FACTORS AND OCCUPATIONAL SAFETY AND HEALTH LEVEL OF AWARENESS IN MALAYSIAN GOVERNMENT AGENCIES

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ABSTRACT

Construction work is dangerous and it is essential that safety of workers be guaranteed. Safety studies in the public sector are limited compared with the private sector. This study surveyed the influence of safety climate and adoption of OHSAS 18000 on safety of construction supervisors in the Department of Irrigation and Drainage (DID) Malaysia, the Public Works Department, Malaysia (PWD), and the Rescue and Fire Department, Malaysia (FRDM). A methodology is developed in diagnosing the Level of Awareness (LoA) on Occupational Safety and Health which includes questionnaire design, observation, data collection, statistical analysis, multiple-regression analysis and model validation.

One-hundred-sixty-four personnel took part in the survey from DID, one-hundred and four from PWD and one-hundred and six from FRDM. The mean work experience for DID was 14.1 years, for PWD was 17.4 years and for FRDM was 10.5 years. Management commitment, employee participation, training and education and communication were tested. Level of Awarenes included safety orientation, company policy, monitoring, risk assessment and review. Data were collected using self-administered questionnaire.

Anova tests were applied to data collected. Regression analysis showed that for DID communication was the most significant factor influencing safety among construction supervisors. Results showed there were significant influences of management commitment, employee participation and training and education on LoA. Results also showed work experience had a significant influence on LoA. Designation, education level and age had no significant influence on LoA. The adoption of OHSAS 18000 did not seem to result in any marked enhancement in LoA of OSH Management.

The developed model was then validated by testing the significant factors namely communication, training and education, employees' participation and management commitment on two other different government agencies namely PWD and FRDM. PWD is a supervisory agency doing similar jobs with DID and FRDM is an agency doing work which is more towards rescue. Regression analysis showed that for both PWD and FRDM, communication was the most significant factor influencing LoA among front liner personnel.

Results showed in both PWD and FRDM, there were significant influences of management commitment, employee participation and training and education and communication on LoA. Results also showed work experience had a significant influence on LoA. Designation, education level and age had no significant influence on LoA.

These results highlight that Communication, Training and Education, Employee Participation and Management Commitment are the predicted factors in the study of LoA on OSH Management for government agencies and also for private companies in Malaysia.

ABSTRAK

Kerja-kerja pembinaan adalah berbahaya dan ia adalah penting bahawa keselamatan pekerja terjamin. Kajian keselamatan dalam sektor awam adalah terhad berbanding dengan sektor swasta. Kajian ini meninjau pengaruh iklim keselamatan dan penggunaan OHSAS 18000 ke atas keselamatan penyelia pembinaan dalam Jabatan Pengairan dan Saliran (JPS) Malaysia, Jabatan Kerja Raya, Malaysia (JKR), Jabatan Bomba dan Penyelamat Malaysia (BOMBA). Metodologi dibangunkan dalam mendiagnosis tahap kesedaran pengurusan keselamatan dan kesihatan pekerjaan yang termasuk reka bentuk soal selidik, pemerhatian, pengumpulan data, analisis statistik, analisis regresi pelbagai dan pengesahan model.

Seratus enam puluh empat orang telah mengambil bahagian dalam kaji selidik daripada JPS, seratus empat dari JKR dan seratus enam dari BOMBA. Pengalaman kerja min bagi JPS adalah 14.1 tahun, JKR adalah 17.4 tahun dan BOMBA adalah 10.5 tahun. Komitmen pengurusan, penglibatan pekerja, latihan dan pendidikan dan komunikasi telah diuji. Tahap kesedaran keselamatan termasuk orientasi keselamatan, dasar syarikat, pemantauan, penilaian risiko dan kajian semula. Data telah dikumpulkan menggunakan soal selidik yang di tadbir sendiri.

Ujian ANOVA telah digunakan untuk data yang dikumpul. Analisis regresi menunjukkan bahawa bagi JPS, komunikasi adalah faktor yang paling penting yang mempengaruhi keselamatan di kalangan para penyelia pembinaan. Keputusan menunjukkan terdapat pengaruh ketara komitmen pengurusan, penglibatan pekerja dan latihan dan pendidikan mengenai tahap kesedaran keselamatan. Keputusan juga menunjukkan pengalaman kerja mempunyai pengaruh yang besar ke atas tahap kesedaran keselamatan. Jawatan, tahap pendidikan dan umur tidak mempunyai pengaruh yang besar ke atas tahap kesedaran keselamatan.

Pemakaian OHSAS 18000 tidak menunjukkan sebarang tambahan yang ketara dalam tahap kesedaran keselamatan. Model yang dibangunkan kemudian disahkan dengan menguji faktor penting iaitu komunikasi, latihan dan pendidikan, penglibatan pekerja dan komitmen pengurusan pada dua lagi agensi kerajaan yang berbeza, JKR dan BOMBA. JKR adalah sebuah agensi penyeliaan yang melakukan kerja yang sama dengan JPS dan BOMBA adalah agensi yang melakukan kerja yang lebih kepada kerja-kerja menyelamat. Analisis regresi menunjukkan bahawa untuk kedua-dua JKR dan BOMBA, komunikasi adalah faktor yang paling penting yang mempengaruhi keselamatan di kalangan kakitangan barisan hadapan.

Keputusan menunjukkan di kedua-dua JKR dan BOMBA, terdapat pengaruh ketara komitmen pengurusan, penglibatan pekerja dan latihan dan pendidikan dan komunikasi terhadap tahap kesedaran keselamatan. Keputusan juga menunjukkan pengalaman kerja mempunyai pengaruh yang besar ke atas tahap kesedaran keselamatan. Jawatan,tahap pendidikan dan umur tidak mempunyai pengaruh yang besar ke atas tahap kesedaran keselamatan.

Keputusan ini menyerlahkan bahawa Komunikasi, Latihan dan Pendidikan, Penyertaan Pekerja dan Komitmen Pengurusan adalah faktor-faktor yang diramalkan dalam kajian tahap kesedaran Keselamatan dan Kesihatan Pekerjaan (KKP) untuk agensi-agensi kerajaan dan juga untuk syarikat-syarikat swasta di Malaysia.

ACKNOWLEDGEMENT

First and foremost, grateful thanks to Allah S.W.T. for guiding and helping me in the completion of this thesis.

I would like to extend my deepest gratitude and appreciation to my supervisors, Assoc. Prof. Dr Che Rosmani Che Hassan and Assoc.Prof. Dr Zubaidah Ismail for their continous guidances, ideas, suggestion, support and valuable advices throughout the period of this PhD Project.

My recognition goes also to all following organizations/institute and their representatives for the grant, precious cooperation, and/or their willingness to provide me the necessary material for realizing the experiments, documents, information, practical insight, explanations and/or pictures for my research:

Department of Occupational Safety and Health Malaysia
Department of Public Works Malaysia
Department of Fire and Rescue Malaysia
INTAN
NIOSH
PERKESO

I am also thankful to the Department of Irrigation and Drainage Malaysia for giving me the opportunity to further my studies in Occupational Safety and Health Management and also for providing the data for this research. Due appreciation also to the Public Service Department for sponsoring my study.

Last but not least is my appreciation and gratitude to my beloved wife, Norashikin Abdul Wahid and my kids for their love, encouragement, support and also for believing in me. I would like to thank all my friends especially those providing me with all the materials required to complete all the assignments.

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LIST OF ABBREVIATIONS

ABBREVIATIONS

ACSNI	Advisory Committee on the safety of Nuclear Installations
ANOVA	Analysis of Variance
BOMBA	Bomba dan Penyelamat
CSFs	Critical Safety Factors
CVR	Content Validity Ratio
DID	Department of Irrigation and Drainage
DOSH	Department of Occupational Safety and Health
FRDM	Fire and Rescue Department Malaysia
GDP	Gross Domestic Product
HSC	Health and Safety Commission
HSE	Health and Safety Ececutive
IAEA	International Atomic Energy Agency
INTAN	Institut Tadbiran Awam Negara
INSAG	International Nuclear Safety Group
ISO	International Standard Organisation
JKR	Jabatan Kerja Raya Malaysia
JTK	Jabatan Tenaga Rakyat
JPS	Jabatan Pengairan dan Saliran
KKP	Keselamatan Kesihatan Pekerjaan
KPIs	Key Performance Indicators
KRAs	Key Result Areas

LoA	Level of Awareness
LSCAT	Loughbrough Safety Climate Assessment Tool
MAMPU	Malaysia Administrative and Management Planning Units
MSCOMM	Meanscore of Communication
MSEP	Meanscore of Employee Participation
MSMC	Meanscore of Management Commitment
MSTE	Meanscore of Training and Education
NIOSH	National Institute Of Occupational Safety and Health
NOSACQ	Nordic Occupational Safety Climate Questionnaire
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act
PWD	Public Works Department
RSSB	Railway Safety Standard Board
SIRIM	Standard and Industrial Research Institute of Malaysia
SPM	Sijil Pelajaran Malaysia
SPSS	Standard Package Social Science
SOCSO	Social Security Organisation
S&H	Safety and Health
TQM	Total Quality Management
USD	United States Dollars

CHAPTER 1: BACKGROUND OF THE STUDY

The aim of this study is to research on issues pertaining to the various criteria and factors governing safety climate and to highlight its influence on Level of Awareness (LoA) of Occupational Safety and Health (OSH). The study will identify the significant factors that will influence the LoA of Occupational Safety and Health (OSH) among supervisory workers in the construction industry in Malaysia. This chapter establishes the study by introducing the background of the problem. On the onset, the statement of the problem highlights both the importance and the ills of the construction industry that will eventually lead to the area of the study namely Level of Awareness (LoA). It further states the objectives, research statement, significances of the study and the parameters of the study.

Malaysia has been classified as one of the potential developing countries (Bahari, 2011). The changes from an agriculture-based to an industry-based economy brought a lot of improvement to the country (Ismail et al., 2010). It brings a lot of new investors to be involved in the small, medium and major industries. The importance of the construction industry in nation building has been discussed at length as the construction industry creates wealth and affects the gross domestic product of a country. The enormous expenditure allocated and spent for development projects make it imperative to ensure projects are a success for the development of the country.

1.1 Problem Statement

The importance of the construction industry and its vital link to the national gross domestic product and huge development expenditure necessitates that projects implemented achieve project success. However, according to Abdul Rashid (2002), the level of risk in any construction work is considerably much higher than in other economic undertaking. Safety of workers becomes a matter of great concern.

Most workers in developed countries generally assume the organization for which they work will take all necessary measures to ensure that they will return to their homes safely at the end of the working day (Abdul Rahim et al., 2008). Despite this assumption, work related injuries and deaths continue to occur at a high rate (DOSH, 2010). Department of Occupational Safety and Health (DOSH) as a controlling body for industrial accidents on behalf of the government produce a yearly accident report as in Table 1.1.

Data showed a decrease in the number of accidents reported since enforcement of the Act 514 in 2001. Data for 2001 are reported to SOCSO from 87,389 down to 64,363 in the year 2010. Nevertheless, the number of accidents reported was still at a very high ratio (SOCSO, 2010). Table 1.1 also shows the data on fatal accidents reported an increase from ten years release of the act. The number of fatal accidents reported in 2001 was 993 and the number increased to 1,717 in 2010. This indicates a very worrying statistics and a drastic and comprehensive action needs to be taken by all parties including the government, especially those who manage the related jobs. The record proved that Malaysia is one of the countries that have a high number of industrial accidents (DOSH, 2010).

There is a difference between the statistical figures released by SOCSO and DOSH, this is because SOCSO reports are based on the amount of insurance compensation claims made by victims or their beneficiaries while DOSH statistics are based on the number of accidents reported and there were no proper and accurate reports of construction accidents, due to fear of assumed reprisal by the authorities.

Table 1.1: Accident Reported to DOSH, JTK, SOCSO (2001-2010)

No.	Year	Accident	SOCSO/JTK	DOSH
1.	2010	Death	1,717	185
		Total Report	64,363	2,354
2.	2009	Death	1,739	224
		Total Report	61,161	2,386
3.	2008	Death	1,432	239
		Total Report	61,710	2,535
4.	2007	Death	1,303	219
		Total Report	63,600	3,395
5.	2006	Death	1,337	209
		Total Report	68,008	4,731
6.	2005	Death	1,292	196
		Total Report	70,690	3,837
7.	2004	Death	1,291	174
		Total Report	77,742	3,550
8.	2003	Death	1,073	190
		Total Report	81,003	3,304
9.	2002	Death	907	137
		Total Report	85,513	3,032
10.	2001	Death	993	146
		Total Report	87,389	2,889

Source:(DOSH, 2010; Malaysia, 2007a)

The construction industry is currently being recognized as a major economic force in Malaysia (Malaysia, 2007a). With the rapid growth of the construction industry for the past decade, injuries and fatalities resulting from accidents at construction sites seems to have grown as well. Based on the Social Security Organization SOCSO (2010), the fatality rate in the construction industry in Malaysia was more than three times of all workplaces. Figure 1.1 shows the frequency of reported accidents in year 2002 to 2010. Although statistics which is Number of Accident Report (NOA) and Number of Industrial Accident (NOI) show a decrease compared to the figures in the early 20s, it is still at an alarming level (SOCSO, 2010). Statistics also show an increase again occurred starting in 2008 until 2010. This phenomenon should be taken seriously by the parties involved in this industry. Compensation costs paid out by SOCSO for industrial accidents and diseases accounted for almost RM650 Million (SOCSO, 2009).

The fatality rate of construction related activities in the United States is among the highest of all industries (Toole, 2002). On the average it bears approximately USD2 billion per year in direct cost such as hospitalization, workers compensation and subsistence payment (Toole, 2002). It covers repair cost, replacement of damaged materials and machines, unproductive labor time, spoiled works, adverse publicity, legal expenses, unscheduled disruptions and other expensive side effect.

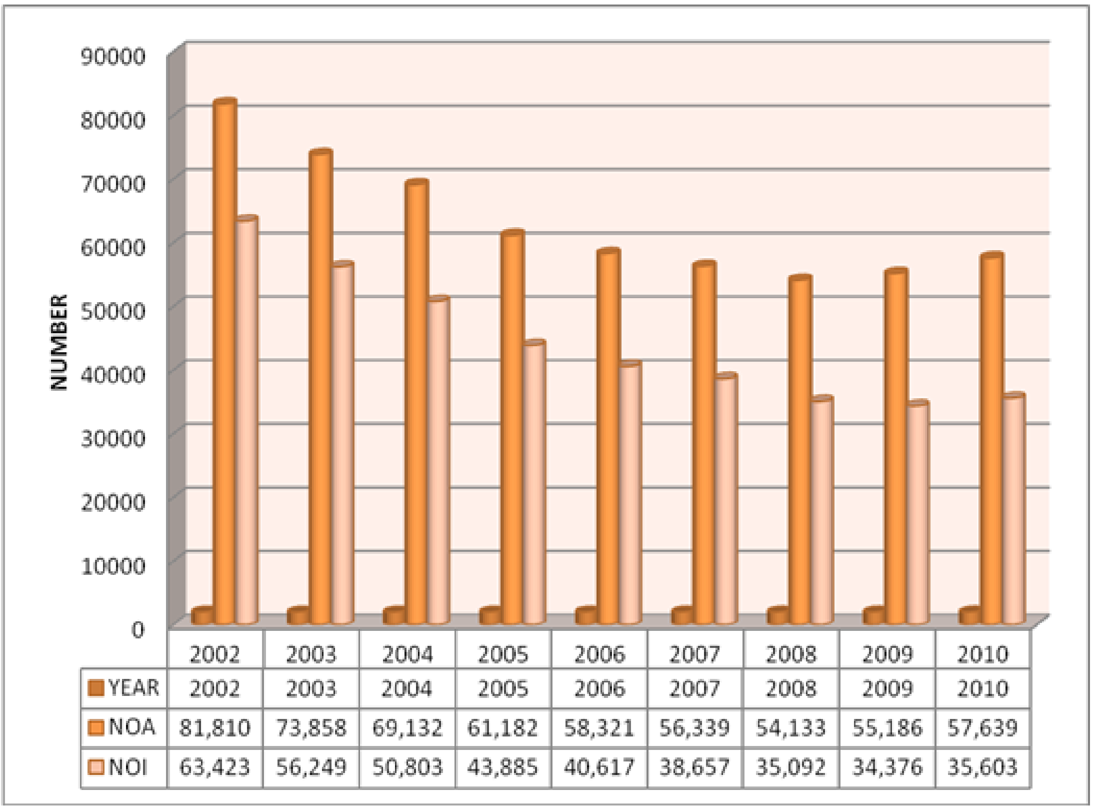
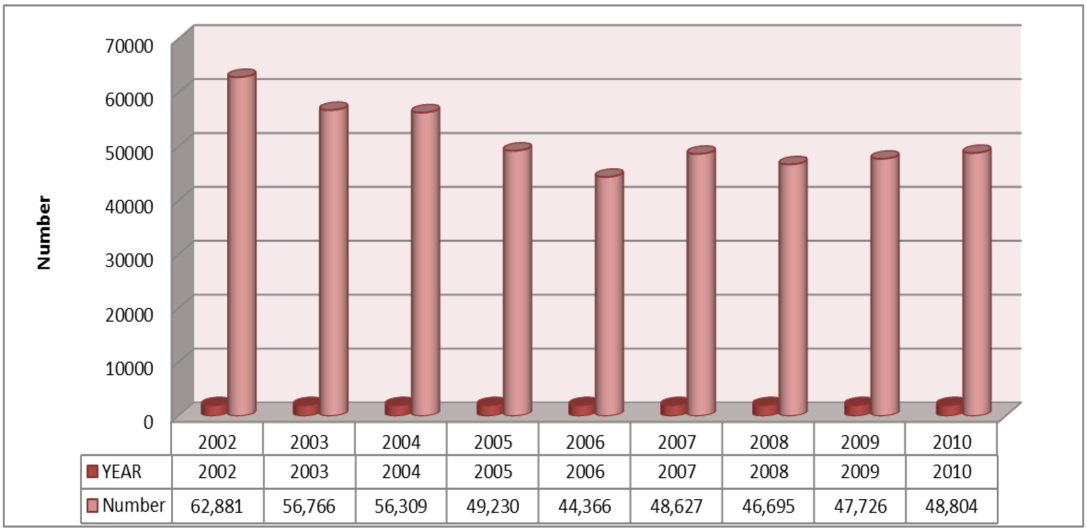


Figure 1.1 : Frequency of Reported Accidents in Year 2002-2010

Source : (SOCSO, 2005) and (SOCSO, 2010)

Figure 1.2, shows the number of Temporary Disablement Benefit Recipients and the Total Payment for Temporary Disablement Benefit. Figure 1.3 shows the number of Permanent Disablement Recipeints and the Total Payment for Permanent Disablement Benefit. Figure 1.4 shows the number of Invalidity Pension Benefit Recipeints and the Total Payment for Invalidity Pension Benefit. It can be seen that these three figures show a significant increase in the number of benefit recipients over the years. This situation reflects an unhealthy phenomenon in this industry. A realistic action needs to be taken to address this problem.

Construction accidents are a burden and have hidden or indirect cost. The hidden or indirect cost of an accident is eight to thirty-three times more than the direct costs, so much so that the total cost of accidents can run into billions of ringgit. In Holland, the total medical cost of handling accidents is almost USD 11 Billion in 2004 (Lillie-Blanton et al., 2008).



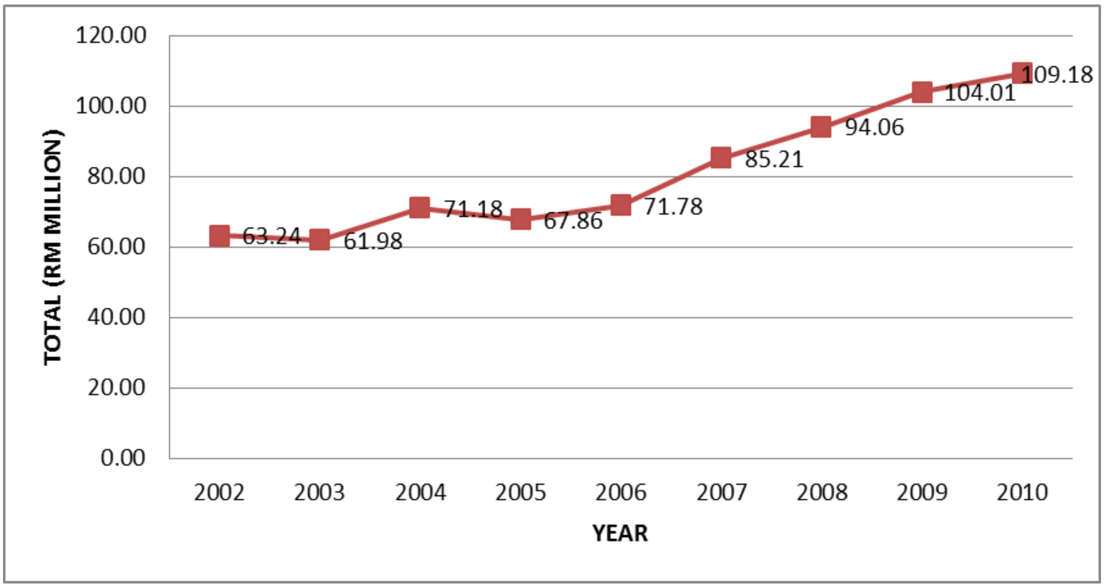
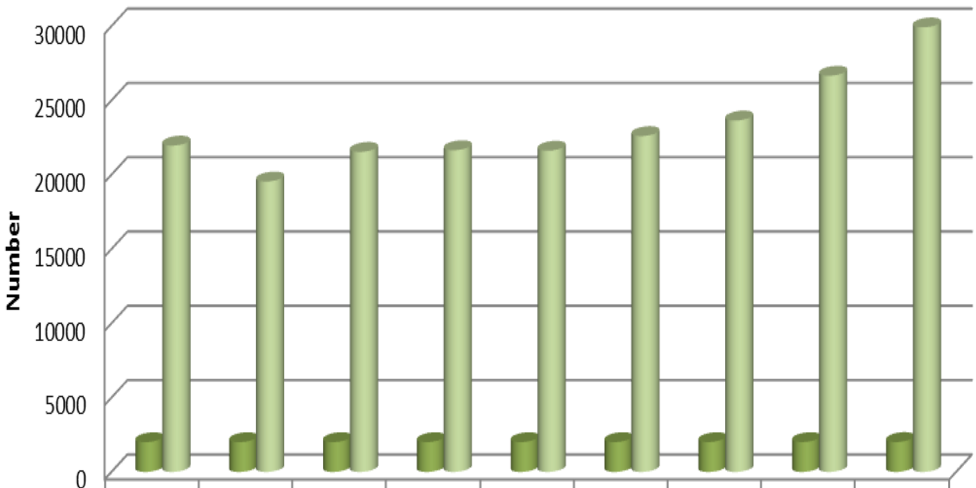


Figure 1.2 : Number of Temporary Disablement Benefit Recipients and the Total Payment for Temporary Disablement Benefit.

Source : (SOCSO, 2005) and (SOCSO, 2010)



	2002	2003	2004	2005	2006	2007	2008	2009	2010
YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number	21,960	19,542	21,535	21,648	21,615	22,600	23,646	26,660	29,914

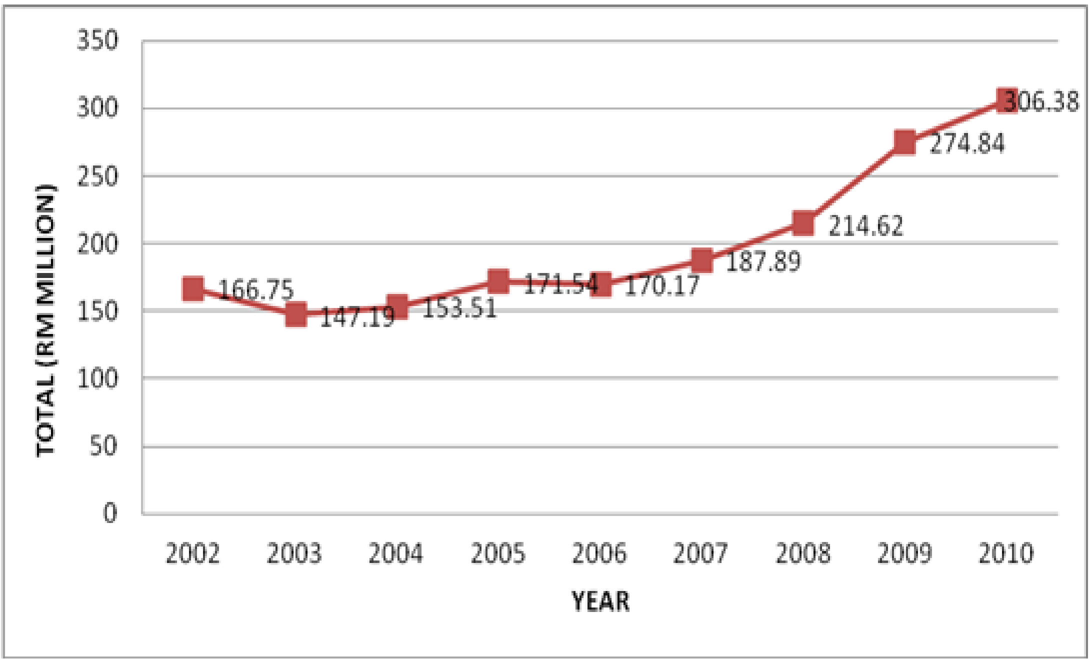
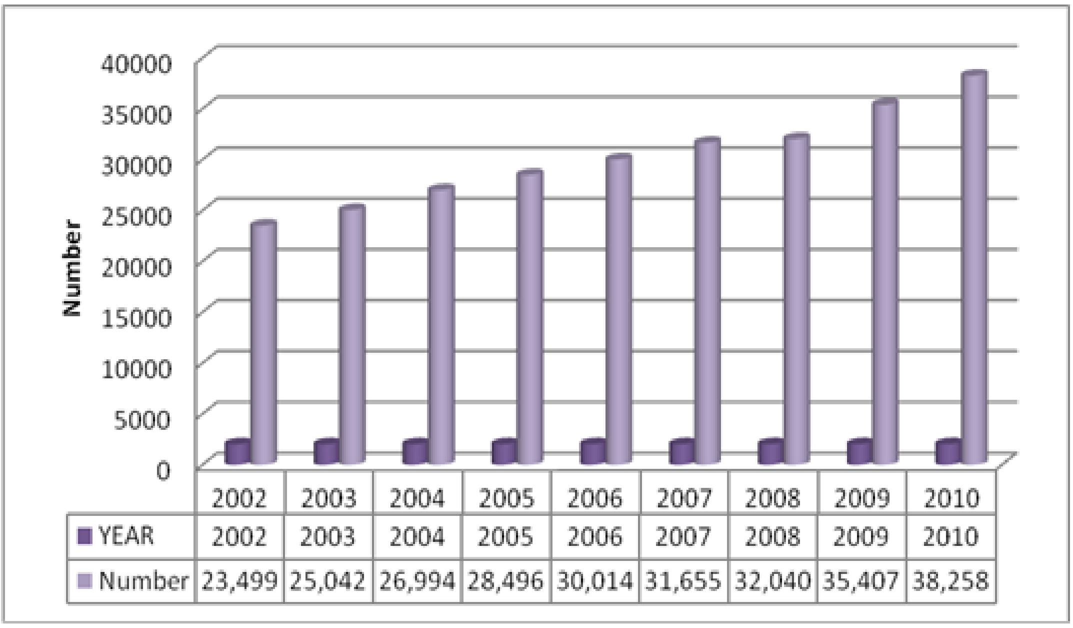


Figure 1.3: Number of Permanent Disablement Recipeints and the Total Payment for Permanent Disablement Benefit.

Source : (SOCSO, 2005) and (SOCSO, 2010)



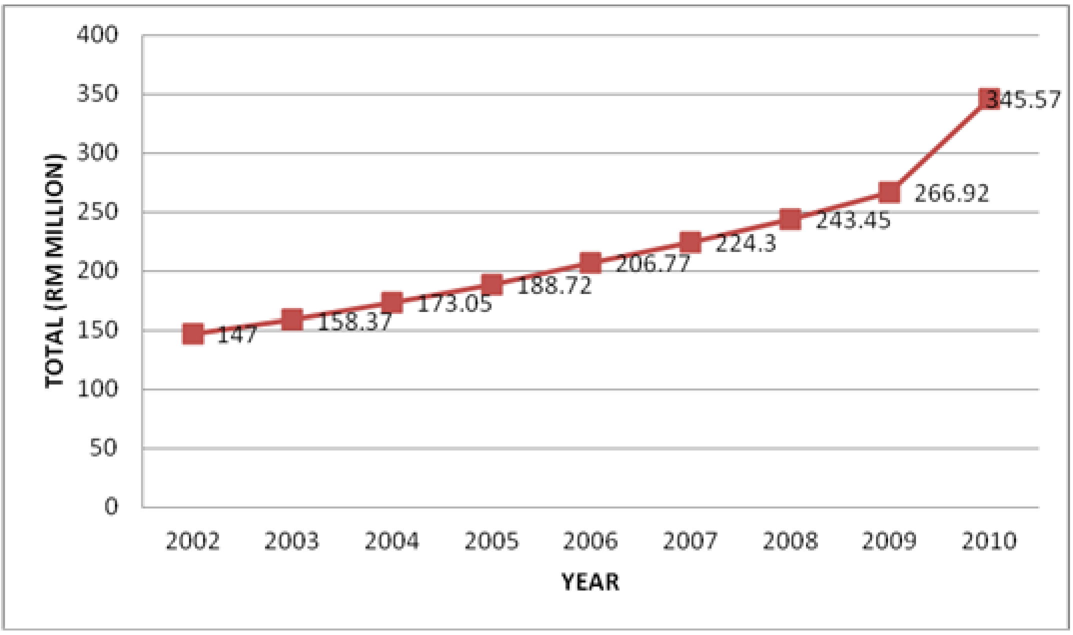


Figure 1.4: Number of Invalidity Pension Recipients and the Total Payment for Invalidity Pension Benefit.

Source : (SOCSO, 2005) and (SOCSO, 2010)

Internationally the level of industrial and construction reporting might not be very different with Malaysia as shown in the global report in Table 1.2.

Table 1.2: Industrial and Construction Accident Statistics (1000s)

Country	1994	1995	1996	1997	Average
Egypt	60.7	57.3	55.4	50.9	56.1
South Africa	9.0	10.5	9.6	6.3	8.9
Namibia	5.0	3.9	4.2	4.9	4.5
Panama	16.8	16.8	16.5	15.8	16.5
Canada	429.7	411.2	378.6	380.7	400.1
Mexico		442.7	401.8	428.9	424.5
United State	3061.0	2967.4	2832.5	2866.2	2931.8
Venezuela	8.0	7.6	6.5	5.2	6.8
Puerto Rico	28.0	25.6	27.2	26.0	26.7
China	16.3	28.5	29.0	26.4	25.1
Hong Kong	64.4	59.4	59.5	62.8	61.5
Israel	84.2	88.3	92.3	83.8	87.2
Jordan	13.7	15.3	14.8	13.4	14.3
Norway	24.0	30.1	27.8	34.1	29.0
Utd Kingdom	159.6	150.3	158.3	167.3	158.9
Australia	135.7	139.1	133.4	123.9	133.1
New Zealand	31.6	40.0	42.6	36.5	37.7

Source: (Barling et al., 2002)

The data in the Table 1.2 from selected countries indicate the number of accidents in the industrial and construction industry during the period of 1994 through 1997. The data suggest that the level of industrial accidents was high internationally (Barling, et al., 2002).

This illustrates a high cost of occupational injuries and fatalities for organizations in terms of production, but more importantly, in terms of lives altered and lost by work-related events. Fortunately, the issue of occupational safety at international level keeps attracting the attention in both the media and at the workplace (Barling, et al., 2002). This might come from the result of large scale industrial accidents such as Chernobyl and Bhopal where the events were highly publicized to the general public which led to increased level of safety awareness.

Chernobyl also was the first disaster where the term ‘safety culture’ first made its appearance in the International Atomic Energy Agency’s initial report (IAEA). Since then, other major disasters like King’s Cross fire and Piper Alpha have been cited as related to the organizational structure and safety management failure to ensure the importance of safety culture being highlighted. It is not surprising that workers start to consider safety and health during their work time to be as important as their salary, allowance and other benefits.

Davies et al.(2000), however, argued that the current focus on work-related accidents is more a function of the threat they pose for the general population than their threat to the workers’ safety. They observed that despite the alarming number of work-related accidents and interest in the issue, occupational safety remains an underdeveloped area in the management of companies. The conclusion of the study below shows the importance of management commitment, employee participation, training and education and communication towards a high level of safety awareness;

'The effect of corporate culture on injury and illness rates within the organization showed that those elements most predictive of high level of safety awareness include a positive management commitment to safety and to employees, open communication, encouragement of employee innovation and suggestions, and management feedback to employees, among others elements' (Erickson, 2001).

The statement shows the importance of factors in organization culture to improve the the level of safety awareness of the company. There are several important factors for measuring LoA of OSH which can provide easy-to-understand LoA information to technical and non-technical persons. Measuring LoA of OSH was also useful to provide indicators to access behavior and trends in key areas of safety management so as to allocate resources in an effective and efficient manner. Finally, it would help the organization to facilitate communication between regulators and company's management and facilitate them to improve their LoA of OSH through contacts with appropriate national and international bodies and inform the public of the plant's safety.

The management of LoA of OSH assessment should be able to discover the overall safety and health objectives and controlling of hazards and risks. It is normally done by comparing with other management units to see whether the company is getting better or worse over time. The effectiveness of the program arranged would also be known. As the above statement discussed the general benefit of measuring LoA of OSH, there are several potential benefits of such a comprehensive set of LoA of OSH assessment directly to the organization.

The first benefit is to ensure that the organization will be able to identify the objective, auditable and non-disputable set of safety parameters. Secondly, when used as a set, it provides an insight as to what is important to safety. Another benefit is to provide information that is easy-to-understand to all stakeholders, to provide an additional basis for self-assessment and to take corrective action accordingly. It also provides an additional basis for investigations by regulators of any incident or accident which happens and enables comparisons to be made, especially in the framework of a small set of internationally agreed safety indicators.

The level of safety climate will give an indication and act as an indirect evaluation of the level of safety culture (CANSO, 2008).It should be noted that there is no entirely satisfactory methodology for evaluating safety culture yet developed. As previously stated, safety climate is often used as an approximate evaluation of safety culture. Evaluating safety climate is much simpler than evaluating safety culture. The main reason for this is that it can be done by using only quantitative methods (CANSO, 2008; Denison, 1996; Lardner, 2003).

From observation, researcher found most of Malaysian companies do not really take safety aspects into their business activity. They always put the importance of production and profit first without much concern for the status of their safety aspects. Safety of employees was solely handed to them with the belief that their employees have to take care of their own safety. This is totally different from the concept implemented by most multi-national companies operating in Malaysia, with their safety culture adapted from their parent company overseas. They always believed that the safety culture implemented by the management will positively affect their employee’s safety performance (Bakar, 2006).

Construction is one of the most hazardous industries due to its unique nature. It is highly fragmented, which marginalizes efforts to safeguard safety and health (S&H) standards. Unlike manufacturing, construction site activities are physically dispersed across various locations, thus supervising and monitoring S&H issues in the workplace is much more challenging (Cheah, 2007). In comparison, construction is often classified as high risk because historically it is plagued with higher and unacceptable injury rates.

Therefore, as one of the central purposes of this survey is to understand how office safety climate factors affect the employees LoA of OSH and further understand the means by which positive or negative effects may occur. In order to investigate this relationship, there is a need to understand the factors of employees' LoA of OSH which is their trust in management, effective commitment to the organization and perceptions of safety culture. These factors have been hypothesized to have positive impact on LoA at the employees' level. LoA of OSH has been conceptualized to extend beyond simply the numbers of lost time injuries, but rather to include employees' personal safety orientation (comprised of safety knowledge, motivation, safety initiatives and safety compliances) and involvement in safety incidents (such as those requiring first aid as well as near-misses).

Moreover, this study was conducted with the hope that it becomes a useful reference for any government agency to incorporate the safety culture of the management with their employee's LoA of OSH. Figure 1.5 shows that, the proposal of this study is to investigate the relationship of four factors of Safety climate on the Employees' LoA of OSH. The factors of Safety Climate consist of Management Commitment, Employee Participation, Training, Education and Communication. The factors of LoA were safety orientation, safety and health policies in the department, risk assessment implementation, the monitoring systems used and review of all S&H related matters.

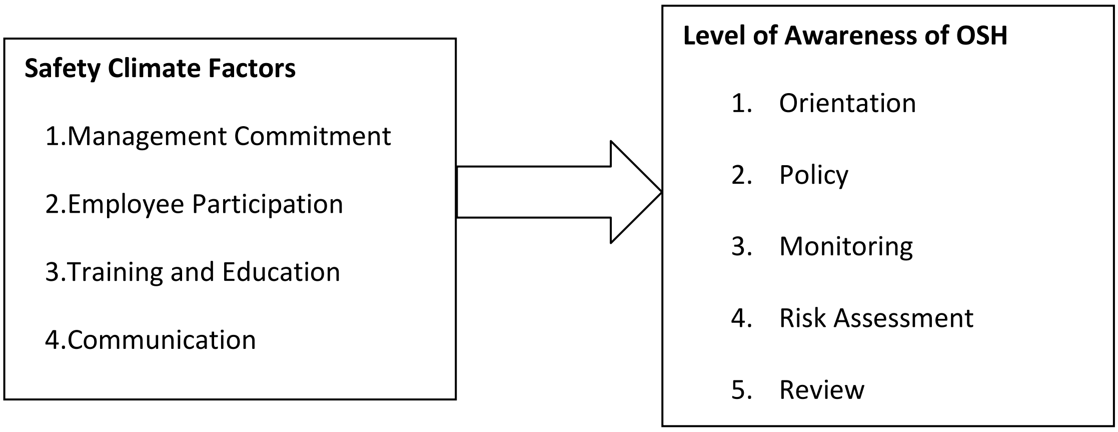


Figure 1.5: Proposed model: Effect of safety climate factors on Level of Awareness on Occupational Safety and Health

According to Amat (2008), Occupational Safety and Health at a construction site covers a wide scope of issues and problem statements. Among the prominent issues are:

a) Construction involves multi-tasking and mixed tasks in a dynamic environment (with this situation the construction personnel are faced with ever-changing hazards);

b) The implementation of construction projects revolves around three main elements namely quality construction, cost implication and work schedule (with these aspects every contractor and project team are motivated in getting the job done fast to gain from early completion of the projects);

c) Contractors and their workers tend to make do with available material at site and in different kinds of environment;

d) Lack of systematic hazard identification and elimination implemented at construction sites;

e) Lack of knowledge and training among construction workers and contractors;

f) Lack of safety management and monitoring at construction sites;

g) Injuries, illness and construction incidents are under-reported;

h) Safety and health issues are not explicitly spelt out in the contract and viewed as a financial and human resource burden.

1.2 Study Objectives

The objectives of the study are:

1) Determination of effects of employee`s demographic background on the perception of Level of Awareness (LoA) on OSH;
2) Measuring the Level of Awareness on Occupational Health and Safety of the agencies;
3) Developing statistical analytical tool for measuring and correlating the Level of Awareness of Occupational Safety and Health and Safety Climate Factors;
4) Identifying significant factors influencing the Level of Awareness of OSH using Multiple Regression Analysis;
5) Model Validation for evidence to support the relationship between dependent and independent variables.

1.3 Research Significance

A lack of studies in safety climate/safety culture research has been highlighted in the literature, for example,(Glendon et al., 2006; Huang, 2010; Lu, 2007). Therefore, the focus of this thesis is concerned with the degree to which safety climate factors impacts and influences safety performance (via level of safety awareness of OSH), particularly with regards to the improvement of safety outcomes in the Malaysian construction industry over a period of time. This unique study has not been done before, in a developed country or in a developing country. With regards to the research publications, research in safety issues (for example, safety management and safety climate(or culture) has been predominantly published by western scholars that focused their research on western countries such as the UK, US, Australia, Canada, Scandinavian countries and European countries.

Very little research related to safety management has been conducted in eastern countries, especially in Malaysia (Bahari, 2011). Furthermore, through literature review, it is found that the theoretical and empirical understanding of safety climate research that has been conducted in Malaysia or other eastern countries was based on the theories, conceptions and contributions of western scholars. Due to this fact, the findings of this current study are believed to be unique in that they contribute to a significant development of safety management research, especially in safety performance and safety climate (or culture) research in an eastern developing country which differs in terms of national culture. The findings of this study have contributed theoretically to a small but growing body of knowledge on safety performance effectiveness and safety climate factors. In this study, it has been hypothesised that safety climate factors impacts would influence the level of awareness of OSH at four government agencies, reflecting changes in the underlying safety culture in the Malaysian construction industry under study. In this construction industry scenario, safety is highly prominent and in all the agencies studied, both level of safety awareness impacts and the safety climate perceptions improved considerably.

The department under study was operating on the basis that providing employees with safety training would facilitate improvement of the safety culture over a period of time, as asserted in the literature (Cooper, 1998; Harvey et al., 2001). Whilst the safety training impacts on improving knowledge, skill and hazards awareness are well established in the literature, there is little literature evaluation of safety performnce on its impact on organisational variables, such as safety climate (or culture). The findings of this study revealed that significant improvements in the safety climate factors related to Management Attitude and Management Action, indicate that the management role has been viewed as crucial in improving and supporting employees' and organisation's safety.

Over a period of time, the positive correlation between safety climate factors and safety awareness became stronger with a significant correlation in all the agencies studied. This finding adds to the theoretical proposition that level of awareness is an antecedent in improving safety climate. There is no doubt that safety awareness appears to be a powerful mechanism that has positive effects on safety culture and workplace accidents within an organisation over time. The findings of this current study add to the position that safety climate is not universal and stable, as pointed out by Ismail, et al. (2010), safety climate factor structure failed to be replicated in the Malaysian context. The findings of this study also strongly support the notion that there is more than one safety culture within an organisation. The subgroup differences suggest that a large group within the organisation as a whole do not share an overall perception of safety within organisations and lead to an absence of safety culture (Hopkins, 2006). Therefore, this chapter commences, by discussing the findings according to the five research objectives addressed in this study. The nature of the findings is such that they need to be considered mainly in terms of consequences for each hypothesis and its implications with regards to each objective.

As to be concluded, construction accidents have been causing many human tragedies, loss of life and property; lower productivity, and delayed projects. The main reason for selecting this topic is the need for improving safety management implemented in the DID Malaysia. Other reasons are:

a) The lack of studies about the safety issues of construction industry in Malaysia.

b) There has been very little research carried out by academics and practitioners on the Occupational Safety and Health (OSH) problems faced by the local construction industry.

c) To provide some ways to help government agencies improve safety management at the workplace.

d) To provide some ways to help companies improve safety management at the construction sites.

e) To comply to Act 514- OSHA 1994 Part IV- General Duties of Employers and Self-Employed Persons- under sections 15(see Appendix A).

According to Rampal et al. (2004), LoA among labor in Palm Oil Industries were still low although the act had been implemented for almost ten years.

1.4 Research Methodology

The study begins with exploratory work to focus on current and pertinent issues that will enable the identification of a clear and precise statement of the problem. Subsequently, the research performs a through literature review on the area of study and adopts a quantitative survey method by conducting a preliminary study and field survey as the strategy for data collection. All data were analyzed by quantitative techniques namely descriptive statistics, statistical analysis, regression analysis and Pearson correlation. Statistical Package for Social Science (SPSS) version (16), is the main tool in assisting the data analysis. The research methodology is further discussed in Chapter 3. It is to be noted that all the figures and tables shown in this thesis are based on this research unless otherwise stated.

1.5 Limitation Of The Study

The scope of this study has to be limited due to several constraints such as time, financial and physical. Limitations of the study are:

1) It was conducted in DID Malaysia, and only the top and middle managers of this department participated in this study.
2) The level of OSH awareness is measured indirectly by personal perceptions.
3) Only the project development unit/section of this department was chosen for the survey. The service sections of this department such as finance, commercial, administration are not included in this survey.
4) The extent of of LoA of OSH management will be measured as personnel perceptions.
5) Responses to the questionnaires may be influenced by the individual`s mood and by the environmental conditions in the setting at the time the questionnaires are completed.
6) Responses to the questionnaires may be influenced by the individual`s theoretical knowledge based on OSH activities.
7) All the scores were self- reported, thus introducing the possibility of bias. At the same time, the question being answered by the respondent would also depend on the:
    a. Honesty of participant while answering the questionnaires.
    b. Accuracy of the answer of the participant.
    c. The ability of participants to understand the questionnaires given.
    d. Time frame given as the participant might answer the question in a hurry

In an effort to counter-balance the specified limitations, the researcher made a clear explanation to survey respondents about the purpose of this study, the meaning of each question asking for honesty and sincerity and cooperation from the respondents in answering the questions. Despite all those limitations, this study should reveal findings of both theoretical and practical significance. The results will suggest the determinants of good safety culture among employees and their safety management system.

1.6 Outline Of Chapters

This thesis is structured as follows:

Chapter 1: Introduction. A brief discussion of the topic

Chapter 2: The concept of Level of Awareness of OSH management. This chapter provides the definition of Level of LoA of OSH management, organizational culture, safety culture, safety climates. It will also discuss dependent and independent variables.

Chapter 3: Methodology. Explanation of research methodology used in this study including Research Design, Research Instrument, Questionnaire Design, Data Collection and Procedures, Technique of Data Analysis and Validation of the model developed.

Chapter 4: Results and Discussions. Indicate the survey results obtained from this study. This chapter describes the measurement of OSH LoA, statistical analysis to test on correlation between variables, multiple regression analysis between dependent variable and independents variables and validation of the model to ensure that the model was validated and reliable.

Chapter 5: Conclusions and Recommendations. Describes the conclusions of the study and chapter will also highlight the problems faced and proposes some effective recommendations. Proposed future studies are also presented.

1.7 Scope of Study

This study was conducted at two offices in the Department of Irrigation and Drainage Malaysia (DID), referred to as DEP1 and DEP2. For the purposes of this study, the overall DID was divided into two groups. Each office manages the Occupational Safety and Health (OSH) Management System differently. DEP1 used normal management practices such as Total Quality Management Systems (TQM) while DEP2 manages the OSH management system under ISO 18000 certificates issued by Standard and Industrial Research Institute of Malaysia (SIRIM) since year 2005.

In general, DID has five major functions which are River Basin Management and Coastal Zone, Water Resources Management and Hydrology, Special Projects, Flood Management and Eco-Friendly Drainage (see Appendix B). In dealing with these five major functions, there are various types of work performed, including physical work such as construction works for flood mitigation projects, providing agricultural channels, construction of office buildings and a variety of laboratory-related work. In carrying out the work of supervision, a front-line technician is constantly exposed to the danger of accidents. From the management side, it shows the initiative taken by them to monitor performance by using a specific indicator while promoting the management's own process improvements.

The focal problems addressed by this study can be summarized into three parts as presented below:

a) There is a need for an evaluation of the level of awareness of OSH in DID.
b) There is the need to develop a model to measure LoA among the workforces.
c) There is a need for specific recommendations on what to do in order to improve the level of awareness of OSH Management system.

This study will mainly focus on the evaluation of the safety climate and not the direct evaluation of the safety culture per se. This is intended to narrow the scope and to enhance the quality of the study. Due to the very broad scope of safety culture, it is difficult for researcher to conduct a study with a very limited capacity. Therefore, the researcher reduced the scope of this study, by measuring the safety climate only in selected organizations. Previous study showed that the measure of safety climate is enough to reflect the level of safety culture in an organization (Antonsen, 2009; Flin et al., 2000).

Consequently, it was found later, in terms of position, the technician formed a large proportion of respondents in this study. Answers they provide should be considered based on their work experiences.

1.8 Concluding Remarks

Chapter 1 discusses the topic and research scopes of the thesis. This research is to determine the level of employees' perception on Safety Climate factors and Level of Awareness (LoA) at the same time to test the relationship between safety climate factors and the LoA of OSH management system. It could be used to improve safety culture and safety management system implementation at the workplace.

The following chapter explores the literature review with regard to the topic in general and LoA of OSH management system in particular.

CHAPTER 2: THE CONCEPT OCCUPATIONAL SAFETY AND HEALTH (OSH) PERFORMANCE

Measuring health and safety is not easy and there are no simple answers to this problem. Measurement is a necessary step in any process management for continuous improvement. If the measurement is not performed correctly and accurately, the effectiveness of a health and safety management system is not clear and there is no reliable information to inform managers how well health and safety risks can be controlled (Lingard, 2011). Although there is much information that can be obtained from the performance measurement process generally, there is little that can lead to health and safety aspects. HSE's experience shows that organizations find health and safety performance measurement a difficult job. They struggled to develop measures of health and safety performance measurement that is not based solely on injury and illness statistics (HSC, 1993).

There are several methods of measuring safety performance. Traditionally, it is made using accident statistics such as minor accidents, near-miss accidents and fatalities. However, this method has the disadvantage of available recorded data quality because there found no accidents reported by the employer for any reason, for example due to fear of legal action for default to the safety regulations gazetted in the act. Now, the collection of information on respondents' experience and perception are becoming increasingly popular study, done by researchers because it was found very effective impact on the safety management system (Lingard, 2011). Safety performance within an organization can also be evaluated through the implementation of safety culture in the workplace. Accordingly, the components in the safety culture were described.

2.1 The Component of Safety Culture

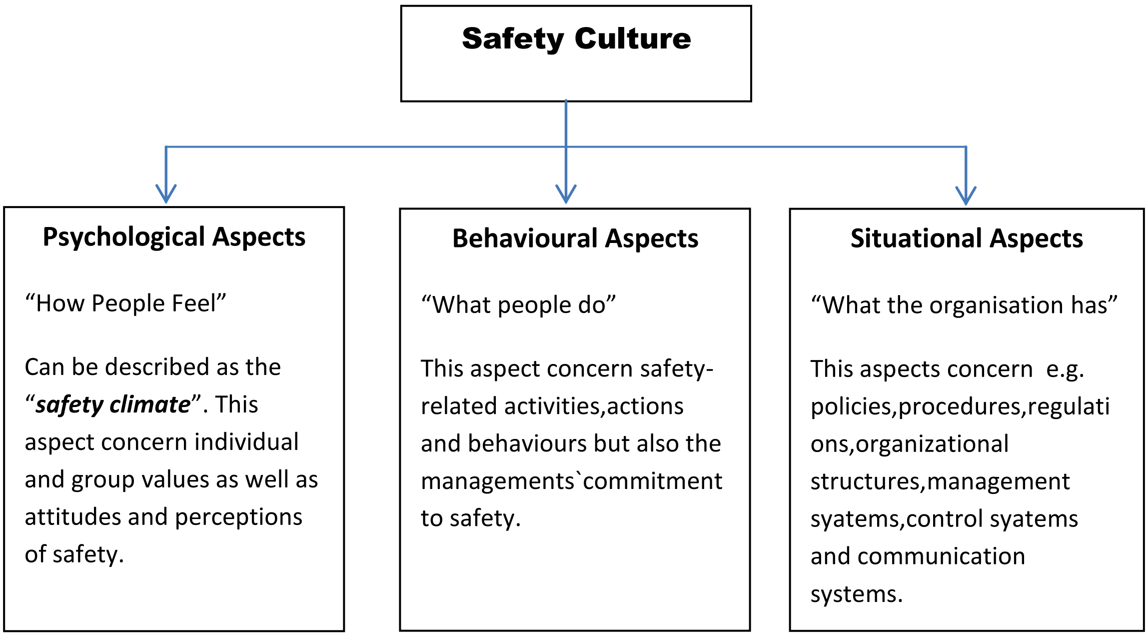


Figure 2.1 The three aspect of a safety culture presented by Cooper (2000). (The figure is adapted from CANSO (2008)

The components of safety culture is also a topic that scientists have not yet agreed on. This thesis is based on the concepts of safety culture described by Cooper (2000); Guldenmund (2010); Reason (1997). Cooper (2000), refers to Bandura's (1986) model of reciprocal determinism when he describes safety culture. The model consists of three interrelated aspects of safety culture, the psychological aspects, the behavioural aspects and the situational aspects. The psychological aspects of a safety culture refer to the safety climate or in other words — how people feel about safety and safety management systems. According to Cooper (2000), this aspect concerns individual and group values as well as attitudes and perceptions of safety. Safety climate has though been defined in several ways in the literature and not all definitions include values, attitudes and perceptions. The behavioural aspects of a safety culture are concerned with — what people do. This includes safety-related activities, actions and behaviours but also the managements' commitment to safety. The situational aspects refer to — what the organization has. This includes e.g. policies, procedures, regulations, organizational structures, management systems, control systems and communication systems. An overview of the concept can be found in Figure 2.1 CANSO (2008); Cooper (2000); HSC (1993). According to Cooper (2000), Bandura's (1986) reciprocal model is the perfect model to use when analyzing safety culture. This study will focus on assessing the psychological aspects of 'how people feel' which can be measured through safety climate factors. This aspect concerns about individual and group values as well as attitudes and perceptions of safety management.

2.1.1 Definition

A problem with safety culture and safety climate is that there exists no universal agreement on the definitions of these concepts. The concept of safety culture was first truly introduced and defined after the Chernobyl accident. The lack of theoretical background to this definition resulted in a development of numerous definitions (Cooper, 2000). There is also on going academic debate about the differences and similarities between these two concepts (Clarke, 2000). Attempts have though been made to find commonalities in the definitions of both safety culture and safety climate in order to find consensus regarding the concepts. Accordingly, the definitions of organizational culture, safety culture and safety climate will be discussed in the subsection below.

2.1.1.1 Organizational culture

The concept of safety culture has it origin in the concept of organizational culture (Nordên-Hágg et al., 2010). In order to understand what safety culture is, it is therefore important to understand the concept of organizational culture. The concept of organizational culture was truly developed during 1970s even though the ideas already existed earlier. Unfortunately, no standard definition of organizational culture has yet been developed and accepted. In fact, there is a controversy among scientists today whether organizational culture is something an organizational "is" or something an organization "has". The former view considers organizational culture as a way of describing the organization. This is often preferred by academics and social scientists. The latter view implies that culture is a variable that can be changed. This approach is often favoured by managers and management consultants (Davies, et al., 2000; Nordên-Hágg, et al., 2010; Reason, 1997).

Reason (1997), defines organizational culture as "a shared values (what is important) and beliefs (how things work) that interact with an organizational structure and control systems to produce behavioural norms (the way we do things around here)".
Cooper (2000), defines organizational culture as "a concept often used to describe shared corporate values that affect and influence members` attitudes and behaviours". Guldenmund (2010), presents a framework for safety culture which was based on Schein`s research and therefore also partly based on Schein`s definition of organizational culture. Schein (2010), defines organizational culture as " a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems".

2.1.1.2 Safety Culture

"The trend around safety culture originated after the Chernobyl disasters brought attention to the important of safety culture and the impact of managerial and human factors on the outcome of safety performance"(Flin, et al., 2000; IAEA, 1986). The term `safety culture` was first used in International Nuclear Safety Group (INSAG`s 1988) Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident where safety culture was described as: "*That assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues received the attention warranted by their significance". The idea was introduced to explain how lacking of knowledge and 'indifferent attitude' of risk and safety by the employees and organization contributed to the disaster"(Flin, et al., 2000).*

The presented concept of safety culture was then left open to interpretation without any reference to literature. The lack of theoretical background together with the fact that the concept was not based on organizational culture theory has led to a development of numerous definitions of safety culture. In fact, both the definition of safety culture and its relationship to organizational; culture is something that is not yet agreed on (Choudhry et al., 2007; Guldenmund, 2010; Mohamed, 2002). Since then, a number of definitions of safety culture have been published. The U.K. Health and Safety Commission developed one of the most commonly used definitions of safety culture:
"The product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization`s health and safety management" (HSC, 1993).

Advisory Committee on the Safety of Nuclear Installations (ACSNI), developed another widely used definition of safety culture, describes as:

"The safety culture of an organization is the product of individual and group values, attitudes, perceptions, competencies and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization`s health and safety management. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures."

Since the 1980's, there has been a large amount of research done in the area of safety culture. However, the concept remains largely 'ill- defined' (Guldenmund, 2000). In the literature there are several different definitions of safety culture with specific arguments. The above definition, from the International Atomic Energy Agency (IAEA) and the UK Health and Safety Commission (HSC), are two of the most prominent definitions and most commonly used definitions (Yule et al., 2007). However, there are some common characteristics that are shared by other definitions. Several features related to safety culture, including the establishment of beliefs, values and attitudes that are shared by a group. Glendon, et al. (2006), emphasized that several definitions of Flin, et al. (2000), safety culture depend on individual perceptions which are shared within the group, the organization, or the community. For example, Cox (1991; HSC (1993); Pidgeon (1991); Schein (1992), all refer to 'shared perceptions of safety'. Reason (1998), stressed that safety culture "is a concept whose time has come", states that there are challenges and opportunities to "develop a clear theoretical understanding of these organizational issues to create a principled basis for more effective culture-enhancing practices".

There is a trend to be specified in terms of safety culture attitudes or behaviors. Glendon, et al. (2006), emphasized that when defining safety culture premise of some researchers is to focus on attitude, where others emphasize safety culture being expressed through their behaviors and work activities. In other words, organizational safety culture is used as a guide as to how employees behave at work. Of course, their behaviors will be influenced or determined by any consideration reward received in the workplace. For example, Clarke (2006), stated that safety culture is not only observed within the "general state of premises and conditions of the machinery but in the attitudes and behaviors of employees towards safety". Perceptions of organizational safety culture are important to be identified because it is a critical factor that influences many aspects of human performance and safety organizations. One of the most concise and usable definitions of safety culture has been discussed by von Thaden (2008).

Safety culture is defined as the enduring value and prioritization of workers and public safety by each member of each group and in every level of the organization. It refers to the extent to which individuals and groups will commit to personal responsibility for safety; act to preserve, enhance and communicate safety concerns, strive to actively learn, adapt and modify (both individual and organizational) behavior based on lessons learned from mistakes; and strive for the honor in association with these values. This definition incorporates the key issues such as personal commitment, responsibility, communication, and learning in a way that are not only influenced by the top management level, but also the behavior of everyone in the organization. It shows that the organization has some sort of safety culture, but this culture is expressed with varying degrees of quality and follow-through.

Comparing the definitions of safety culture, it is evident that there are some similarities between each other. With the exception of the definition provided by the Health and Safety Commission (1993), the similarity is that the definitions tend to reflect the notion that safety culture is something that the organization ‘is’ rather than something that the organization ‘has’ (De Witte, 1999; Deal, 1982; Ogbonna, 1996) cited by Ferraro (2002). This view was shared by many authors when they characterized the safety culture as “something to do with the people and unique quality and style of organization”. Kilman (1985), quoted by Marcoulides (1993), “the way we do things around here” (Deal, 1982), or the expressive ‘non-rational qualities or an organization`.

Until recently, culture has been examined with performance and effectiveness. According to Cooper (2000); Reicher (1990), while culture researchers have devoted numerous articles to the nature and definitions of culture, relatively fewer articles have been contributed towards culture and performance research. One reason for this was the difficulty in operationalizing the culture construct.

2.1.1.3 Safety Climate

Safety climate is of current interest to construction practitioners and researchers. The concept of safety climate has been actively explored in the field of industrial and organizational psychology but is just gaining popularity in the construction industry (Lingard, 2011). A positive and strong safety culture is important for ensuring worker safety. For example if team members feel unable to speak freely about errors or risks they see, then this is likely to delay identification and action to reduce risks. As with organizational culture and safety culture no standard definition of safety climate exists. There is also confusion concerning the relationship and the differences between safety culture and safety climate.

Consequently, the term safety climate is sometimes used interchangeably with the term safety culture (Guldenmund, 2010). One of the more common descriptions of safety climate is that it is a "snapshot" of safety culture (CANSO, 2008; Wiegmann et al., 2001; Zhang et al., 2002). This means that safety climate reflects the safety culture at a given time and place. In contrast to safety culture, safety climate often refers to the features and not to the deeper context (Denison, 1996).

Nordên-Hágg, et al. (2010), concluded in her doctorial' thesis that it can be considered that the organizational culture is expressing itself through the organizational climate. Wiegmann, et al. (2001), formulated, what they call, as a global definition.
The definition states that "*Safety climate is the temporal state measure of safety culture, subject to commonalities among individual perceptions of the organization. It is therefore situational based, refers to the perceived state of safety at a particular place at a particular time, is relatively unstable, and subject to change depending on the features of the current environment or prevailing conditions.*"

2.2 Performance Measurement

Monitoring of Occupational Health and Safety performance has traditionally focused on the measurement results, such as lost time injuries and number of accident records *(Australia, 1994; Department of Employment and Workplace Relations Office of Australian Safety and Compensation, 2005; Lingard, 2011; Wales, 2001).* Management usually measure performance to determine whether the set objectives or goals are achieved (Wadsworth, 2009). There are various areas in which monitoring of performance management can be made. Some examples include the production, financial and cost aspects of the environment and the health and safety of workers (Cooper, 2001). For this study, performance measured through survey among supervisory workers in few selected government agencies regarding their Level of

Awareness (LoA) of Occupational Safety and Health Management System implemented in their daily routine work. Performance measurement is an important aspect of monitoring and evaluating the effectiveness of an Occupational Health and Safety program in the company and/or industry (Redinger, 2002). One of the main objectives of the performance measurement on Occupational Health and Safety program is to provide feedback on the health and safety management.

Health and safety are different from many aspects measured by managers because success depends on the number of cases (injury or illness) than it actually is. But even with the rate of total injuries and ill-health rates being low in the last few years, there is no guarantee that risks are controlled and that it will not lead to injury or illness in the future. This is particularly true in organizations where there is a low probability of accidents, but the main danger is present. The historical record can thereby be a misleading indicator of safety performance. Organizations need to recognize that there is no reliable single method to measure the performance of health and safety performance. What is needed is a 'basket' step or 'balanced scorecard' which provides information about various health and safety activities. Because there are disadvantages associated with the use of data and ill-health injuries only as a way to measure performance, some organizations recognize they need to be more proactive or adopt 'up-stream' performance measures. Generally this translates into the things that can be easily measured, such as the number of training courses or number of inspections. Identifying deficiencies is a systematic approach to derive these measures and show how they relate to the risk control process. This is similar to the period before the emergence of a model for health and safety management system, when there is activity on the health and safety but little understanding of the activities done in the framework of health and safety management as a whole (Smith, 2009).

According to HSE (2001), the benefits associated with the introduction of a performance measurement system for Occupational Health and Safety includes:

1) The ability to provide an indication of how the management is performing in relation to Occupational Health and Safety issues;
2) The ability to identify problem areas where adverse outcomes are occurring and subsequently to identify where preventive action should take place;
3) The ability to document effects of attempts to improve Occupational Health and Safety performance. For example, a measurement system could provide feedback as to whether implemented safety interventions are operating adequately;
4) The ability to promote Occupational Health and Safety reviews of existing work practices and work organisation; and
5) The ability to benchmark performance measures or comparative performance assessments.

2.3 Measuring the Health and Safety Culture

In order to ensure the effectiveness of risk control in an organization it is found that the health and safety culture is an important key factor. Systematic health and safety management system significantly influences the safety culture of an organization. Measuring aspects of safety culture is a part of the whole process of measuring health and safety performance. According to Bergh (2011), there are a lot of activities that support the development of a positive safety culture that should be measured. They fall under the heading (‘4Cs’): control, communication, co-operation and competence.

The term ‘health and safety climate’ has been used to describe the tangible output of organizational culture of safety and health as perceived by the individual or the group at a point in time. Health and safety climate can be measured. There are many tools available to measure safety climate developed, tested and used after the pioneering by Zohar (1980), around the world, in various sectors to enable organisations to canvass the views of their employees on some key aspects of health and safety within their organisation. Several research publications have been collected, evaluated and compared. Safety climate questionnaires are available to analyze the underlying definitions, theories, the factors (dimensions), their predictive validity, etc.

The health and safety related behaviour of individuals at all levels of the organisation is influenced by the health and safety culture, and the behaviours in turn shape the culture. Behaviours which support and promote a positive health and safety culture and an effective health and safety management system need to be included within the measurement process.

‘There are a variety of methods that have been used to assess safety culture and safety climate. Unfortunately, however, there are no standardized or “off the shelf” tools that can be used across domains or even within a single domain’ (Flin, et al., 2000). However, several factors should be considered in assessing the safety culture, including methods of measurement, the level of analysis, and implementation constraints.

2.4 Method of Measurement

Tools for assessing safety culture is divided into two namely, qualitative and quantitative methods. Qualitative methods including observation employees, focus group discussions, review of historical information, and case studies (Wreathall, 1995). With qualitative measurement methods, organization members usually serve as informants, which interact directly or indirectly with the researchers, using their own terminology and concepts to express their thoughts, as in a focus group discussion (Rousseau, 1990). Thus, by measuring qualitative, intensive and in-depth information can be obtained using the focal group`s own language. Meanwhile, the quantitative methods attempt to numerically measure or score safety culture using procedures which is highly standardized and calibrated, such as highly structured interviews, surveys and questionnaires (Wreathall, 1995). In the quantitative measurement approach, the members of the organization usually acts as respondents who had responded to a standard set of stimuli or questions provided by the researcher (Rousseau, 1990).

Quantitative method is relatively easy to use in cross-sectional comparisons, generally easy to implement in different organizations and by other researchers, and straightforward according to common, articulated frame of reference (Wreathall, 1995). There is an agreement among researchers that both qualitative and quantitative methods have a unique potential for the evaluation and testing of theories and that there are benefits to combining methods to gain a thorough understanding of safety culture. However, quantitative approach, especially individual survey responses, often more practical, in terms of time and cost effectiveness (Glendon, et al., 2006; Wreathall, 1995). Thus, the available surveys and questionnaires have been widely used to assess the safety culture in a variety of industries, such as chemicals, construction, transportation, and manufacturing.

As presented by Cox (1991), safety culture can be likened to personality, whereas climate is likened to mood. Both can change within an organisation. However, like one's personality, safety culture takes time to grow and change; you can not "implement" a safety culture but it can be re-directed through concerted effort and action by an organisation. Safety climate, as with one's mood, can change more quickly and dramatically given the circumstances and current conditions being faced by an organisation and the resulting actions taken. You try to shape the culture over time by changing the climate.

2.5 Factors Affecting Occupational Safety and Health Programs

As will be further discussed in Chapter 3, safety climate is assessed by means of quantitative, psychometric questionnaire surveys, so-called 'safety climate scales', measuring the shared perceptions/opinions of a group of workers on certain safety related dimensions or factors. Examples are perceptions towards management, commitment to safety, leadership safety support, worker communication, participation and competence (including training aspects) with regard to safety, safety systems (policies, rules, reporting, preventive measures, etc.), risks, and work pressure (Flin, et al., 2000; Seo, 2005). The outcome of such safety climate scales are regarded by many researchers as a predictor or indicator of safety awareness..

There are few studies which have been done by scholars all over the world on workplace safety management, level of awareness of occupational safety and health management, safety program issues, etc. In order to effectively gain from safety programs, factors that affect its implementation need to be studied.

The following in Table 2.1, is the list of factors/dimensions of safety scales identified by the researcher, from several studies that have been done throughout the world on safety issues. Accordingly, we will have the safety climate factors that can be used as the tool to measure LoA in the current study.

Table 2.1: Factors affecting the implementation of safety programs

No.	Places	Factors	Comments
1.	Thailand (Aksorn, 2008); (Pipitsupaphol, 2000)	i. Clear and realistic goals ii. Good communication iii Delegation of authority and responsibility iv. Management Support v. Program Evaluation vi. Continuing Participation of employees vii. Personal Motivation viii. Personal Competency ix. Teamwork x. Positive group norms xi. Personal attitude xii. Effective enforcement scheme xiii. Safety equipment acquisition and maintenance xiv. Appropriate supervision xv. Sufficient resource allocation xvi. Appropriate safety education And training.	16 Factors were grouped into 4 dimensions: i. Management commitment ii. Worker involvement iii. Safety arrangement iv. Safety prevention and control system

‘Table 2.1, continued’

No.	Places	Factors	Comments
2.	Singapore (Cheah, 2007);(Evelyn et al., 2005)	- To establish worksite safe should be shared by developer, consultant and government. - lack of integration of safety consideration in the upstream construction activities. - the role of government - poor chain of command and management - role of workers - negligence by contractor - inadequate company policies - unsafe practices - poor in attitudes - insufficient safety knowledge and training.	The challenge of making worksites safe should be shared by all parties affecting the value chain of construction including the developers, the consultants and the government.

‘Table 2.1, continued’

No.	Places	Factors	Comments
3.	Indonesia (Yusuf Latief et al., 2011)	i. working condition ii .management failure iii. unsafe acts of workers iv. non-human related events v. improper PPE equipment vi .failure to follow instruction and SOP vii. careless	
4.	Malaysia (Abdul Rahim, et al., 2008); (Abdul Razak et al., 2010);(Che Hassan, 2007)	i. workers` negligence ii .improper PPE iii. poor site management iv .lack of knowledge v. poor attitude vi. organizational commitment vii. communication among workers viii .obstacles to safety	Analysis of key functional areas like operations management, R&D, and OSH administration provide insights into improvement.
5.	China (Tam et al., 2004)	i. poor safety awareness of top management ii. lack of training iii. poor safety awareness of project manager iv .reluctant to input resources to safety v .reckless operation vii .poor equipment	

‘Table 2.1, continued’

No.	Places	Factors	Comments
6.	Hong Kong (Fang et al., 2006)	i. Management commitment ii. employees involvement iii. resources and training iv. inappropriate safety procedures v. work pressure vi .competence vii. appraisal of hazard and reporting	There is significant statistical relationships between safety climate and personal characteristics including safety knowledge, direct employer and individual safety behavior
7.	Kuwait (Katram et al., 2000)	i. disorganised labour ii. extensive use of subcontractor iii. lack of safety regulation and legislation iv. low priority given to safety v. competitive tendering vi. severe weather condition vii. poor accident record keeping and reporting systems xiii. extensive use of foreign labor ix. small size of most construction firms.	
8.	Libya (Al-Kilani, 2011)	i. management commitment ii. role of workers iii. safety knowledge iv. safety awareness v .lack of training vi. delivery system	

'Table 2.1, continued'

No.	Places	Factors	Comments
9.	Saudi Arabia (Al Haadir, 2011)	I .management support ii. clear and reasonable objectives iii. personal attitude iv. teamwork v. effective enforcement vi. safety training vii. suitable supervision	They do not know why the safety programs do not work efficiently, or where to start.
10.	Australia (Lingard, 2011)	I .management commitment ii. communicating among workers iii. co-worker support iv .supervisor role v. obstacles to safety	There have been a move away from measuring safety using retrospective data such as lost time incidents.
11.	USA (Abdelhamid, 2000);(Toole, 2002)	I .improper PPE ii. unsafe acts iii. lack of supervision iv. unsafe position and posture v .poor housekeeping vi .inadequate training vii. poor attitude	

'Table 2.1, continued'

No.	Places	Factors	Comments
12.	Jordan (Mohammad et al., 2010)	i. lack of safety regulation awareness ii .lack of enforcement iii. incompetent personnel iv. mechanical failure v. chemical impairment	
13.	Turkey (Colak et al., 2004)	poor attitude ii. unsafe site condition iii. Lack of knowledge and training iv. defective material used v improper PPE	
14.	Uganda (Lubega et al., 2000)	i. lack of safety regulation awareness ii .lack of enforcement iii .incompetent personnel iv. poor attitude v. improper PPE	

Some researchers have tried to identify the common characteristics between surveys, particularly on dimensions as shown in Table 2.2.

Table 2.2: Safety Dimensions

No.	Researcher	Dimensions	Comments
1.	(Clarke, 2000)	i. safety management systems ii. individual responsibility and involvement iii. work task/work environment iv. management attitudes v. management actions.	Reviewed 16 studies on safety climate and found a variation in the safety climate dimension used.
2.	(Flin, et al., 2000)	i. management / supervision ii. safety system iii. risk iv. work pressure v. competence vi. procedures / rules	6 common themes in safety climate questionnaire were identified.
3.	(Guldenmund, 2010)	i. management ii. risk iii safety arrangements iv. procedures v training vi. work pressure	

'Table 2.2, continued'

No.	Researcher	Dimensions	Comments
4.	Nordic Safety Climate Questionnaire (NOSACQ-50,2010)	i management safety priority commitment, and competence ii. management safety empowerment iii .management safety justice iv. worker`s safety commitment v. worker`s safety priority and risk non-acceptance vi. safety communication, learning, and trust in co-workers safety competence vii. worker`s trust in the efficacy of safety systems	A team of Nordic OSH researchers has developed a NOSACQ-50 based on organizational and safety climate theory, psychological theory, previous empirical research and results acquired through international studies.
5.	(Flin, et al., 2000)	i. management ii. risk iii .safety arrangements	Draw the conclusion that there are approximately three core themes.

Moreover, there are lists of safety culture and safety climate studies collected from year 1980 to 2010 in Appendix C. Using factor analysis (FA), author grouped and renamed all the (16) sixteen identified variables which are affecting the safety programs and safety climate into FOUR (4) groups namely (i) management commitment; (ii) employees participation; (iii) training and education; and (iv) communication as in Figure 2.2. This will be discussed later in Chapter 3.

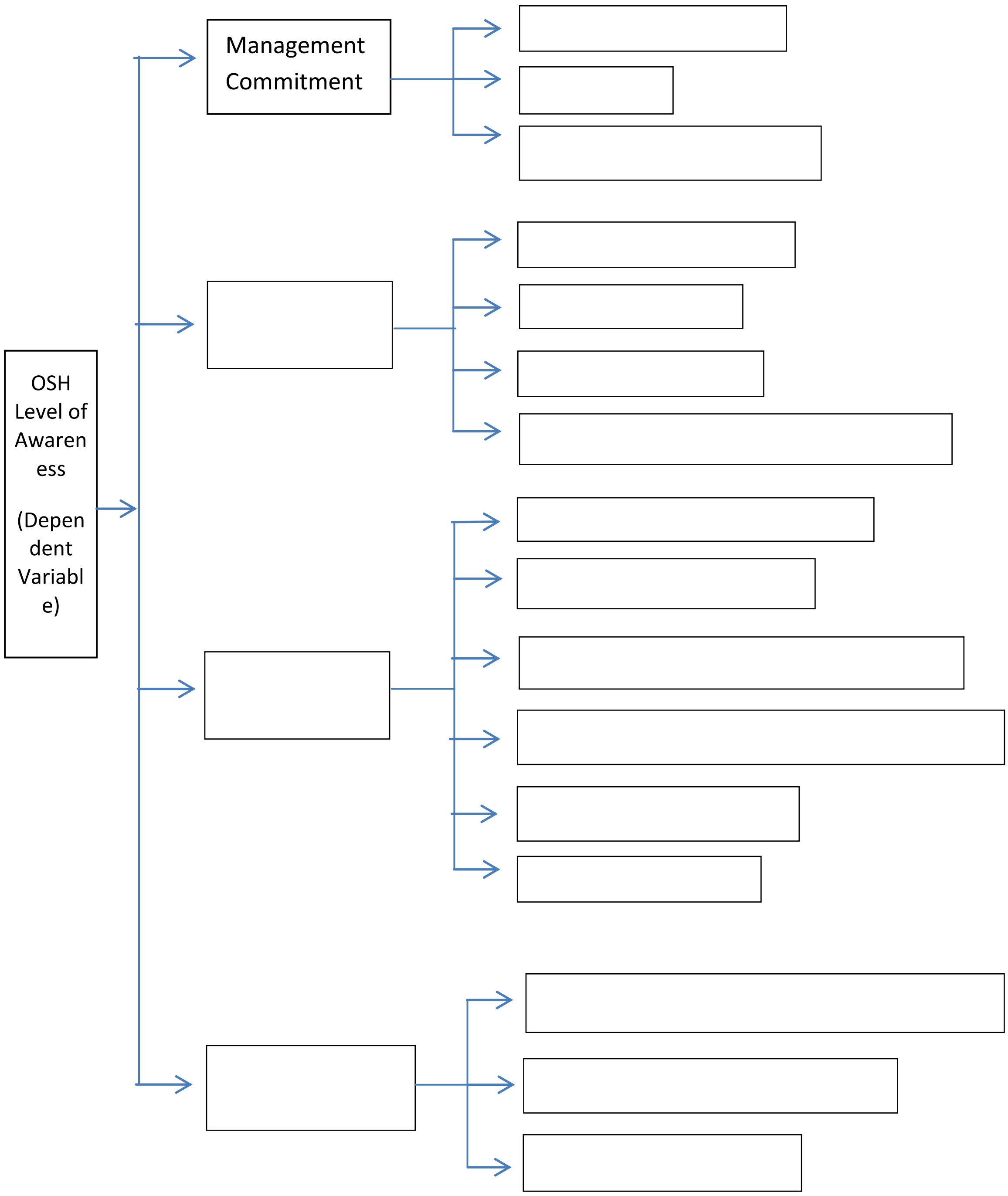


Figure 2.2: The Proposed Safety Climate Factors

2.6 Selection Of OSH Culture Asseeement Tools

In this subsection, the selection of tools that can be used to measure the LoA of organizational safety culture is discussed. First, the criteria for selection and search strategies are discussed. Next, each tool with features and specific approaches are described in detail. Finally, the common features of these devices are discussed and practical advice on the selection of the most appropriate tools given and implementation issues regarding the device. It should be noted a number of the proposal selection tools to measure the LoA that will be discussed is not an absolute recommendation by researcher. Selected tools should be considered merely with these considerations in mind and had to comply with the following criteria:

The Tool should be available within the public domain, and preferably accessible through the Internet.

The Tool should preferably be free of charge at the point of use (i.e. not commercial)

The Tool should be primarily aimed at OSH practitioners, and also as information to business managers in organisations.

Therefore the tool should at least have some guidelines to facilitate the use of OSH culture assessment in the organization. Prior to getting the appropriate approach to measure safety climate, five tools have been selected, namely:

1) Score Your Safety Culture Checklist
2) Safety Climate Assessment Toolkit and User Guide (LSCAT)
3) Safety Health of Maintenance Engineering (SHoMe) Tool
4) Nordic Occupational Safety Climate Questionnaire (NOSACQ-50)
5) Railway Safety Standard Board-(RSSB Safety Culture Toolkit)

2.6.1 Score Your Safety Culture Checklist

The ‘Checklist for Assessing Institutional Resilience’, was developed by James Reason and John Wreathall. It was first time presented at the 2000 Manley Conference in Sydney, Australia, and published in the January-February 2001 edition of Flight Safety Australia. Confusingly, this tool is also known as the ‘Score Your Safety Culture Checklist’.

This instrument consists of 20 statements that describe various aspects of safety manner, such as how organizational safety culture is considered by senior management. The respondents were asked to read the statements given and evaluate each as either a ‘Yes’, ‘No’ or ‘Do not know’. Scoring is analyzed and generated single-digit scores that summarize the state of organizational safety culture/institutional resilience. Rating interpreted according to the following criteria:

16-20: So healthy as to be barely credible!

11-15: You’re in good shape, but don’t forget to be uneasy.

6-10 : No at all bad, but there is still a long way to go.

1-5 : The organisation is very vulnerable.

0 : Jurassic Park!

Compared with other safety culture assessment tools, Score Checklist for Your Safety Culture is relatively uncomplicated in terms of its structure and scoring system. This makes it very easy to use, especially for new and inexperienced users. However, there is still a lack of it in the following areas:

a) A lack of benchmarking data and the potential for collecting it.

b) The complexity of the language used in the items.

In addition, this checklist should be modified if is to be used more effectively in other industrial sectors.

2.6.2 Safety Climate Assessment Toolkit and User Guide (LSCAT)

The Loughborough Safety Climate Assessment Toolkit (LSCAT) is 'free at the point of use' tools. It has been designed to enable organizations to measure safety culture practiced by combining quantitative and qualitative methods. This kit uses the principle of triangulation, comprising a combination of data obtained from the survey with additional data sources as follows:

a) informal discussions within individual

b) focus groups

c) document analysis

d) inspection records and data bases

Respondents can exploit a variety of methods of data collection of safety climate assessment through triangulation approach. The advantage of using a variety of methods to assess the safety culture allows different aspects of safety culture to be evaluated (see Table 2.3).

Table 2.3: Different perspectives on safety culture relating assessment methods of LSCAT

Safety culture viewed as	Assessment methods
Objective organisational attribute	Observation, audit
Perceptions of the organisation	Interviews, questionnaires, etc.
Individual perceptions	Questionnaires, observation, etc.

Source :(Guldenmund, 2010)

The questionnaire consists of 47 items that evaluate the following organizational factors such as organizational content, the social environment, individual appreciation, the work environment, and the organization specific factors. Initially, the Toolkit has been developed for use in the offshore oil and gas, but with some modifications it has been used in other sectors e.g. in the health sector in the UK by the Royal College of Nursing. A comprehensive guideline for users can be downloaded from the Loughborough University website for free. This document is very comprehensive covering all the basic information needed by the user, on how to evaluate the elements contained in the questionnaire. Results of the evaluation are displayed by using 'radar plots', together with the relevant information that serves as a useful guideline to understand the safety culture and issues that exist in the organization.

This document also outlines the procedure on how to set up and conduct interviews and use behavioral indicators to support the collection and interpretation of data such as direct observation of unsafe acts, and other documentation. However the use of this tool can create problems for respondents with limited training or no training in qualitative research methods. Given the relatively simple use of quantitative methods over qualitative methods, the questionnaire is potentially the most useful component for evaluating OSH. Potential users may be attracted to this Toolkit for benchmarking data which are available from the University of Loughborough. However, given that the Toolkit users will require at least a basic level of expertise and commitment, compatibility Toolkits for use in very small (i.e. micro-organization less than five employees) are questionable.

Web link: http://www.lboro.ac.uk/departments/sbe/downloads/pmdc/safety-climate-assessment-toolkit.pdf.

2.6.3 Safety Health of Maintenance Engineering (SHoMe) Tool

Safety Health Maintenance Engineering Tools (SHoMe) was developed on behalf of the UK Civil Aviation Authority by the Health and Safety Engineering Consultants Limited. The purpose of this tool was to identify the indicators of 'health safety' in aviation engineering maintenance organizations. This device is suitable for use either for larger or smaller organizations. In this context, 'health safety' is understood as the property of the organization, and is not related to the behavior of individual employee's health and safety. SHoMe tool designed in three sets of questionnaires, each set aims to evaluate one of the working groups listed below. Set of questions which will be conducted on different groups of workers as shown in Table 2.4.

Table 2.4: Overview of the three questionnaires of the SHoMe Tool

Worker group	Generic questionnaire	Job difficulty questionnaire	Organisational questionnaire
Technical certifying staff	Version 1	Standard	Standard
Technical non-certifying staff	Version 2	Standard	Standard
Management and technical support staff	Version 3	Not applicable	Not applicable

Source :(Guldenmund, 2010)

Each set of questions consisted of three parts, namely in the form of Generic, Job Difficulties Questionnaire survey and Organization Questionnaire. Generic questionnaires, which consists of 83 questions that require respondents to answer using a five point Likert scale where 1 = Strongly disagree and 5 = Strongly agree. The 'Job Difficulties Questionnaire' which consists of 32 statements that requires the answer 'Yes' or 'No' to indicate if the task forms part of the respondents. If the answer 'Yes' is given, respondents are asked to rate the level of difficulty experienced from the following three options: (1) 'No problem', (2) 'Some problems' or (3) 'Major problem'. The 'Organizational Questionnaire' which consisted of 92 statements pertaining to various circumstances that might occur in the organization. These could include e.g. 'Noisy working environments' or 'the general space in and around an aircraft'. The respondents were asked to respond if any of these statements have caused them or a colleague to make a mistake or cause them or colleagues' confusion or uncertainty over a job or otherwise affected airworthiness.

ShoMe uses a scoring system in the form of software that requires a lot of procedures when using the tools. The results are shown in the format that was developed to help senior managers to identify the most pressing concerns of the human factor. Decisions involving 19 separate human factors "root issues" that have the potential to affect the performance of safe and reliable maintenance, including the provision of resources, training, fatigue, satisfaction, job stress, and others.

Documentation 'Introduction to Device' and 'User Guide' supplied with reference to the user. This includes all levels of use of tools such as how to use the software, how to handle the questionnaire, data entry, how to analyze the data and interpretation of results. User Guide supplied helped in stating the obvious criteria to interpret the output. However, these tools do not have benchmarking data.

This tool can be used by management as part of the audit process ‘health safety’, or as a pro-active step in assessing ‘health safety’. The main purpose of this tool is to identify and highlight safety issues within the organization that may potentially cause problems, may occur beyond the control or knowledge of senior management. However, a key limitation of SHoMe is that it is designed for use in aviation maintenance industry. However, it could be changed to make this tool relevant to other industries/other sectors. It is assumed that the consent of the developer will be required to do this.

Weblink: http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode= detail&id=1129

2.6.4 Nordic Occupational Safety Climate Questionnaire (NOSACQ)

The Nordic Occupational Safety Climate Questionnaire (NOSACQ-50) was developed by a team of occupational safety researchers from respectively Scandinavian countries including Denmark (NRCWE), Finland (FIOH), Iceland (Administration of Occupational Safety and Health Administration), Norway (University of Stavanger) and Sweden (University of Gothenburg). The tool is based on the theory of organizational climate and safety, psychological theory, previous empirical research, and empirical results obtained through international research and continuous development process. NOSACQ-50 has been pilot tested in a variety of industries in all the Nordic countries, and the results confirm the reliability and validity of the questionnaire. It is available in many languages including: Chinese (simplified), Czech, Dutch (Belgium and Netherlands), Danish, English, Finnish, French (Belgium), Germany, Hungary, Iceland, Italy, Norwegian, Persian, Polish, Russian, Slovene, Spain and Sweden, versions and other languages versions are being prepared. This makes it easy applied in companies that have a multilingual workforce and/or multinational. The results using this tool from all over the world are collected in an international database to enable benchmarking made for the purpose of further development of this tool. Questionnaires have been used in some of the high risk of injury, such as construction, manufacturing, healthcare, transportation, etc. Safety climate is defined as the shared perceptions of work group manager and group safety policy related work, procedures and practices. In other words, the safety climate reflects employees' perception about the true value of safety in an organization.

The tool consists of 50 items across seven dimensions, i.e. shared perceptions of:

a) management safety priority, commitment, and competence

b) management safety empowerment

c) management safety justice

d) workers' safety priority and risk non-acceptance

e) workers' safety commitment

f) workers' trust in the efficacy of safety systems

g) safety communication, learning, and trust in co-workers' safety competence

An example of a resulting NOSACQ-50 diagram is shown in Figure 2.3.

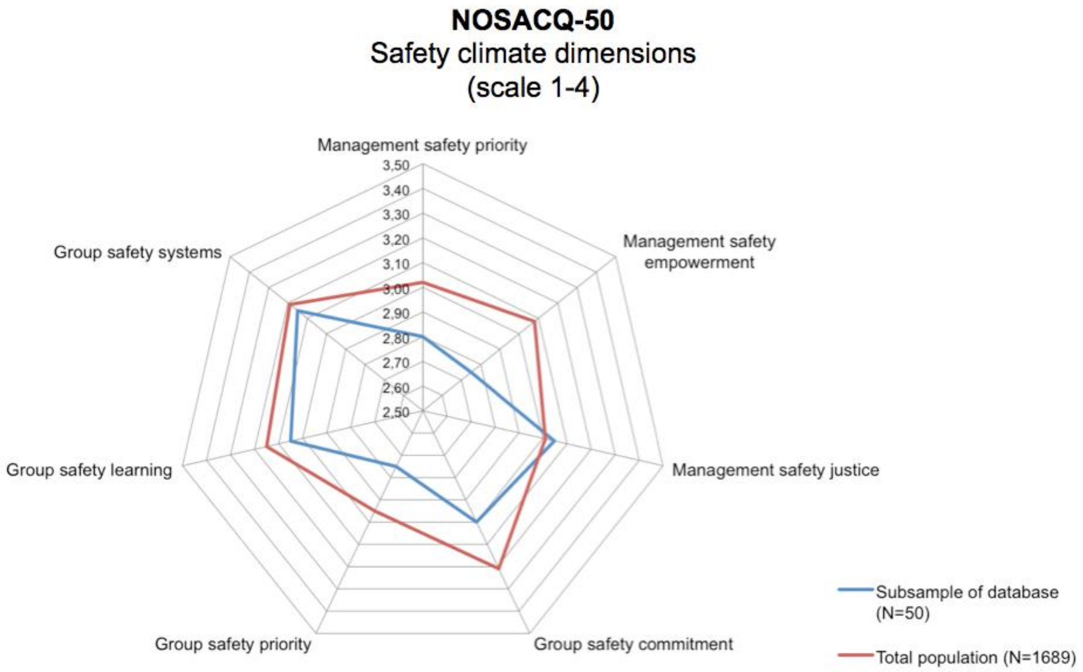


Figure 2.3: Example of a NOSACQ diagram.

NOSACQ-50 in full version can be used or tailored to obtain research tools that meet the research situation. This is important to obtain the results desired. Use of this tool is free of charge for the purposes of exchange of the information (data and experience), and it cannot be used commercially.

Weblink: http://www.arbejdsmiljoforskning.dk/Spørgeskemaer/NOSACQ-50.aspx?lang=en

2.6.5 The Railway Safety Standard Board-(RSSB Safety Culture Toolkit).

This toolkit has been designed for the rail industry but will also be of relevance to non-rail companies. It provides public access to background information on safety culture, guidance on conducting analyses and development. The RSSB safety culture assessment survey was first developed in 1997 for the Railway Safety and Standards Board and had been used by many rail companies. It comprised a standard questionnaire that was analysed by RSSB and they produced a report for the assessed company. This provided a comprehensive safety culture, self-assessment package which included the following features:

a) Useful background information on safety culture;

b) On-line and/or paper-based safety culture self-assessment using a standardised questionnaire;

c) Automated analysis of results and production of graphical outputs;

d) Access to assessment-specific improvement solutions;

e) Industry benchmarking;

f) Links to solutions and good practice

This site is designed for safety managers and supervisors involved in planning and implementing safety policy and safety management systems. It is relevant to all companies (rail and non-rail) regardless of their current level of safety culture: there is always room for improvement and the site will offer advice and good practice guidance specific to their current level of safety culture development.

2.6.5.1 The Assessmet ToolKit

There are many differing models of safety culture, however they all tend to focus on very similar areas. The RSSB safety culture assessment approach reflects consideration of these and is based around the following 4 key elements (of a 'positive' safety culture), 11 'factors' and associated 'sub-factors' as shown in Table 2.5

Table 2.5: Key Element, Factor and Sub Factor In RSSB Toolkit

Key Element	Factor	Sub Factor
Effective & appropriate safety management systems	Barriers & influences	Practicality of tasks
		Procedure practicality
		Resources & equipment availability
	Training	Personal H&S training
		Priority on H&S training
		Training/Refresher Frequency
	Communications	Management feedback
		Quality of communications
Demonstrable management commitment to H&S (senior and line)	Organisational commitment	Genuine Commitment to H&S
		Resources and systems
		Safety vs. Commercial priority
		Senior managers' attention to H&S
	Management Commitment	Challenging Non-compliance
		Senior Management Visibility
		Management response to H&S suggestions
	Supervisor's Role	My Supervisor
Participation, involvement & workforce attitude to H&S	Personal role	Personal Confidence & Understanding
		Personal Responsibility for H&S
	Work mate's influence	Attitude towards colleagues
		Workmate's H&S behaviours
	Risk taking behaviours	PPE use
		Compliance levels
	Employee participation	Level of Trust
		Management/workforce collaboration
Organisational learning & continuous improvement	Organisational learning	Just culture
		Level of reporting
		Learning attitude

Source: http://rssb.info-exchange.com/?=130071

The main assessment tool is the survey that includes 54 questions to assess employee attitudes, values and perceptions towards safety and safety management systems across the 11 safety culture 'factors'. The survey can be tailored to an individual company by defining the job roles, departments and locations to be included in the survey.

The survey is distributed and completed, either via hard copy or directly on-line. The software then allows a range of analyses to be conducted that automatically generates results-specific guidance.

The specific guidance is generated automatically by the toolkit from analysis of the survey responses. This provides:

- An overall assessment of the organisation's safety culture level
- Identification of the overall priority 'enablers' for safety culture improvement
- Identification of detailed areas to address and potential "quick wins"
- Identification of issues that require further investigation
- Links to improvement examples

The main overview is obtained by:

- Selecting the default options in the 'Standard reports' Function menu to run an overall assessment report for the whole company. This will provide an indication of the overall/company average safety culture development level and relative strengths and weaknesses across all factors/questions, roles, locations and departments
- Comparing up to 6 roles, departments or locations to identify relative strengths and weaknesses across all factors
- Generate an industry benchmarking report to compare anonymous company results against companies in the same sector

2.7 Proposed Measuring Safety Culture/Climate Toolkit

Since there are contextual differences between and within the organization, then the approach to adopt the standard, 'one size fits all' strategy cannot be practiced. Measure and diagnose the safety culture of an organization cannot just 'take from the shelf devices'. It needs to have a tailored approach taking into account the local context. Therefore, merging several methods and tools to measure safety climate is highly recommended during the assessment process. This approach is recommended to ensure that the safety culture assessment process would produce the best results as expected and can help organizations create a work environment that is safe and conducive.

Most of the tools are 'free at the point of use' to help organizations in the assessment process of safety culture/climate. There are advantages and disadvantages in the five methods discussed. Based on the advantages and disadvantages that are shown in Table 2.6, the author decided to select the tool from Loughborough Safety Culture Assessment Toolkit(LSCAT) issued by Health and Safety Executive (HSE), United Kingdom. It is the collaboration between the Offshore Safety Division of the HSE, Chevron UK and the Railway Safety Standard Board (RSSB Safety Culture Toolkit) which led to the creation of a set of tools that will be used in the study.

Both of these methods were chosen because it was easy to use and the questions were short but clear. These types of questions are related to the current study and have been widely used in previous studies and the results confirm their reliability and validity of the questionnaire. Several reasons have been mentioned in previous subsections. Almost all the research questions used in this research were research independent and dependent variables. Types of questions chosen were according to the suitability to the study and local conditions.

Table 2.6 Characteristics of the Safety Culture/Climate Toolkits

Tools	Advantages	Disadvantages
Score Your Safety culture Checklist (developed by James Reason and John Wreathall,2000 in Australia)	-Structure and Scoring system Is uncomplicated. -Easy to use for beginners and inexperienced user.	-Lacking of benchmarking data -complexity of languages used -need to be modify to be used more effective in other industrial
Loughborough Safety Culture Assessment Toolkit(LSCAT) (developed by Loughborough University)	-it was developed initially for use in oil and gas. -benchmarking data available from Loughborough University	--need to be modify to be used more effective in other industrial -need some knowledge to use it.
Safety Health of Maintenance Engineering (SHoMe) Tool (was developed by UK Civil Aviation Authority)	-initially was developed to identify indicators of `safety health` in aviation engineering maintenance organization.	- need to be modify to be used more effective in other industrial
Railway Safety Standard Board (RSSB Safety Culture Toolkit) (developed by Railway Safety and Standard Board)	-This toolkit has been designed for the rail industry but will also be of relevance to non-rail companies. - It provides public access to background information on safety culture, guidance on conducting analyses and development. - provided a comprehensive safety culture self-assessment package.	- provided a comprehensive safety culture self-assessment package, need to be modify to be used more effective in other industrial

'Table 2.6 continued'

Tools	Advantages	Disadvantages
Nordic Occupational Safety Climate Questionnaire (NOSACQ-50). (developed by Consortium of some Scandinavian Institutes)	-The Tool is based on organisational and safety climate theory, psychological theory, previous empirical research, and empirical results acquired through international studies and a continuous development process. -have been pilot tested in various industries in all Nordic countries and the result confirm the reliability and validity of the questionnaire. -available in numerous languages. -already been applied in several high injury risk sectors, e.g. construction, manufacturing, health care, transport, etc.	

In preparing the assessment tool, several factors were involved such as independent and dependent factors. Accordingly, the explanation about these factors will be discussed in the subsection below.

2.8 Dependent Factor

Dependent variable is the result or effect in the relationship between the variables (Chua, 2006). Level of Awareness is the dependent factor in this study, and explanation about it will be found in the next subsection.

2.8.1 Level of Awareness (LoA) of OSH

It is important to measure LoA and improve the health and safety of a company (HSE, 2001). A positive and high compliance on safety aspects is important in carrying out the work. This is for ensuring worker safety. Several studies Brown et al. (2000); Department of Employment and Workplace Relations Office of Australian Safety and Compensation (2005); Hofman (1996); Seo (2005); Thomas (1999), focused on discovering mechanisms between particular organizational factors and individual safety awareness.

In UK and Australia, there has been a move away from measuring safety using retrospective data such as lost time incidents. '*There is currently a move towards predictive assessments of the safety climate of the organization or worksite'* (Australia, *1994; Department of Employment and Workplace Relations Office of Australian Safety and Compensation, 2005; Lingard, 2011; Wales, 2001).*

A number of methods have been developed to measure awareness. One method is to use five common factors which are: 1) perceptions of management's commitment to safety; 2) perceptions of safety management systems; and 3) perceptions of risk; 4) work pressure and 5) competence as propose by (Flin, et al., 2000).

'Management commitment to safety would lead to active promotion of safety activities (Zhang, et al., 2002) and more supervision' (Zohar, 2000).

Management has a key influence on the organization safety culture. A review revealed that workers' perceptions of management attitude and behavior towards safety are useful measures of an organization's safety climate. Production planning and discipline are also important.

"More devotion to safety training would increase workers' competence. More supervisors' involvement would enhance employees' awareness and behavior" (Simard, 1994).

The main issue is clearly that the safety culture approach is to identify and clarify the relationship between the organization's safety culture and safety awareness (i.e. how the features of organizational safety culture affects safety). The accident records (self-reported accident statistics, observed incidents/near miss), compliance with safety regulations and employee behavior could be an indication of an organization's safety awareness.

'The underlying reasoning is that by enforcing and enhancing an organization's safety culture-assuming that this is feasible – workers' behavior compliance and participation (i.e. their willingness and motivation to contribute to safety beyond the minimum requirements) would be influenced positively, eventually leading to higher level of safety in organization"(Guldenmund, 2010).

Based among others on the meta-analysis review, there is growing evidence that the safety climate (i.e. shared perceptions of workers, as measured by the survey) is a predictor of safety awareness, and it is found across industries and countries (Christian et al., 2009; Clarke, 2006; Kuenzi, 2009; Nahrgang et al., 2006).

A recent study by Smith (2009), found that studies conducted not only shows the relationship between safety climate and safety awareness while working alone but more focused on a more consistent and independent integration between employees at all times.

Based on the results of previous studies it is shown that safety climate can be used as predictors of safety awareness, and it can form the basis of the more pro-active preventive actions before a work-related accident really happened (Antonsen, 2009; Flin, et al., 2000).

2.9 Independent Factors

Independent variables are the causes or factors that existed before the change in the dependent variable (Chua, 2006). Based on the literature review made and through validation, researcher had identified 16 potential variables that affect the safety awareness to make the survey questions. Furthermore, based on factor analysis test, the 16 variables were grouped into fours dimensions: management commitment, employee’s participation, training and education and communication in which will be discussed in next subsection.

2.9.1 Management Commitment

There are three factors in this group: management support, teamwork, clear and realistic goals. Details in Table 2.7.

Table 2.7: Management Commitment Factors

Factors	Description	References
Management Support	It is evident that management plays a very important role in an efficient and effective safety program. Management must fully and actively translate ideas into safety actions, including issuing a written comprehensive safety policy, allocating sufficient resources, promptly reacting to safety suggestions and complaints, attending regular safety meetings and training, regularly visiting the workplace following the same safety rules as others, etc.	Pierce(1995b), Blake(1997), Stranks (2000), Rowlinson (2003), Rechenthin (2004), Abudayyeh et al.(2006), Herrero et al.(2006), Aksorn and Hadikusumo (2008)
Teamwork	A safety program succeeds when all concerned parties from top to bottom hierarchical levels realize that preventing accidents is everyone`s responsibility.	McGowan and Norton(1989),Krause (1997), Ulloa and Adams (2004)

Adapted from Aksorn (2008)

‘Table 2.7 Continued’

Factors	Description	References
Clear and Realistic Goals	Safety programs can accomplish the desired results when safety goals have clearly established. The safety goals should give a clear picture, directing and focus for performing day to day activities in order to reach desired results. When realistic and achievable goals are set up, the progress towards accomplishing such goals can be easily measured.	Weber (1992a), Cooper(1993), Pierce (1995a), Blake (1997), Aksorn and Hadikusumo (2008)

Adapted from Aksorn (2008)

2.9.2 Employees participation

There are four factors in this group: positive group, personal attitude, personal motivation and continuing participation of employees as shown in Table 2.8.

Table 2.8: Employees' Participation Factors

Factors	Description	References
Positive group norms	Group norms are the accepted attitudes about various things amongst a group of people. In practice, members of a group conform to certain attitudes simply to avoid sanctions. If positive attitudes towards safety can be built and embedded within group, safety can then be managed successfully.	Petersen (1984), Sarkus (1977), Stranks (2000), Johnson (2003)
Personal attitude	Attitude is a tendency to respond positively and/or negatively to certain persons, objects or situations and is normally built up through experience. Individuals, however, differ in their perception of risks and willingness to take risks. Successful safety programs can be achieved if the positive attitudes of employees toward safety are reinforced.	Levitt and Samelson (1993), Stranks (1994), Tam et al.(2001), Johnson (2003), Schultz (2004), Fang et al. (2006).

'Table 2.8 Continued'

Factors	Description	References
Personal motivation	Although workers have adequate knowledge and skills to accomplish their jobs safely they will not however, work in such manner unless they are motivated to do so. To ensure commendable safety records, all personnel in the workplace must be motivated to carry out their job responsibilities safely, by the possibilities of achievement and recognition, opportunity for additional responsibilities, rewards, and personal growth.	Petersen (1984), Levitt and Samelson (1993), Stranks (1994), Neal and Griffin (2002), Johnson (2003)
Continuing participation of employees	-Successfully safety programs largely depend on employee involvement as workers tend to support the activities that they themselves help to create. -Workers should be given opportunities to provide input into the design and implementation of safety programs such as being a member of the safety committee, reporting hazards and unsafe practices to supervisors and identifying training needs, investigating an accidents , etc.	Peyton and Rubio (1991), Harper and Koehn (1998), Ariss (2003), Smith (2003), Abudayyeh et al.(2006).

Adapted from Aksorn (2008)

2.9.3 Training and Education

There are six factors in this group: effective enforcement scheme, appropriate supervision, appropriate safety education and training, safety equipment acquisition and maintenance, personal competency and program evaluation as shown in Table 2.9.

Table 2.9: Training and Education Factors

Factors	Description	References
Effective Enforcement Scheme	Not conforming to safety rules is known as a violation. Violation need to be encountered with enforcement. Management must therefore provide the means of enforcing workers, especially the violators, to obey the safety rules and regulations. By providing an effective enforcing mechanism, management will face less cases of violation by employees.	Pierce(1995b),Michaud (1995), Construction Safety Association of Ontario(2002), Fang at al.(2004)
Appropriate Safety Education and Training	A successful safety program can be achieved if all employees are given periodic educational and training programs in order to improve their knowledge and skills on safety at work.	Cooper and Cotton (2000), Toole(2002),Tam et al.(2004), Fang et al.(2004), Fang et al.(2006).

Adapted from Aksorn (2008)

'Table 2.9 Continued'

Factors	Description	References
Safety equipment acquisition and Maintenance	The workplace must be carefully assessed to determine possible hazards on order for proper selection of safety equipment. An effective safety program results in fewer injuries due to proper safety equipment acquisition and maintenance. Managing a safety equipment program takes up not only a large percentage of time for purchasing the correct equipment, maintaining them good condition, and inventory control, but it also requires a good cooperation amongst the safety manager/head purchasing, production, warehouse supervisor, maintenance manager, etc.	Toole (2002), Tam et al.(2004)
Personal Competency	A successful safety program also results from placing the right person on the right job. The right person is defined as the person(s) who are physically and mentally capable for carrying out the assigned tasks with the right knowledge, experience and skills.	Top (1991), Mohamed (2002), Tam et al.(2004), Fang et al. (2006).

Adapted from Aksorn (2008)

'Table 2.9 Continued'

Factors	Description	References
Appropriate Supervision	A sound safety program requires employers to provide sufficient supervision in protecting workers from workplace hazards. Successful supervision requires competent personal to assign work in line with the worker`s ability, appraise workers when they do job safely, communicate by listening and speaking , set a good example by following the same safety rules and correct arising safety problems.	Weber(1992b), Levitt and Samelson (1993), Ontario Ministry of Labor(1999), Stranks(2000), Fang et al.(2004).
Program Evaluation	Safety programs should be periodically evaluated to determine its success in meeting set out goals and objectives. When the implementation of a safety program does not meet the defined goals, an evaluation process can facilitate in identify the shortcomings of the program and thereafter, areas for improvements can be traced and reviewed accordingly.	Peyton and Rubio (1991), Pierce (1995b), Olakhoma Department of Labor (1998), Stranks(2000), Abudayyeh et al. (2006)

Adapted from Aksorn (2008)

2.9.4 Communication

There are three factors in this group: delegation of authority and responsibility and good communication as shown in Table 2.10.

Table 2.10: Communication Factors

Factors	Description	References
Delegation of Authority and Responsibility	Any one individual cannot make a safety program successful. Therefore, responsibilities to safely accomplish activities must be transferred to individuals at lower levels of authorities. Effective delegation involves granting adequate authorities and assigning clear responsibilities to perform specific tasks with enough resources such as appropriate completion time, money and cooperation of all involved parties.	Anton (1989), Oklahoma Department of Labor (1998), Rue and Byars (2001), Abudayyeh et al.(2006)

Adapted from Aksorn (2008)

'Table 2.10 Continued'

Factors	Description	References
Sufficient Resource Allocation	The goals of safety programs cannot be accomplished without adequate resources. An effective safety program results from the commitment of the top management to providing an appropriate level of resources. Management must consider and allocate sufficient resources to carry out day to day activities to accomplish both short- term and long-term goals. The resources required for effective safety program may include sufficient staff, time, money, information, methods used in safety works, facilities, machine, etc.	Erikson (1997), Olakhoma Department of Labor (1998), Rollenhagen and Kahibom (2001), Rechenthin (2004),Abudayyeh et al. (2006).
Good Communication	When the lines or communications between management and workforce are open, workers can bring reports of unsafe working practices and hazardous environments to management`s attention. Management in turn can communicate their concerns and priorities of safety to gain employee's compliance and awareness.	Peyton and Rubio (1991), Stranks (1994), Vredenburgh (2002), Fang et al.(2004), Abudayyeh et al.(2006).

Adapted from Aksorn (2008)

2.10 Concluding Remarks

In this chapter discussed the importance of measuring the LoA of implementation occupational safety and health program in an organization, approach to measuring awareness, the factors involved, the definition and the selection of appropriate measurement methods. The next chapter will discuss the methodology used in this study.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter describes the methodology used in this study. This is an important part of the research as it will eventually determine the reliability of the analysis and the findings. It describes all the approaches used in this study. Based on literature review, a theoretical model is then developed. The proposed theoretical model can be used by practitioners and stakeholders in the selection of the factors for LoA of OSH management system. For data collection, this research carried out pilot study and field survey using self-explanatory questionnaires. Data were then analyzed based on the multivariate analysis.

The study emphasizes on respondents` knowledge and perception based on their vast experience in supervising projects in their daily work activities at construction sites. It is postulated that a set of significant safety factors will emerge from the study and as such, the lesson learnt by the respondents on what are the inter-related key areas that are of critical importance are captured in this study. This study then, correlates the safety factors relevant to the Malaysian construction industry.

The research methodology is based on the Flow Chart shown in Figure 3.1.

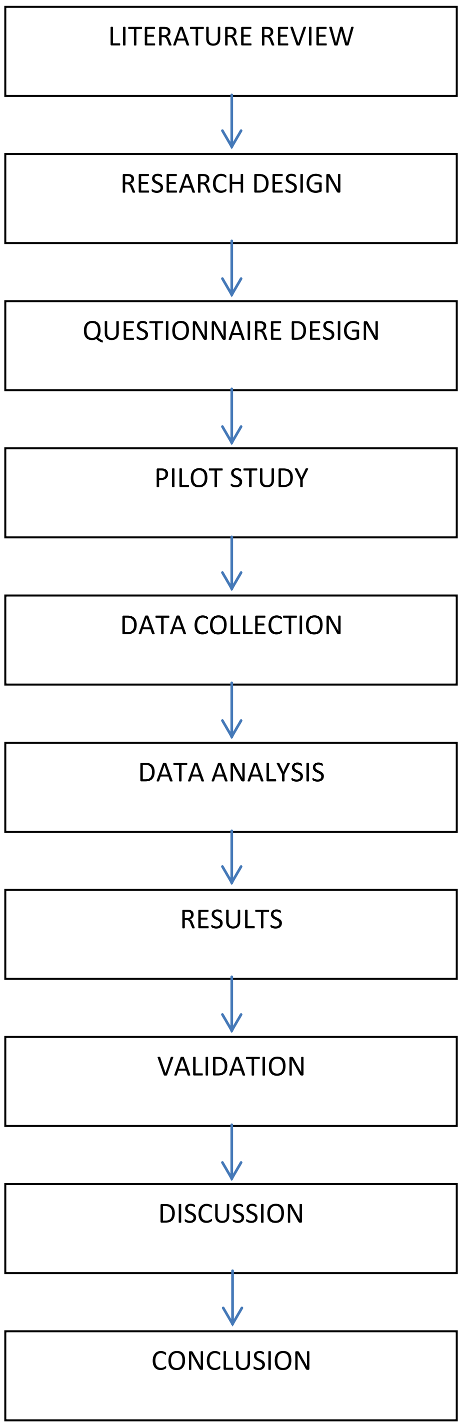


Figure 3.1: Flow Chart of Research Methodology

3.1 Research Design

This study was set to examine all the objectives stated in Section 1.2, among supervisory workers in DID Malaysia. Factors of the organization's safety climate was determined as management commitment, training and education, communication, and employees' participation whereas the factors of LoA was identified with policy of the organization, safety orientation among employees, risk assessment done within the organization and also review of all the factors stated before.

The research started with the gathering of information through literature review, in which factors that might affect the safety and health standards of construction industry in general were identified. A pilot study questionnaire was then prepared based on this preliminary list of factors. The draft questionnaire was first sent to various levels of supervisory employees in Department of Irrigation and Drainage Malaysia for review and comment. Feedback sessions were then conducted with these participants to refine the questionnaire. The amended version was then distributed to the target group in the department for filling out. The sampling technique for each respondent group is largely random. Quantitative techniques were subsequently employed to analyze the feedback before the research findings were organized and concluded in a more meaningful manner.

The study was inclined towards the management of safety and health issues, rather than the scientific and technologies facets. Literature related to this research topic was identified for a more in-depth review. The following subsections provided insights into the appropriate research methodology, design of the questionnaire and analytical techniques. However, the methodology and findings of this research should be referenced with caution, since they were designed to suit localities and conditions of the countries where the research were conducted. The industrial context of Malaysian construction must be duly considered.

The entire samples were selected using simple random sampling techniques and they responded to the questionnaires with guidance from researcher to ensure that they understood the meaning of the questions. They were seated in one room to answer the questionnaires. Every respondent was free to ask questions if they were in doubt or unable to comprehend the questions.

3.2 Research Respondents

Employees of Department of Irrigation and Drainage Malaysia (DID) have been selected for this study. Those included as samples were between ages of 24 to 57 years and with mean supervisory work experiences of 14.1 years with respect to department construction projects. They consist of various levels of position, who conducting supervision work at the construction site and had a background of education levels that range from SPM (C-Level) to bachelor's degree. The department was selected as a study case because it is one of the largest government departments in Malaysia and had been in operation since 1932. The department is also involved with construction work involving the use of human resources as implementers who are exposed to a variety of hazards that can cause accidents that cause serious injuries also lost their lives, which requires systematic safety management. DID provides professional and quality services in the planning, design, implementation and management of all irrigation, drainage, river engineering, coastal engineering and hydrology and water resources programs and projects . The service provided was based on best engineering practices with regard to environmental sustainability, economic and social. Moreover, this study was highly recommended by Human Capital Development Division, DID Malaysia (see Appendix D). Table 3.1 shows the breakdown of respondents who participated in this study.

Table 3.1: Breakdown of respondents representing different positions

	Number of Respondents / Percentages			
	DEP1	(%)	DEP2	(%)
Technician(J17-J26)	38	(45.8)	49	(60.5)
Assistant Engineer (J29-J38)	11	(13.3)	17	(21)
Engineer (J41-J52)	33	(39.8)	15	(18.5)
Manager (J54-above)	1	(1.2)	0	(0)
TOTAL	83	(100)	81	(100)

3.3 Research Instrument

Data for this study consisted of primary data (obtained from questionnaires) and secondary data obtained from sources like journals, books, publication and the internet. The questionnaire used was designed to be self-explanatory to ensure that respondents can complete the questionnaire by themselves. However, the researcher believes that the best way to get a hundred percent response from the entire selected respondents was through personally assisting them on the questionnaires by inviting all of them for a face-to-face meeting. By doing so, the researcher was able to assist, monitor and resolve any questions that might arise. Naoum (1998), claims that this is the best method of data collection as it not only ensures a high response rate but also an accuracy of results.

A token of appreciation was given to each participant before he was asked to fill up the questionnaires. It might help to increase the return rate of the survey as participants may feel that the researcher valued the time they spent completing the survey (Dillman, 2000). It was a specially designed ball-pen that looks attractive and most of the participants used it to fill up the questionnaires.

The questionnaires were divided into three sections, Section 1: requires respondents to fill in their personnel particulars; Section 2: focusses on the factors of the safety climate as practiced in the offices. The intention of Section 3 is to gather information on the factors of LoA of OSH management in the department. All respondents were expected to complete the questionnaire within 30 minutes. However, with personal guidance from the researcher, most of them were able to complete it within 20 minutes.

3.4 Questionnaire Design

The type of population, the nature of the research questions and availability of resources will determine the type of questionnaire to be used to conduct the survey.
Having taken cognizance of both merits and demerits of using various questionnaires, it was decided that combination of self-administered questionnaire with the guidance from researcher would be the most appropriate survey instrument to be used in this exploratory study. According to Glendon, et al. (2006), employed quantitative methods with self-administered survey is the most favourable among researchers because it is convenient, practical and cost effectiveness. Considering the contextual differences between and within organisations, it is not feasible to adopt a standard, ‘one size fits all’ strategy. Addressing and diagnosing an organisation’s safety culture comprises thus more than just simply ‘taking a tool from the shelf’. It implies a tailored approach, taking into account the local context (Bergh, 2011).

In addition, when investigating the feasibility of developing a standard tool for the current study, it is recommended, therefore, to combine several methods and tools during the assessment process. Based on the advantages and disadvantages that were shown in Table 2.8, thereby the Loughborough Safety Culture Assessment Toolkit (LSCAT) and Railway Safety Standard Board (RSSB) Safety Culture Toolkit appeared to be the most suitable for this purpose. Some changes were made through discussion among senior management of the department to suit the situation of the study. Moreover, both Toolkits had been pilot tested and widely used in a variety of industries by many companies all over the world. They had been analysed by appropriate boards; and they provided comprehensive guidelines and reports for users covering all the basic information needed. In other words, they were fully established and questions taken from the two toolkits, can be considered to be valid and reliable.

Peterson (2000), states that as the questionnaire is the 'heart and soul' of a research, it must be constructed effectively to ensure the respondents decode the research questions as intended by the researcher and the answers are encoded to provide the relevant information. As such, in drafting the questionnaires, several points are considered to ensure reliability, accuracy and unbiased responses. The questionnaires are simple, brief and specific (Peterson, 2000), relevant, accurate and not leading, loaded, ambiguous, or double-barrel questions (Zigmund, 2000), uplifting and not boring so as to motivate respondents to become involved and involves 'selling' as to why it is important to participate in the survey to encourage cooperation (Ticker, 2001).

A total of 56 questions were used in research independent and dependent variables. It is simple and bilingual (see Appendix E and Appendix F) to help the respondents to answer questions correctly. The diagnosis of an organisation's safety culture requires a close collaboration between the organisation's internal resource and outside expertise. So one important consideration is the actions that can be taken internally, and the extent to which external consultancy and support is needed. Expert guidance can add significant value - not only for steering and supporting the assessment phase, but also for interpreting the different assessment outcomes and advising which actions could be useful to achieve improvements and change in OSH management (Naoum, 2003). Therefore, experts from the Department Of Occupational Safety and Health (DOSH), En Sharul Nizam Shaharudin (Appendix G), Madam Ho Chong Peng from INTAN (see Appendix H) were also involved to confirm that the questionnaire is constructed effectively. It was also reviewed by DID top management and by the university lecturers.

The questionnaire that was developed comprises of three parts: Respondents Personal Profile, Safety Climate, Safety and Health Awareness as practiced in the department. Respondent Personal Profile section was designed at section one followed by the second section of the questionnaire which covered four variables to gather information on management commitment, workers participation, training and education; and communication towards safety and health.

The final section of the questionnaire was developed to gauge namely factors pertaining to employees' personal orientation, company's policy, risk assessment and review. The respondents were requested to rate each of the 56 questions on a five-point Likert scale. It ranges from 1 (strongly disagree) to 5 (strongly agree). Data collected through Likert scale are highly reliable compared with other scales such as Thurstone and Guttman (Likert, 1932).

The summary of the variables and type of measurement used are shown in Table 3.2.

Table 3.2 : Questionnaire variables and types of measurement.

Variables	Question numbers	Measurement
Management commitment	9	**Rating of 1 for 'strongly disagree'** **Rating of 2 for 'disagree'** **Rating of 3 for 'moderate'** **Rating of 4 for 'agree'** **Rating of 5 for 'strongly agree'**
Employees participation	11	
Training and education	8	
Communication	11	
OSH orientation	3	
Policy	3	
Monitoring	4	
Risk assessment	5	
Review	2	

3.4.1 Respondent Personal Profile (Section 1)

The first part consists of questions about personal detail to get the information about their level of position starting from Manager (J54 –above), Engineer (J41-J52), Assistant Engineer (J29-J38) and Technician (J17-J26). In this study the code 'J' is used to show engineering services in the Malaysian government civil service. The second part consists of questions to determine their level of education either they finish their study at SPM and below, Technical Certificate, Diploma or Degree and above. SPM is equivalent to medium secondary level. Other answers from respondents were their current age and participant's working experiences. Table 3.3 shows the details.

Table 3.3: Personal Profile Questions.

1	Position	[a]	Manager
		[b]	Engineer
		[c]	Assistant Engineer
		[d]	Technician
2	Education Level	[a]	SPM- below (C-Level)
		[b]	Technical Certificate
		[c]	Diploma
		[d]	Degree
		[e]	Master and above
3	Age	________	years old.
4.	Working Experiences	________	years.

3.4.2 Safety Climate factors (Section 2)

The questions in this section of the questionnaire were designed to measure the level of organization safety climate. It started with questions about management commitment, which comprise of nine questions starting from Q1 to Q9. Q10 to Q20 gather information about workers participation towards safety and health in the organization. Q21 until Q28 gather information on training and education and its relation to safety and health among employees. The final part of this section consisted of Q29 until Q39, which were designed to study the communication of safety and health in the organization.

3.4.2.1.Management commitment

Nine questions were used to study the management commitment towards the implementation of Safety and Health. The answers gathered will show the level of current management with regard to the safety and health of their employees. According to Mowday (1979), he defines organizational commitment as the relative strength of and individual identification with and involvement in a particular organization. The relationship factor to this definition was identified as a strong belief in an acceptance of the organization’s goal and values, a willingness to exert considerable effort on behalf of the organization and finally a strong desire to maintain membership in the organization.

All of the nine questions were positive, stated item except Q6 where it was a negative stated question. Q1 was to gather the information on how serious the management put their resources in safety. This included all type of resources especially financial, time, human and also the property of the company.

As all the senior management included in the team of management, Q2 was to ensure that every senior manager understood the importance of safety in every aspect of work and the level of their awareness towards safety thinking.

Q3 and Q4 were about responses given by the general management and immediate manager of employees in term of receiving an idea or suggestion from employees to improve their safety and health condition. In managerial employees, technician is the nearest person to the hazard that existed in their workplace and their suggestions should be taken into consideration in order to improve the level of safety and health in the workplace.

Q5 was intended to know that employees were provided with Personal Protection Equipment by the management to protect them from any work related injury. Q6 to Q9 were the questions on priority, action, recognition and promotion done by the management for safety and health. Table 3.4 shows the details of management commitment questions which had been used in the study.

Table 3.4: Management Commitment Questions

1	The company puts sufficient resources into safety.
2	Senior managers take safely issues into account when making decisions.
3	Management readily acts upon safety suggestions from staff.
4	I get a good response from my manager when I raise a safety issues to him.
5	I am provided with suitable and sufficient PPE for my job.
6	Management places low priority on Health and Safety Training.
7	Management only bothers to look on OSH after there has been an accident.
8	There is a reward and recognition program for innovation in safety.
9	Management’s promotion of a work culture is supportive of safety.

3.4.2.2 Employee Participation

Employee participation is one of the factors studied in this survey. For this purpose, 11 questions have been developed to get wide view of workers participation in the company. Generally the questions used to get the information about the level of awareness among employees and how they perceived the importance of safety and health in their work. This includes on how they believe that they are the one who is responsible for the safety of themselves, their own workplace including their colleagues. If they positively believe in the importance of safety and health at workplace, they should know all the safety measures and issues before they start work.

Besides that, it was to gather the team work spirit among employees and superiors. The questions were developed to study on how employees discussed the workplace safety issues among their colleagues and superiors. Some companies might implement open and frank type of discussions and some companies might do it adversely.

The other questions under this section were to identify employees' personal perception of their role in ensuring their workplace safety and health. They might be selfish to ensure that they are the only ones who work safely or at the same time to ensure that everybody's safety was their shared responsibility. This included on how they react when they see their colleagues break safety and health procedures, how they behave during work time without any supervision by their superior and also their willingness to avoid any dangerous work especially to perform short cut work which clearly violated safety and health procedures. Table 3.5 shows the details of Employees Participation questions which had been used in the study.

Table 3.5: Employees Participant Questions

10	I have responsibilities for the safety of myself and my colleagues.
11	I am aware of the safe system of the work before I start a job.
12	Discussion about safety at meetings (team and safety related meeting) was frank and open.
13	I have opportunity to discuss the day-to-day job plan with my manager or immediate superior.
14	Management and the workforce will work together as a team to tackle safety and other work related problems.
15	Everybody understands their safety responsibilities and acts accordingly.
16	When see potential safety hazard, I am willing to correct it myself if possible.
17	My workmates would react strongly against person who breaks safety and health procedures/rules.
18	People here always work safely even though they are not being supervised.
19	I am willing to warn my co-worker about working unsafely.
20	I sometimes take shortcut in performing my job when it’s sensible to do so.

3.4.2.3 Training and education

Training is considered as one of the contributions where management will spend financial and other resources to ensure the awareness and understanding regarding safety and health. Q21 was designed to study either the training organized by the management covered the area needed especially based on employees personal work environment or the training does not cover the area needed. It will show how management study the need of training based for their employees work and to ensure the effectiveness of the training. The next question was specifically to gather information about emergency procedures that training should be given to all employees to face with any emergency situation.

The question asks about the existing accident investigation process to identify hazard and briefing done continuously by the management to ensure that all the hazards discovered were communicated to all employees. This is considered as part of how management can educate the employees to understand the hazard and to avoid any unsafe behavior and the unsafe condition. Q25 and Q26 were developed to ascertain the education related to safety and health given to employees starting from the senior leaders in the department until the lowest employees' level. It was also to find out whether the education or training was given right from the first day of the employees' report for duty from Q27.

Finally, to close this section, questions were asked whether the training given generally start from identifying and reporting near misses, adverse events and errors. The entire questions designed were intentionally to discover the level of training and education contributed by the management. Table 3.6 shows the details of Training and Education questions which had been used in the study.

Table 3.6 : Training and Education Questions

21	The training had covered all the safety and Health risks associated with the work for which I am responsible.
22	I have received training in the emergency procedures and arrangements for my workplace.
23	Accident investigation is mainly used to identify safety hazards in the workplace.
24	I have been briefed to identify safety hazards in the work place.
25	Organization's senior leaders received specific safety education.
26	Employees were given specific safety education.
27	Safety components are included in all new employee member orientation programs.
28	All staff members, workers, and managers receive specific training in procedures to identify and report safety concerns, adverse events, near misses, and errors.

3.4.2.4 Communication

The fourth part of the second section was related to the questions about safety and health communication from top to the bottom and bottom to top. The first two questions asked about general communication of safety and health whether it was well managed and were all employees receiving useful and accurate information from the management. The next four questions start to explore the promotion done by the management to encourage employees' communicating regarding their opinion in safety and health which can improve the condition of safety and health in the department.

This includes the feedback from the management upon receiving the opinion and how the workers feel when expressing their opinion. The department shows their acceptance of employees' suggestion if the answer on Q33 proved that employees expressed their opinion without any fear. Q34 was created to discover the level of accident reported by employees to management.

The next three questions from Q35 to Q37 were to discover the other version of communication called top to bottom, including if any safety and health decision and vision made by the management are shared with the employees. The final two questions in this section were developed to get opinion from employees about whether the safety and health procedures were practically designed by the management and the system being used in the organization is good. Table 3.7 below shows the details of Communication questions which have been used in the study.

Table 3.7: Communication Questions

29	There are good communications here about Safety and Health issues.
30	I received useful and accurate OSH information.
31	The company encourages suggestions on how to improve safety and health conditions.
32	There is good feedback from management on reported OSH issues.
33	I can report an accident or near-miss without fear of blame of retribution.
34	Accidents which happen here are always reported.
35	Information on current level of awareness of OSH is easily available.
36	I am given sufficient information on management's decisions regarding matters of OSH.
37	I believe that management has communicated a clear vision of OSH to them.
38	Some safety and health procedures/rules are not really practical.
39	The company has a good system for identifying and dealing with OSH problems.

3.4.3 Level of Awareness (LoA) (Section 3)

The final section was developed solely to study the employees' level of awareness of OSH safety management. There are several factors which need to be considered. Those factors were employees' personel safety orientation, policy of the company, risk assessment being conducted, monitoring level and management consideration to review the policy regulation and implementation of safety and health. The first and second question in this section were intended to get information on the level of employees confidence toward their workplace safety and health and whether they believe that the management took enough effort to ensure their safety during work time.

Next, three questions were developed to gather information about safety and health policy of the department. It started from the existence of the policy until the implementation of the policy and status of the policy being reviewed. The third factor of monitoring level was captured by the next four questions starting from Q46 until Q49. The entire questions asked respondents about information of safety and health provided by the management to employees and whether the objectives set up by the management were well spread out to every employee. The other question was about the existence of safety and health committee and whether it always considered as the discussion field between management and employees' on the safety and health matters.

Risk assessment was the fourth factor. The questions related to this factor that was developed starting from Q50 until Q54. The entire questions analyze the risk assessment, safety inspection, accident reports and audit carried out in the department.
Finally, the last two questions developed were to ensure the availability of safety and health procedures and whether the procedures were being reviewed or just left as what originally–existed. Table 3.8 below shows the details of LoA of OSH management questions which had been used in the study.

Table 3.8: Level of Awareness of OSH Questions

40	I feel safe at workplace.
41	My organization takes all OSH measure to ensure employees safety.
42	My organization has Occupational Safety and Health policy.
43	The policy meets the legal requirements and best practice of occupational safety and health.
44	The policy is up to date.
45	The policy being implemented effectively.
46	My organization provides safety and health information to employees.
47	My organization has a safety and health committee.
48	My organization sets safety and health objectives based on an organizational level.
49	My organizational sets safety and health objectives based on an individual level.
50	The workplace risk assessments are being carried out.
51	The systems are in place to ensure risk assessments are reviewed when appropriate.
52	OSH inspections are being carried out.
53	My organization has a system for reporting accidents.
54	My organization has an audit system in place.
55	My organization has procedures for safety and health.
56	My organization reviews safety and health implementation.

3.5 Validity And Reliability

The questionnaire developed as a survey tool in this study was a combination of questionnaires taken from the Loughborough Safety Culture Assessment Toolkit (LSCAT) and Railway Safety Standard Board (RSSB) Safety Culture Toolkit. Both toolkits have been validated and widely used in a variety of industries by many companies all over the world. Based on this, through content validity, construct validity and criterion validity testings were not mandatory. Nevertherless, some validity testing and reliability testings were carried-out in this study. (Detailed explanation in subsection 4.4). The repeatability of the questionnaires was also evaluated by using the Intra-class correlation coefficient (ICC), which takes values between -1 and +1. Values proximate to +1 show high repeatability of the questionnaire. Additionally, evaluation of the internal consistency of the sub-scales for the safety climate questionnaire was carried out by calculating the Cronbach Alpha coefficient. This coefficient ranges from 0 - 1. Large Cronbach Alpha values indicate a high consistency of the questions of which the sub-scale is consisted of.

As a further check on the suitalility of the questionnaires, discussion sessions were conducted with Heads of Departments and officers of the Department of Occupational Safety anf Health. A pilot study, which is considered as a best practice (Liaw, 2002) and (Naoum, 1998), was also conducted prior to the actual field study. A pilot study is beneficial as it sets and paves the way to achieve the objectives of the study (MAMPU, 1987). According to Ahmad Mahdzan (1992), a pilot study is carried out to test the relevance and clarity of the questionnaire, the suitability of scales used, and the duration and cost of the study. This will then be the basis of the actual field study.

Thirty sets of questionnaires were distributed to the targeted group of respondents. The group was from various levels of position (grade J17 to grade J54) in the mechanical and electrical services unit in DID Malaysia (see Appendix I). It was found that their demographic data showed similar demographic data with the respondents in this study. Their jobs are related to the design and maintenance of mechanical work and electrical departments. This is to check for errors and ambiguity.

The researcher distributes the questionnaire and explains the purpose of the questionnaire for a pilot test. The response was 100 percent as all employees filled up and submitted the given questionnaires. The researcher stayed in the meeting room to assist respondents in filling up the questionnaires and immediately collected the questionnaires upon completion. This was to ensure that the respondents were able to understand clearly the meaning of each question. The collected data were analyzed using the appropriate analysis using SPSS program and based on the results and the role played by the pilot study, it showed that the questionnaire used has high reliability and validity and can be used in this study.

3.6 Data Collection And Procedures

According to Sekaran (2000) and Zigmund (2000), data sources can either be primary or secondary data. This study uses both primary data and secondary data. The principal sources of secondary data are from documentary sources namely books, periodicals, professional journals, conference papers, referred publications, research papers, economic reports, statistical sources, government sources, internet information articles and magazines. Primary data are obtained through the pilot studies and field studies.

After the respondents in the department were selected, an approval was needed before the survey could be run and the questionnaires could be distributed to the respondents. A letter was sent to the Director General of the department seeking his approval (see Appendix J). After being briefed by the researcher, approval was given. Several terms and conditions were imposed and it was agreed by both parties. One of them stipulated that this study should be used for academic purposes only, and should be classified as private and confidential. Once the approval was given, researcher distributed the questionnaires to all respondents. They were grouped together in the meeting room and assisted by the researcher in case they encountered difficulties. Completed questionnaire forms were collected at the end of every session.

It was accepted that the main constraint in conducting this survey was the time available to the respondents. During the selection of managerial level employees there were some difficulties as more than half of them cannot be part of the sampling due to their work load and time constraints.

3.7 Technique of Data Analysis

Analysis of data would generate acceptable conclusive results through statistical means (Norusis, 1999a) and able to construct a detail description of phenomenon, to provide recommendations to problems identified (Kamarudin, 1990). In this study, data collected from the questionnaires were treated and analyzed using Statistical Package for Social Science (SPSS) Version 16. It employed multivariate statistical comprising descriptive statistics, Pearson`s correlation coefficient, analysis of variance (ANOVA) and regression analysis. According to Zulkarnain (2001), SPSS is a popular statistical package used in the field of science namely management, education and economics.

Descriptive statistics were used to identify the sample based on the data provided in the Respondents Information Sheet. Analyses for frequencies, means and standard deviations were calculated to describe demographic of the respondents and on the questions that have options. Descriptive analysis converts raw data by rearranging, ordering and manipulating for easy interpretation (Zigmund, 2000). According to Johnson (2002), a large set of data will be difficult to extract relevant information unless the data are assessed by a summary number, measure of location or central value, or a measure of spread or variation. Descriptive statistic provides such summary by calculating the percentages, frequency distribution, average, mean and standard deviation.

Even though Chan (1997), opined that descriptive statistics namely the mean score does not reflect relationship between attributes and as such are not an appropriate technique to access overall ranking, others disagree as they used the technique for such purpose. This technique is amongst that used in studies by Belassi (1966); Collins (2004); Hartman (2002); Hartman et al. (1998); Iyer (2005); Nguyen et al. (2004) and Wang

(2005), to rank safety factors. Level of Awareness of Occupational Safety and Health management can be determined using the overall mean score.

The summaries are shown in Table 3.9.

Table 3.9: Mean Score for Determining Level of Awareness of Occupational Health and Safety Management.

Group Code	Mean score range	Consistency Level
1.	**3.68-5.00**	**High**
2.	**2.34-3.67**	**Moderate**
3.	**1.00-2.33**	**Low**

Source: (Bergh, 2011; Idrus et al., 2004)

Statistical method used to get the result of the hypotheses were one way ANOVA-Test and Pearson Correlation, *r*, was utilized as data were parametric and normally distributed. ANOVA-Test was used to differentiate between the mean scores for the study samples. Pearson Correlation Test measured the strengths of the relationship between the research variables and employees safety awareness. Correlation analysis establishes and describes the strength and direction of relationship between two variables. The common statistic methods are the Pearson correlation and Spearman's Rho correlation (Williams, 2001). Correlation coefficients reveal the magnitude of relationships (Cooper, 2001). The sign of the correlation coefficient (+, -) defines the direction of the relationship, either positive or negative.

A positive correlation coefficient means that as the value of one variable increases, the value of the other variable increases; as one decreases the other decreases. A negative correlation coefficient indicates that as one variable increases, the other decreases, and vice-versa.

The computation of the Pearson product-moment correlation used is as follows:

$$r_{yx} = \frac{\mathrm{cov}(y,x)}{\sqrt{\mathrm{var}(y) \cdot \mathrm{var}(x)}}$$

where

$\mathrm{Cov}(y, x)$	=	the covariance of *y* and *x*
$\mathrm{Var}(x)$	=	the variance of *x*
$\mathrm{Var}(y)$	=	the variance of *y*

This study applied Pearson's correlation coefficient to investigate the relationship between variables. For example, it investigates whether the position of employees will differently affect their level of safety climate and safety awareness. Another example is whether the management commitment significantly affects the level of awareness of OSH management. The interpretation of the values of correlation coefficient as compiled by Chua (2006), is shown in Table 3.10. The interpretation of the values ranges from 0 to +/– 1, where the absence of a relationship is expressed by a coefficient of zero and a perfect positive or negative correlation is expressed by a coefficient of +/– 1.

Table 3.10: Interpretation of the values of correlation coefficient

Correlation coefficient range	Level of correlation
0.91 to 1.00 / -0.91 to -1.00	Very High
0.71 to 0.90/ -0.71 to -0.90	High
0.51 to 0.70/ -0.51 to -0.70	Moderate
0.31 to 0.50/ -0.31 to -0.50	Low
0.01 to 0.30/ -0.01 to -0.30	Very Low
0.00	No. Correlation

Source: Chua (2006)

Multiple regression analysis was used in this study. It aims to get the most significant factor affecting the level of awareness of safety and choose the best line that summarizes the linear relationship between variables. A regression model can be used to described the relationship (Montgomery et al., 2001). A multiple regression model might describes the relationship among variables is;

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + \varepsilon$$

where

Y	=	Dependent Variable
α	=	Intercept
$\beta_1, \beta_2, \ldots, \beta_k$	=	Regression Coefficients
$X_1, X_2, \ldots, X_k$	=	Independent Variables
ε	=	Random Error

Based on the results of statistical analyzes that have been made, is found only a model developed for this study. Model to be developed is as follows:

$$\boldsymbol{OSH\ LoA = \beta_1 MC + \beta_2 EP + \beta_3 TE + \beta_4 COMM + \alpha}$$

where

OSH	=	***Occupational Safety and Health***
LoA	=	***Level of Awareness***
$\boldsymbol{\alpha}$	=	***Intercept***
$\boldsymbol{\beta_1, \beta_2, \beta_3, \beta_4}$	=	***Regression Coefficients***
MC	=	***Management Commitment***
EP	=	***Employee Participation***
TE	=	***Training and Education***
COMM	=	***Communication***

Based on the literature review, most previous studies in project management use multivariate statistical analysis. This method is abled to analyze data to explain the relationship between different variables of LoA of OSH management system and to identify the key factors that would not be ascertained by other methods (Shenhar et al., 2002).

Internal consistency condition of the data set or internal coherence of data is important in any data evaluation (Hair et al., 1998) and (Aripin, 2004). This condition is necessary since any comparative assessment to be valid has to be made on equal basis, that is comparing like against like and that data are not biased. In this condition, whatever conclusion is derived should be able to reflect the correct situation of the problem being investigated. As such in order to achieve the requirement of high level trustworthiness of the research findings, internal consistency tests are performed on the data set. Data consistency is thus measured by the value of alpha coefficient obtained. This means that the higher the value of the coefficient obtained the more consistent will be the data set. A mark below 0.70 is considered as lack of internal consistency (Nunnaly, 1978).

3.8 Concluding Remarks

The explanation of this chapter provides the details of the methodology used to complete this study. It begins with the research design, research instrument, questionnaires design and data collection procedures and ended with technique of the data analysis. The researcher believes that after completing this chapter the reader would be able to understand the process of this study. The next chapter will present the results of the survey conducted.

CHAPTER 4: RESULTS AND DISCUSSION

This chapter is divided into six major sections including the demographic characteristic data in the first section. In the second section, findings of survey are presented. In section three, the overall Level of Awareness of Occupational Safety and Health management system is summarized. In section four the statistical analyses are presented and in section five regression analyses are presented. Finally, the chapter ends with a section on validation of the models.

4.1 Demograpic Characteristic Data

There were 164 respondents who participated in this study (83 in DEP1 and 81 in DEP2). They were selected based on the different categories of position, academic background, ages and working experiences. The demographic information of the samples is shown below.

4.1.1 Respondent's Position

One percent of the respondents are managers grade J54 and above in DEP1, while there were no managers grade J54 and above in DEP2. Forty percent are engineers grade J41 to J52 in DEP1 and nineteen percent in DEP2. For assistant engineers grade J29 to J38, thirteen percent were in DEP1 and twenty one percent in DEP2. Forty six percent technicians grade J17 to J26 in DEP1 while sixty one percent in DEP2. It could be seen that technicians were the largest group in both departments involved in this study. Detailed information are given in Table 4.1, Figure 4.1,Table 4.2 and Figure 4.2.

Table 4.1: Designation in DEP1

DEP1		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	Manager (J54 - above)	1	(1.2)	1.2	1.2
	Engineer(J41- J52)	33	(39.8)	39.8	41.0
	Assistant Engineer (J29 - J38)	11	(13.3)	13.3	54.2
	Technician (J 17 - J26)	38	(45.8)	45.8	100.0
	Total	83	(100.0)	100.0	

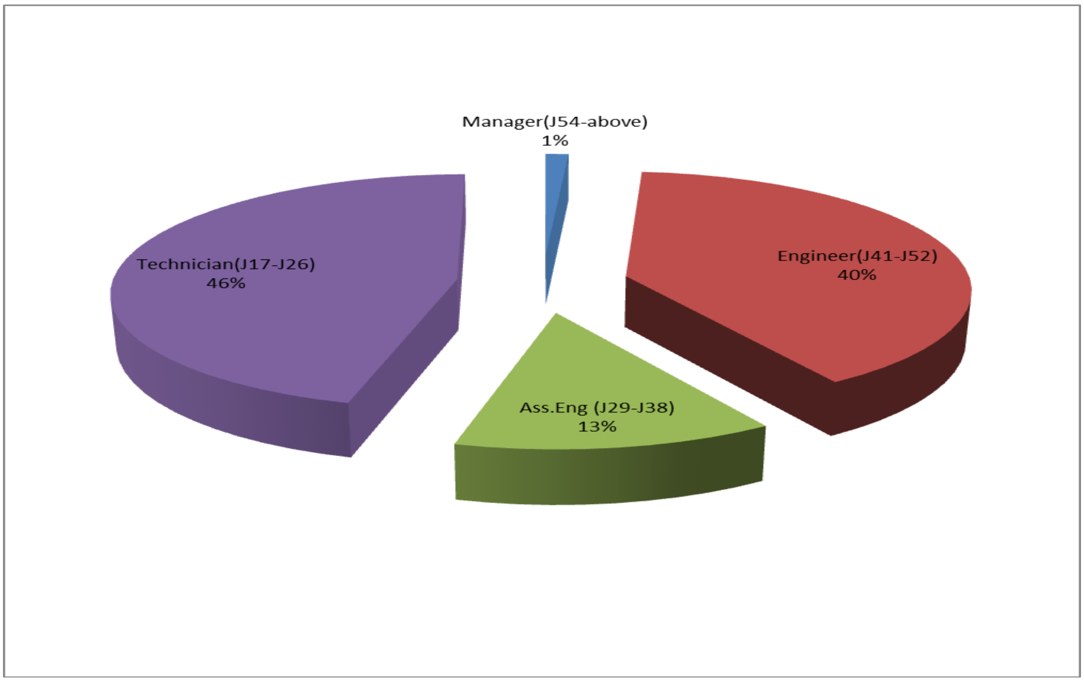


Figure : 4.1: Designation in DEP1

Table 4.2: Designation in DEP2

DEP2		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	Engineer(J41- J52)	15	(18.5)	18.5	18.5
	Assistant Engineer (J29 - J38)	17	(21.0)	21.0	39.5
	Technician (J 17 - J26)	49	(60.5)	60.5	100.0
	Total	81	(100.0)	100.0	

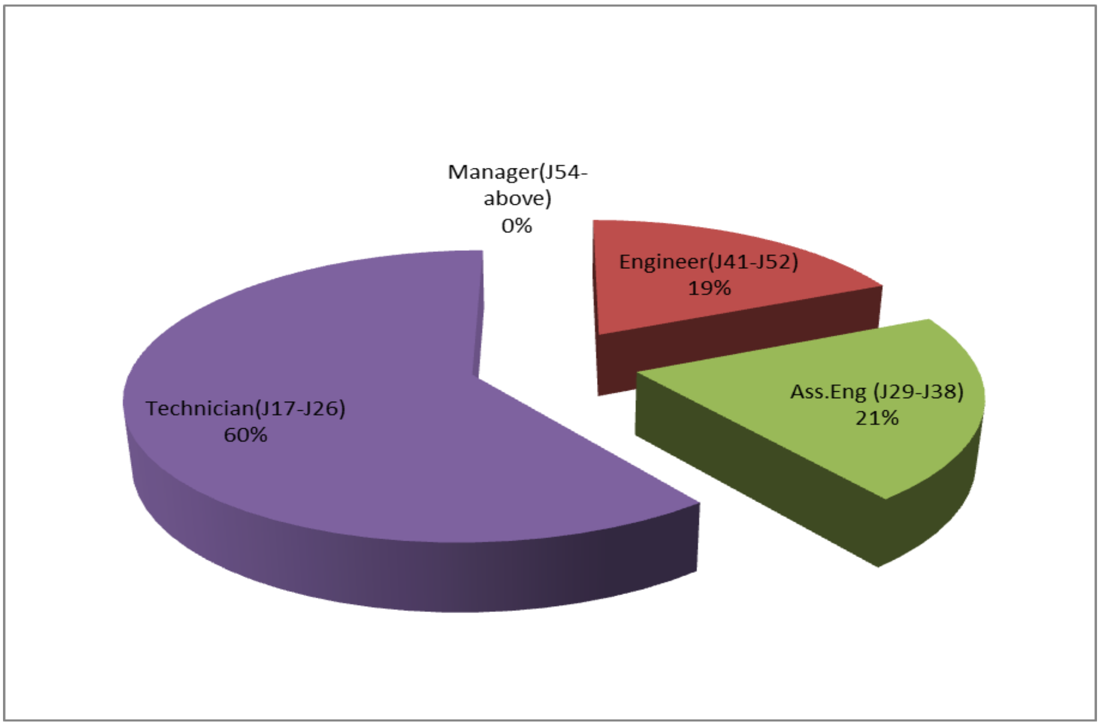


Figure 4.2: Designation in DEP2

4.1.2 Education Level

The respondents were from different academic background. Table 4.3 shows about twenty-four percent were with SPM and below. Twelve percent of them had technical certificates, about twenty four percent were diploma holders and thirty five percent were degree holders. For masters and above level there were only five percent of them in DEP1. Table 4.4 shows that the number of respondents with SPM and below was seven percent. Twenty five percent of them were with technical certificates. Forty seven percent were diploma holders and finally the balance of twenty one percent had degrees in DEP2. In terms of educational background it was found that the proportion in DEP1 was quite balanced, but it was clear in DEP2 that diploma holders represented almost half of the respondents' ratio. Detailed information are given in Table 4.3, Table 4.4, Figure 4.3 and Figure 4.4.

Table 4.3:Education Level in DEP1

DEP1		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	SPM - below	20	(24.1)	24.1	24.1
	Technical certificate	10	(12.0)	12.0	36.1
	Diploma	20	(24.1)	24.1	60.2
	Degree	29	(34.9)	34.9	95.2
	Master and above ..	4	(4.8)	4.8	100.0
	Total	83	(100.0)	100.0	

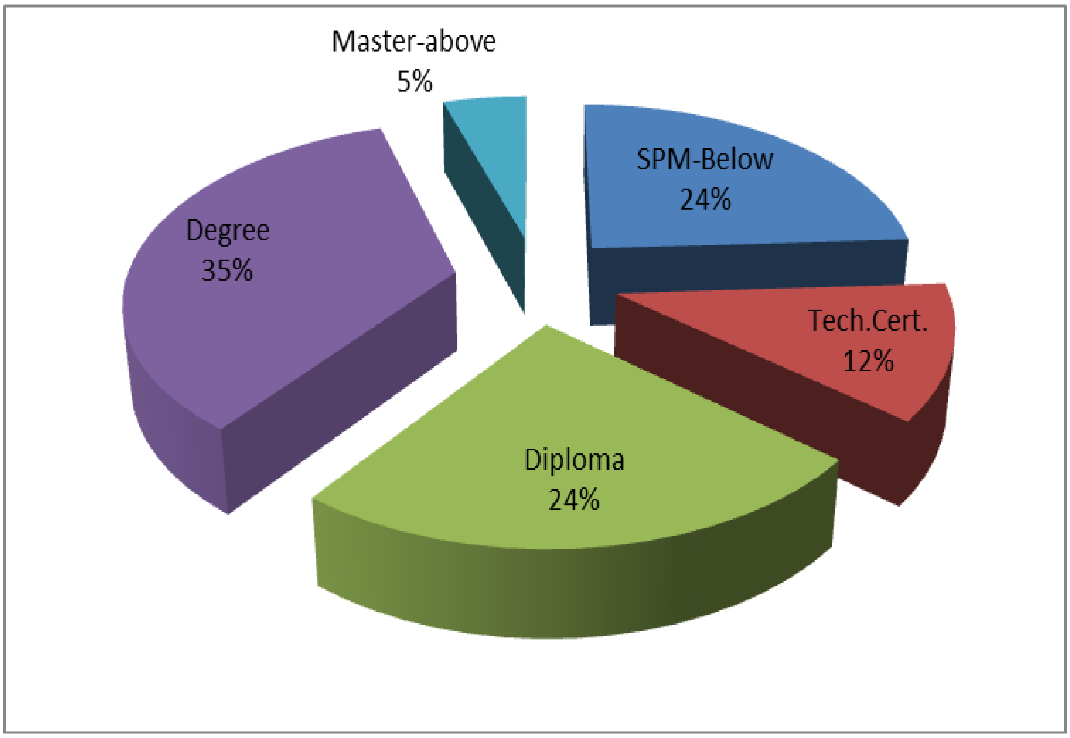


Figure 4.3 : Educational Level in DEP1

Table 4.4:Education Level in DEP2

DEP2		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	SPM - below	6	(7.4)	7.4	7.4
	Technical certificate	20	(24.7)	24.7	32.1
	Diploma	38	(46.9)	46.9	79.0
	Degree	17	(21.0)	21.0	100.0
	Total	81	(100.0)	100.0	

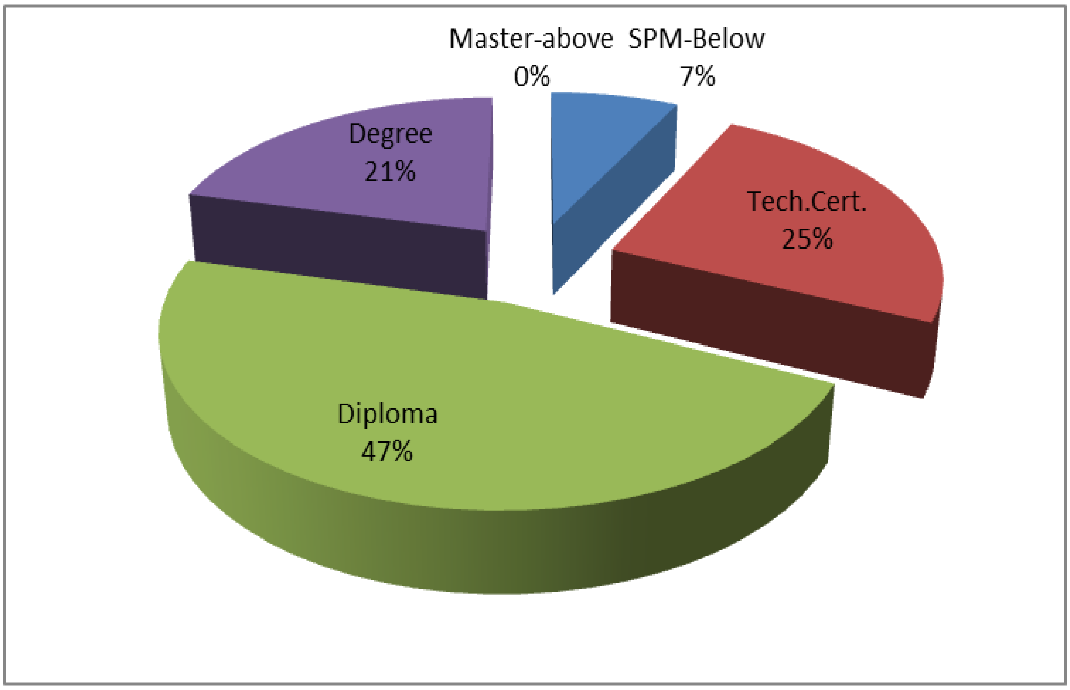


Figure 4.4 : Education Level in DEP2

4.1.3 Age of Respondents

In terms of age, respondents were segregated into four age groups. First group covered the respondents' aged between 20 to 29 years old which was nineteen percent in DEP1 and thirty six percent in DEP2. The second group between 30 to 39 years old was thirty three percent in DEP1 and thirty seven percent in DEP2. The group of respondents in the ages of 40 to 49 years old was eighteen percent in DEP1 and nine percent in DEP2. Finally, thirty percent and nineteen percent of the respondents came from the group of more than 50 years old in DEP1 and DEP2 respectively. It can be seen that the proportion of the respondents in DEP1 was fairly balanced compared to DEP2, in which the majority consisted of a group of young people under the age of 40 years. Detailed information is given in Table 4.5, Figure 4.5, Table 4.6 and Figure 4.6.

Table 4.5: Age in DEP1

DEP1		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	20-29	16	(19.3)	19.3	19.3
	30-39	27	(32.5)	32.5	51.8
	40-49	15	(18.1)	18.1	69.9
	50-above	25	(30.1)	30.1	100.0
	Total	83	(100.0)	100.0	

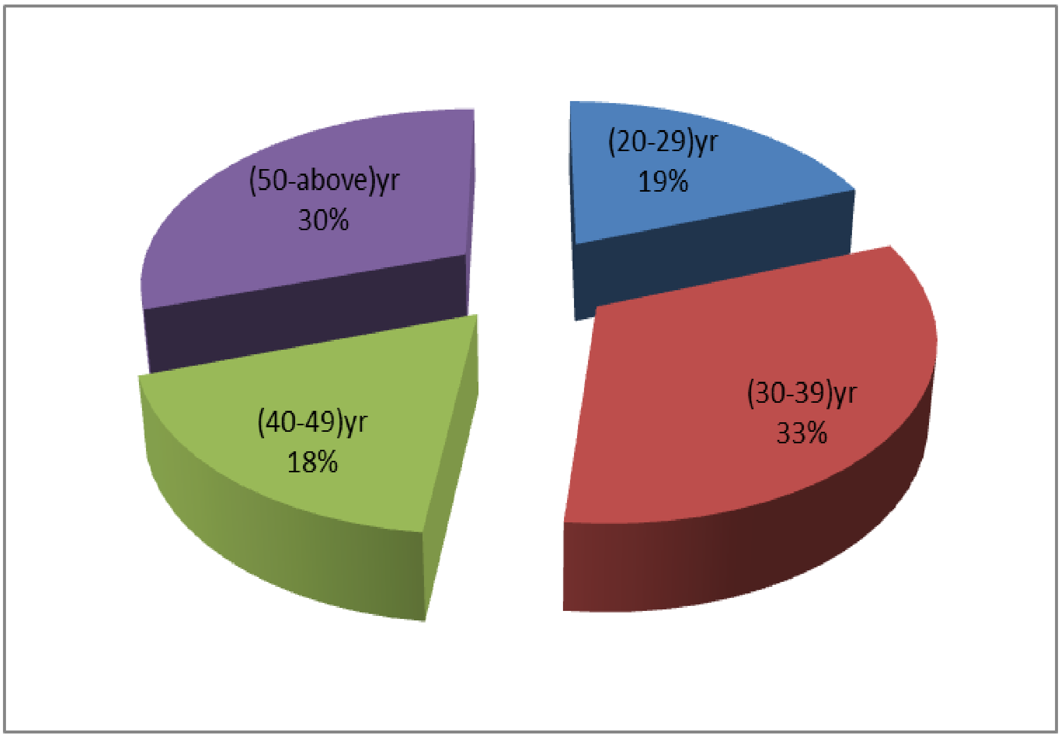


Figure 4.5: Age in DEP1

Table 4.6: Age in DEP2

DEP2		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	20-29	29	(35.8)	35.8	35.8
	30-39	30	(37.0)	37.0	72.8
	40-49	7	(8.6)	8.6	81.5
	50-above	15	(18.5)	18.5	100.0
	Total	81	(100.0)	100.0	

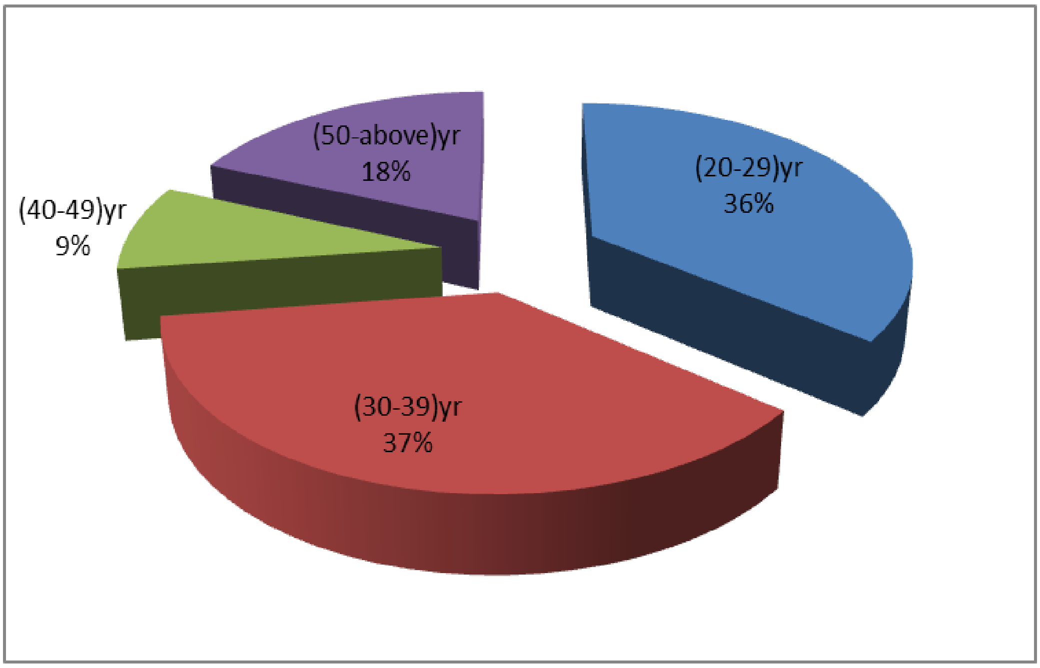


Figure 4.6: Age in DEP2

4.1.4 Respondent's Working Experiences

Another variable of personal profile in question was the respondents working experiences. In this section, the respondents were segregated into four groups; the first group was for employees who worked less than five years and the percentage of respondents was twenty eight percent in DEP1 and thirty three percent in DEP2. The second group with 6 to 10 years working experiences covered eighteen percent in DEP1 and twenty eight percent of respondents in DEP2, followed by the third group with 11 to 15 years of experiences formed eight percent in DEP1 and eleven percent in DEP2. The final group who worked more than 16 years formed forty six percent in DEP1 and twenty seven percent among the respondents in DEP2. It was clear that the respondents in the DEP1 were more experienced than respondents in DEP2. Detailed information is given in Table 4.7, Figure 4.7, Table 4.8 and Figure 4.8.

Table 4.7: Working Experience in DEP1

DEP1		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5-below	23	27.7	27.7	27.7
	6-10	15	18.1	18.1	45.8
	11-15	7	8.4	8.4	54.2
	16-above	38	45.8	45.8	100.0
	Total	83	100.0	100.0	

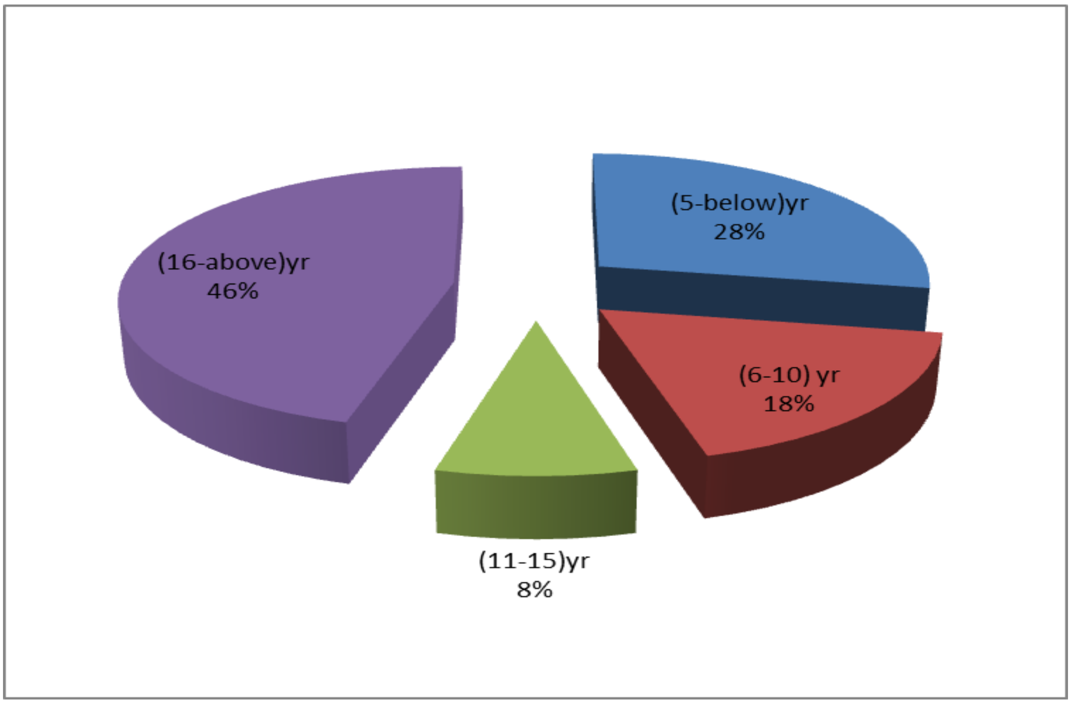


Figure 4.7: Work Experience in DEP1

Table 4.8: Working Experience in DEP2

DEP2		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5-below	27	33.3	33.3	33.3
	6-10	23	28.4	28.4	61.7
	11-15	9	11.1	11.1	72.8
	16-above	22	27.2	27.2	100.0
	Total	81	100.0	100.0	

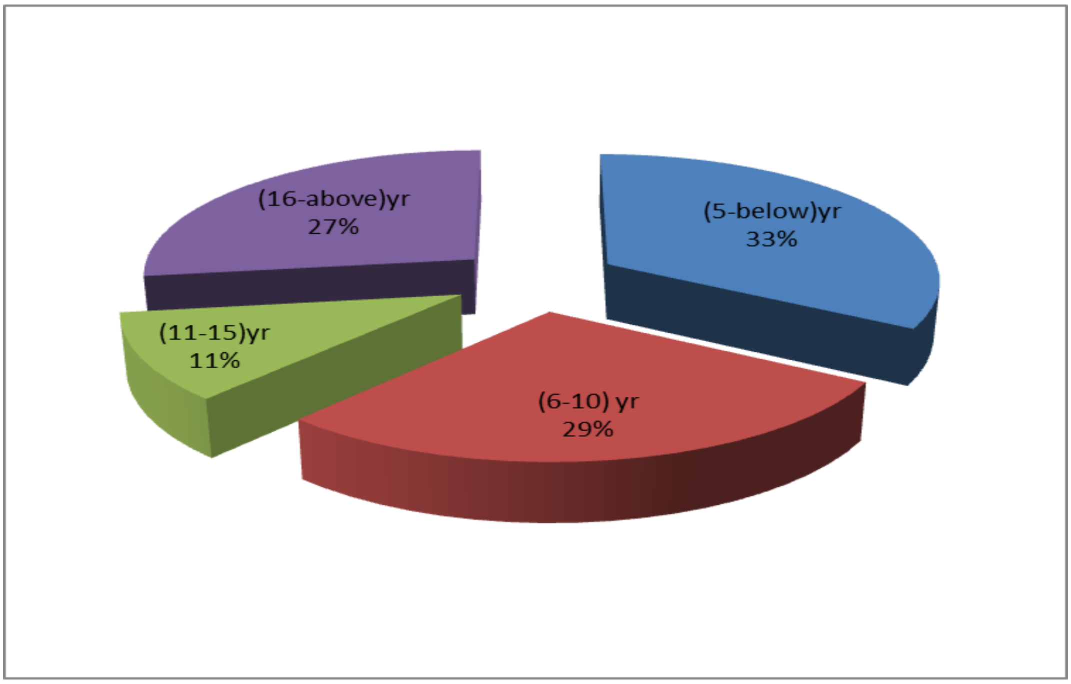


Figure 4.8: Work Experience in DEP2

4.1.5 Summary

Demographic data showed that the proportion of respondents in DEP1 have age group and level of education fairly balanced and were more experienced than respondents in DEP2 who consisted of younger, less experienced but highly educated workers. Demographic data shows that the technician group represented the greatest proportion in the both departments.

4.2 Findings of Survey

Subsequently, the findings from the surveys that were conducted in both departments are shown. It is divided into two parts which are Safety Climate factors and Level of Awareness of Occupational Safety and Health management system.

4.2.1 Safety Climate Factors

Safety climates factors comprise of management commitment, employee participation, training, education and communication.

4.2.1.1 Management Commitment

Results show that data were normally distributed.From figure 4.9, about 34% and 35% of the respondents from DEP1 and DEP2 had chosen a Likert-scale 3 for management commitment and about 41% and 47% of them had chosen a Likert-scale 4. About 47% of the respondents in DEP1 and 52% in DEP2 agreed with the statement given in the questionnaire. This indicates that they are 'moderately satisfied' with their employer's role.

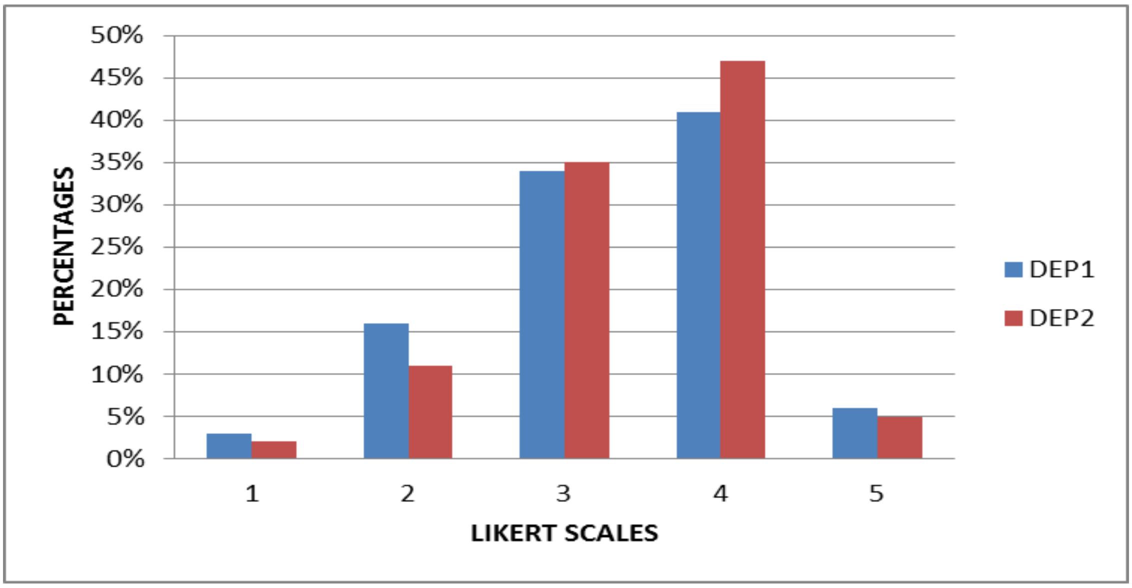


Figure 4.9: Management Commitment

4.2.1.2 Employees' Participation

Results show that data were normally distributed. From Figure 4.10, the responses indicate that, about 52% and 54% of the respondents from DEP1 and DEP2 had chosen a Likert scale 4 for employees' participation. The second highest in percentages was a Likert scale 3 which was 29% in DEP1 and 33% in DEP2. About 61% of the respondents in both DEP1 and DEP2 agreed with the statement given in the questionnaire. This shows that they are 'moderately satisfied' with their participation in the department.

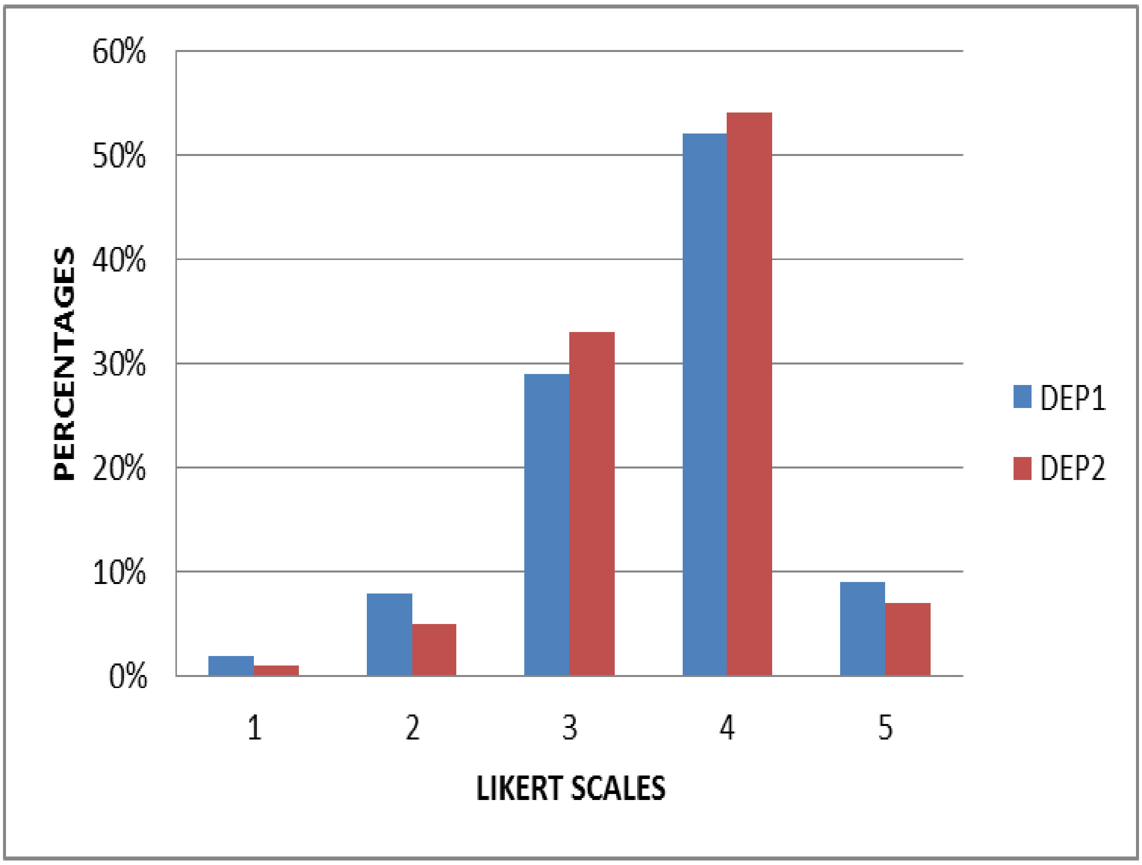


Figure 4.10: Employees' Participation

4.2.1.3 Training and Education

Results show that data were normally distributed. From Figure 4.11, about 34% of the respondents from DEP1 and 51% of the respondents from DEP2 had chosen a Likert scale 4 for training and education. For a Likert scale 3, there were about 44% of the respondents in DEP1 and 41% of the respondents in DEP2. About 38% of the respondents in DEP1 and 56% in DEP2 agreed with the statement given. Generally, this shows that they are ‘moderately satisfied’ to ‘satisfied’ with the training and education program in their department.

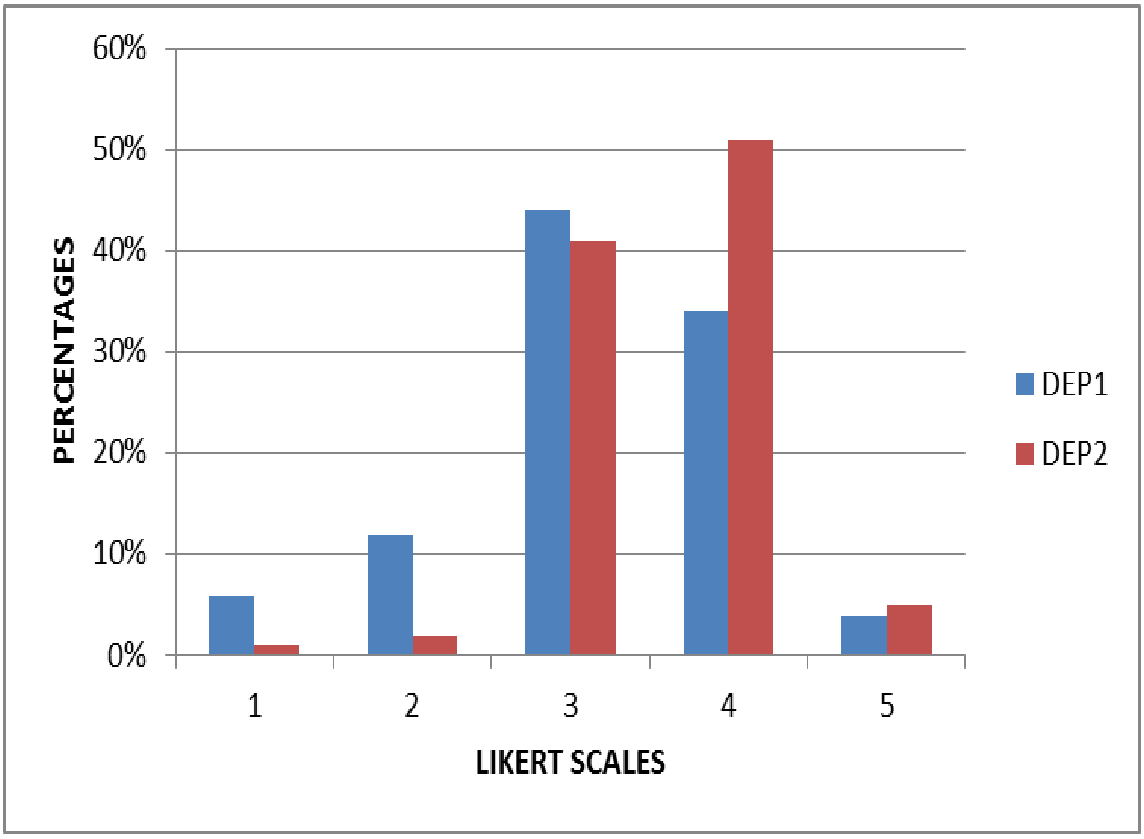


Figure 4.11: Training and Education

4.2.1.4 Communication

Results show that data were normally distributed. From Figure 4.12, the responses indicate that, about 43% of the respondents from DEP1 and 59% in DEP2 had chosen a Likert scale 4 for communication in the department. The second highest in percentage was a Likert scale 3 which was 38% in DEP1 and 30% in DEP2. About 50% of the respondents in DEP1 and 66% in DEP2 agreed with the statement given to them. This shows that they are 'moderately satisfied' with communications in the department.

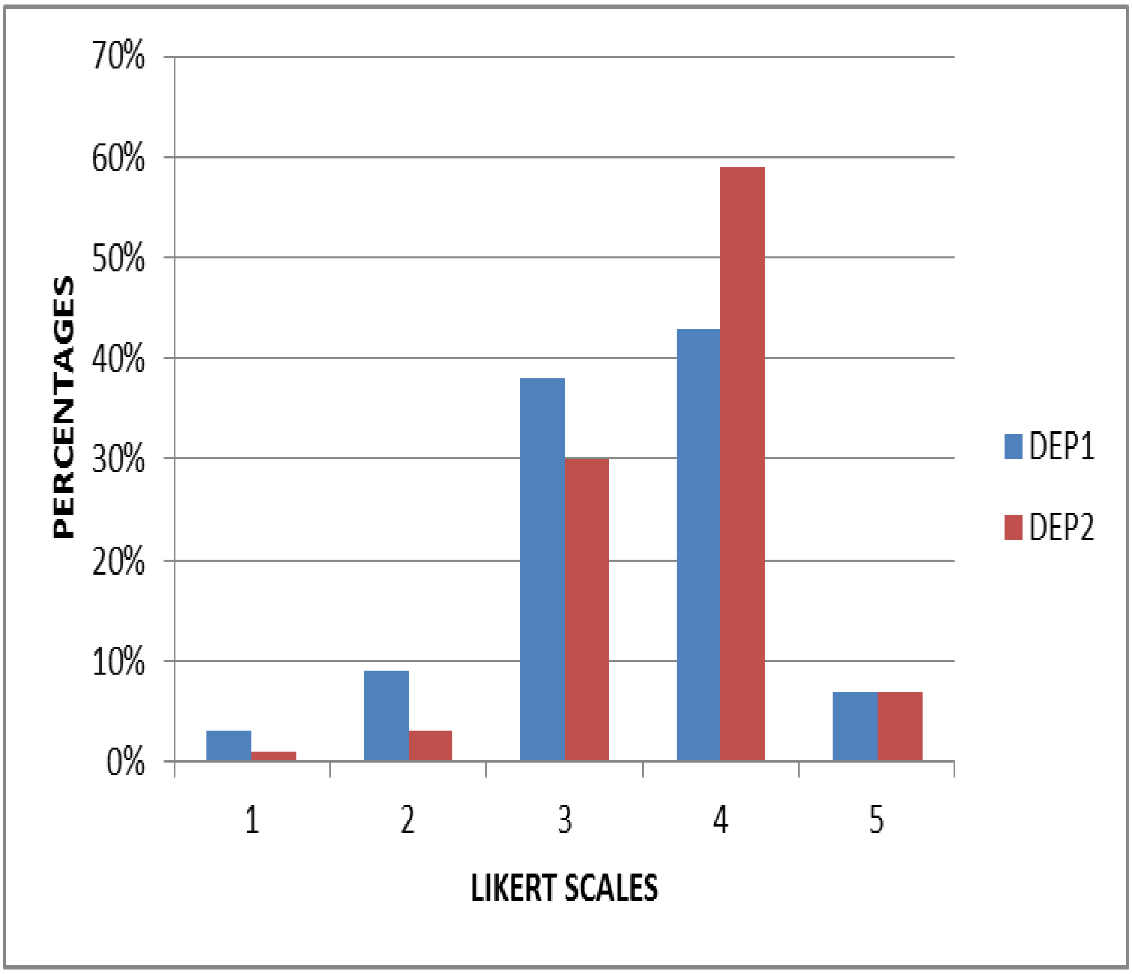


Figure 4.12: Communication

4.2.2 Level of Awareness of OSH Management System

In this study, LoA measured by orientation, policies, monitoring, risk assessment and review of all the above factors.The data obtained were processed using descriptive analysis method comprising the table of mean score, standard deviation and the percentage. This analysis is used to explain the demographics of respondents to the questions that have options. Table 4.9 (a, b, c, d and e) shows the data collected to measure the LoA of OSH management system for both the departments.

Table 4.9(a): LoA of OSH-Orientation

			SD	D	M	A	SA	MS/ SD
40	I feel safe at workplace**.**		(f) 0	2	24	48	9	3.77
		DEP1	% 0	2.4	28.9	57.8	10.8	0.669
			(f) 0	1	17	49	14	3.94
		DEP2	% 0	1.2	21	60.5	17.3	0.659
41	My organization takes all OSH measure to ensure employees safety.		(f) 2	4	29	43	5	3.54
		DEP1	% 2.4	4.8	34.9	51.8	6.0	0.786
			(f) 0	0	15	59	7	3.90
		DEP2	% 0	0	18.5	72.8	8.6	0.515
42	My organization has Occupational Safety and Health policy.		f) 3	9	29	26	16	3.52
		DEP1	% 3.6	10.8	34.9	31.3	19.3	1.040
			(f) 0	0	15	42	24	4.11
		DEP2	% 0	0	18.5	51.9	29.6	0.689

About 57 (68.6%) and 63 (77.8%) of the respondents in DEP1 and DEP2, respectively, felt safe at the work site. The results show that, about 48 (57.8%) in DEP1 and 66 (81.4%) of the respondents in DEP2, respectively, agreed that their organization had taken all Occupational Safety measures to ensure employees safety. About 42 (50.6%) respondents in DEP1 and 66 (81.5%) respondents in DEP2 agreed that their organization had the safety policies.

Table 4.9(b): LoA of OSH-Policy

			SD	D	M	A	SA	MS/SD
43	The policy meets the legal requirements and best practice of occupational safety and health.		f) 4	7	24	41	7	3.48
		DEP1	% 4.8	8.4	28.9	49.4	8.4	0.942
			(f) 0	0	15	53	13	3.98
		DEP2	% 0	0	18.5	65.4	16.0	0.591
44	The policy is up to date.		f) 5	13	26	38	1	3.20
		DEP1	% 6.0	15.7	31.3	45.8	1.2	0.934
			(f) 0	2	26	43	10	3.75
		DEP2	% 0	2.5	32.1	53.1	12.3	0.699
45	The policy being implemented effectively.		f) 5	10	32	33	3	3.23
		DEP1	% 6.0	12.0	38.6	39.8	3.6	0.928
			(f) 0	1	29	44	7	3.70
		DEP2	% 0	1.2	35.8	54.3	8.6	0.641

About 48 (57.85) in DEP1 and 66 (81.4%) of the respondents in DEP2, agreed that the policy meets the legal requirements and best practices of OSH. The responses also indicated that 39 (47%) in DEP1 and 53 (65.4%) respondents in DEP2 agreed that the policy is up to date. About 36 (43.4%) in DEP1 and 51 (62.9%) respondents in DEP2 agreed that the policy is being implemented effectively.

Table 4.9(c): LoA of OSH-Monitoring

			SD	D	M	A	SA	MS/SD
46	My organization provides safety and health information to employees.		f) 4	10	27	39	3	3.33
		DEP1	% 4.8	12.0	32.5	47.0	3.6	0.912
			(f) 0	0	23	53	5	3.78
		DEP2	% 0	0	28.4	65.4	6.2	0.548
47	My organization has a safety and health committee.		f) 4	11	26	30	12	3.42
		DEP1	% 4.8	13.3	31.3	36.1	14.5	1.049
			(f) 0	0	16	40	25	4.11
		DEP2	% 0	0	19.8	49.4	30.9	0.707
48	My organization sets safety and health objectives on an organizational level.		f) 4	15	22	35	7	3.31
		DEP1	% 4.8	18.1	26.5	42.2	8.4	1.023
			(f) 0	0	16	49	16	4.00
		DEP2	% 0	0	19.8	60.5	19.8	0.632
49	My organizational sets safety and health objectives on an individual levels.		f) 4	14	29	33	3	3.20
		DEP1	% 4.8	16.9	34.9	39.8	3.6	0.934
			(f) 0	5	25	45	6	3.64
		DEP2	% 0	6.2	30.9	55.6	7.4	0.713

About 42 (50.6%) in DEP1 and 58 (71.6%) of respondents in DEP2 agreed that their organization provided safety and health information to them. The responses also indicated 42 (50.6%) and 65 (80.3%) of respondents in DEP1 and DEP2, respectively, agreed that their organization had a safety and health committee. About 42 (50.6%) and 65 (80.3%) of respondents in DEP1 and DEP2, respectively, agreed that their organization had set safety and health objectives on an organization level. About 36 (43.2%) and 51 (63%) of respondents in DEP1 and DEP2, respectively, agreed that their organization had set safety and health objectives on an individual level.

Table 4.9(d): LoA of OSH-Risk Assessment

				SD	D	M	A	SA	MS/SD
50	The workplace risk assessment are being carried out.	DEP1	f)	2	10	43	26	2	3.19
			%	2.4	12.0	51.8	31.3	2.4	0.772
		DEP2	(f)	0	3	31	41	6	3.62
			%	0	3.7	38.3	50.6	7.4	0.681
51	The systems are in placed to ensure risk assessment are reviewed when appropriate.	DEP1	f)	2	10	31	36	4	3.36
			%	2.4	12	37.3	43.4	4.8	0.849
		DEP2	(f)	0	3	23	50	5	3.70
			%	0	3.7	28.4	61.7	6.2	0.641
52	OSH inspection are being carried out.	DEP1	f)	2	12	35	32	2	3.24
			%	2.4	14.5	42.2	38.6	2.4	0.820
		DEP2	(f)	0	1	23	52	5	3.75
			%	0	1.2	28.4	64.2	6.2	0.582
53	My organization has a system for reporting accidents.	DEP1	f)	3	10	41	25	4	3.20
			%	3.6	12.0	49.4	30.1	4.8	0.852
		DEP2	(f)	0	2	24	44	11	3.79
			%	0	2.5	29.6	54.3	13.6	0.702
54	My organization has an audit system in place	DEP1	f)	4	11	18	36	14	3.54
			%	4.8	13.3	21.7	43.4	16.9	1.074
		DEP2	(f)	0	1	16	47	17	3.99
			%	0	1.2	19.8	58.0	21.0	0.680

About 28 (33.7%) and 47 (58%) of respondents in DEP1 and DEP2, respectively, agreed that their organization had carried-out workplace risk assessment. About 40 (48.2%) and 55 (67.9%) of respondents in DEP1 and DEP2, respectively, agreed that, the systems were in placed to ensure risk assessment, were reviewed when appropriate. About 34 (41%) and 57 (70.4%) respondents in DEP1 and DEP2, respectively, agreed that OSH inspection was been carried-out. About 29 (34.9%) and 55 (67.9%) of respondents in DEP1 and DEP2, respectively, agreed that the organization had a reporting accidents system. About 50 (60.3%) and 64 (79%) of respondents in DEP1 and DEP2, respectively, agreed that the organization had an audit system in place.

Table 4.9(e):): LoA of OSH-Review

			SD	D	M	A	SA	MS/SD
55	My organization has procedure for safety and health		(f) 5	7	26	39	6	3.41
		DEP1	% 6.0	8.4	31.3	47.0	7.2	0.963
			(f) 0	0	16	48	17	4.01
		DEP2	% 0	0	19.8	59.3	21.0	0.642
56	My organization reviews safety and health implementation.		f) 3	9	34	31	6	3.34
		DEP1	% 3.6	10.8	41.0	37.3	7.2	0.901
			(f) 0	1	19	49	12	3.89
		DEP2	% 0	1.2	23.5	60.5	14.8	0.652

About 45 (54.2%) and 65 (80.3%) of respondents in DEP1 and DEP2, respectively, agreed that the organization had the procedures for safety and health. About 37 (44.5%) and 61 (75.3%) of respondents in DEP1 and DEP2, respectively, were satisfied that the organization reviewed safety and health implementation.

4.2.3 Summary

Results showed that all factors of management commitment, employee participation, training and education and communication are normally distributed (see Appendix K). Evaluation for normality of distribution of the continuous variables was tested by the Kolmogorov-Smirnov test. It means that data collected from the survey seems to be of high quality to be used in this study. This is important because most of the analysis require data that are normally distributed for good analysis results. Respondents in both departments showed that they were ‘moderately satisfied’ to ‘satisfied’ with the management commitment. They were also ‘moderately satisfied’ to ‘satisfied’ with their involvement in safety activities organized by their department. Respondents in both departments indicated they were ‘moderately satisfied’ to ‘satisfied’ with the training and education programs conducted by their department, while they are also ‘moderately satisfied’ with the communication process adopted by the department.

4.3 Overall LoA of OSH Management System

Data obtained from the survey were analyzed and using the mean score, the overall LoA of OSH management system is obtained as shown in Table 4.10. The results indicate that LoA of OSH are between 'moderately agreed' to 'highly agreed' in the department based on overall mean score of 3.37 in DEP1 and 3.86 in DEP2.

Table 4.10: Overall LoA of OSH

	MEAN SCORE					OVERALL OF OSH LoA (MEAN SCORE)
	ORIENTATION	POLICY	MONITORING	RISK ASSESSMENT	REVIEW	
DEP1	3.61	3.30	3.32	3.31	3.38	**3.37 (MODERATE)**
DEP2	3.98	3.81	3.88	3.77	3.95	**3.86 (HIGH)**

4.4 Statistical Analysis

In this section, the statistical analysis is divided into six sub-sections including the introduction in the first sub-section. Validity of the questionnaire used as a survey tool in this study will be discussed in second sub-section. Reliability measures of tested factors are presented in the sub-section three. Then, analysis of differences perception LoA of OSH management system between groups are presented and discussed in sub-section four. Correlation results are illustrated and summarized in sub-section five. Finally, the section ends with a discussion.

4.4.1 Validity of Questionnaire

As mentioned in the ealier sub-section, the developed questionnaire was build using combination of questions taken from established and widely used safety climate survey tools, and that a through validity testing is not mandatory. The extent of validity testing conducted for the current study is presented as follows:

4.4.1.1 Content Validity

From the literature, the researcher has compiled a list of variables that affect the effectiveness of the safety program (refer to Table 2.1, Table 2.2, and Appendix C). Discussions and brainstorming were conducted among top management of the department. Twenty-five factors/variables had been identified (Appendix L), in term of meaning similarity, word repetition, the appropriateness of the exact term and suitability to the study situation and environment. To ensure the appropriateness of the variables to be used as a factor in this study, an evaluation process called content validity ratio (CVR) based on Lawshe's equation was then done among panels of top management of the departments (see Appendix M). The panels were asked to rank the variables listed in three stages as shown in Table 4.11.

Table 4.11: Level of Agreement for CVR

No.	Level	Level explanation
1.	1	Essential
2.	2	Useful but not essential
3.	3	Not necessary

Source :(Lawshe, 1975)

The data collected were then analyzed to obtain the content validity ratio (CVR). (Lawshe, 1975) stated that content validity threshold depends on the number of panels (see Appendix N). Apart from this, Lawshe provided a minimum CVR value for different sizes of the panelist based on a one-tailed test at $\alpha = 0.05$ significance level. As a result, with a panel size of 30 respondents, the minimum value of 0.33 CVR was to be considered as acceptable. Thus, for any of the variables with value of CVR less than 0.33 will not be included in the questionnaire. Results of this preliminary study showed that only 16 of the tested variables had values greater than 0.33 (0.33 to 0.73) as shown in Appendix O. Thus, it can be concluded that only sixteen (16) variables are strongly accepted.

4.4.1.2 Construct Validity

As mentioned earlier, factor analysis was performed for the evaluation of the construct validity of the questionnaire used (Cronbach, 1955; Mohsen, 2011). Initially, the relevance of the data used for the factor analysis was confirmed. The statistical criteria Kaiser-Meyer-Olkin (KMO = 0.948) and the Bartlett Test of sphericity (value 20,230.187, $p < 0.001$), indicated that the raw data were suitable for the implementation of factor analysis and values of KMO > 0.8 indicate a fairly high correlation and therefore, factor analysis is meaningful (Field, 2005).

From the 39 original questions used in the factor analysis, using the Kaiser criterion and Varimax orthogonal rotation, **FOUR (4)** main factors emerged, referred to as 'management commitment', 'employees participation', 'training and education' and 'communication'. As shown in Table 4.12, the "management commitment" factor consists of 9 questions. This factor explains 44.2% of the variability of the original data. The "employees participation" consists of 11 questions. The percentage of variability in the data interpretation by this factor is estimated to be 7.9%. The "training and education" consists of 8 questions. This particular factor explains 4.5% of the variability of the data.

Finally, the "communication" factor consists of 11 questions. This particular factor explains 3.8% of the variability of the data.

Table 4.12: Results Derived from Factors Analysis

Dimension	Eigenvalue	% of variance	Interpreted Component	Sub-component	Factor Loading
1	5.420	32.426	Management commitment	-Management support -Teamwork -Clear and realistic goals	0.887 0.622 0.579
2	1.856	11.565	Employee Participation	-Positive group norms -Personal attitude -Personal motivation -Continuing participation	0.850 0.825 0.670 0.533
3	1.850	10.864	Training and Education	-Effective enforcement scheme -Appropriate safety education and training -Equipment acquisition and maintenance -Personal competency -Appropriate supervision Program evaluation	0.770 0.725 0.658 0.610 0.585 0.540
4	1.240	7.676	Communication	-Good communication -Delegation of authority and responsibility -Sufficient resource allocation	0.910 0.826 0.740

4.4.1.3 Criterion Validity

Criterion validity is a measure of how well one variable or set of variables predicts an outcome based on information from other variables. Since criterion validation focuses on the relationship between test score and level of awareness (LoA), the key to validation using this approach is the use of a statistical test known as the "correlation coefficient" where each respondent's test score is correlated with his LoA. If the correlation coefficient equals or exceeds $r = 0.20$, it means the test is sufficiently related to LoA to make judgments about a suitability of the survey tool. Note that a correlation of $r = 0.20$ is the minimum that should be considered acceptable (Field, 2005).

Ordinarily, one would like to see a correlation that is larger which indicates the relationship between test score and level of awareness is stronger. The larger the correlation, the better.

In this study, the criterion test is analyzed using a simple correlation between factors related obtained from the pilot study. Results from Table 4.13 indicate that the correlation coefficients, r, are from 0.60 to 0.810 which shows large correlation between factors. Its mean the survey tool is suitable and sufficient to predict the criterion variables in this study (Radhakrishna, 2007).

Table 4.13: Results Derived from Pearson Correlation Test

No.	Factors	Correlation Coeffcient
1.	Management Commitment	0.604
2.	Employees Participation	0.584
3.	Training & Education	0.723
4.	Communication	0.810

4.4.1.4 Repeatability of the Questionnaire

The repeatability of the questionnaire was evaluated by using the Intra-class correlation coefficient, ICC, (Takao, 2007). The ICC's results and their 95% confidence intervals, 95% CI, for all factors are tabulated in Table 4.14. The results showed that all ICCs are greater than 0.8 and lie in the 95% confidence interval. This evaluation of repeatability showed that all factors of the questionnaire were highly repeatable.

Table 4.14: Repeatability of Factors of Assessment Questionnaire

Safety Climate Factors	ICC	95% CI
Management Commitment	0.870	0.754 - 0.952
Employees Participation	0.920	0.835 - 0.970
Training and Education	0.900	0.775 - 0.947
Communication	0.890	0.735 - 0.953
Level of Awareness (LoA)	0.970	0.900 - 0.993

ICC : Intraclass correlation coefficient

CI : Confidence interval

4.4.2 Reliability Measures

Reliability refers to stability or consistency of a measurement to produce identical, similar and repeatable results when repeated measurements are made (DeVellis, 2003; Field, 2005; Norland-Tilburg, 1990). In this study, questionnaire reliability was tested using Cronbach's (alpha (α). Cronbach's alpha is derived from the average correlation of all items on the scale (Rodeghier, 1996). The most common test of reliability analysis is Cronbach's Coefficient α (Salkind, 2000). This is to achieve the requirement of high level trustworthiness of the research findings. The reliability measures of the questionnaire on management commitment, employees' participation, training and education, communication and Level of Awareness(LoA) of OSH management system, have been tested as shown in Table 4.15.

The results indicate that the reliability was high for management commitment in both departments with values from 0.695 to 0.704. As for employees' participation the results show that the reliability was high in both departments with values of 0.693 to 0.821. Training and Education is considered high in reliability with values of 0.831 to 0.909. The results also indicate communication is considered high in reliability with values of 0.837 to 0.930. Finally, LoA of OSH shows high reliabilities for both departments with values of 0.928 to 0.954.

This means that the higher the value of the coefficient obtained the more consistent will be the data set. A mark below 0.70 is considered as lack of internal consistency (Cronbach, 1955; DeVellis, 2003; Nunnaly, 1978). This shows the reliability and validity of the questionnaire used in this study.

Table 4.15 : Result for Reliability Measures

SAFETY FACTORS	DEP1	DEP2
Management Commitment	0.695	0.704
Employees` Participation	0.693	0.821
Training and Education	0.831	0.909
Communication	0.837	0.930
OSH Performance	0.928	0.954

In SPSS, if the value of the coeficient exceeds 0.7, then the scale is said to have internal consistency, hence reliable to be used. In this study, it was found that all the coefficient values are greater than 0.7, which showed that all the questions used in the questionnaire were consistent and reliable.

4.4.3 Testing of Hypotheses

There were a few research questions to be answered in this study. Four hypotheses tested were to cater for the third study objective and another four were to cater for the fourth objective.

4.4.3.1 Analysis of Differences Between Groups

To test the differences in perception between the groups on LoA of OSH based on demographic data, four hypotheses were made. This is necessary to test whether demographic data affecting their perceptions of safety awareness.

Hypothesis 1: There is difference of perception Level of Awareness(LoA) on Occupational Safety and Health based on their designation.

The hypothesis is designed to test whether the designation of employees affects their perception towards occupational safety awareness.

The hypotheses (null hypothesis, H_0, and alternative hypothesis, H_A) to be tested are:

- H_0 : There is no difference in perception level on Occupational Safety Awareness among employees based on their designations.
- H_A : There is difference in perception level on Occupational Safety Awareness among employees based on their designations.

One way ANOVA Tests were conducted and Table 4.16 shows the test outputs. The test results are further discussed as follows.

Table 4.16: Result for the Difference of Employees' Perception Level on Occupational Safety Awareness Based on Their Designation

LoA-DEP1	Sum of Squares	Df	Mean Square	F	Sig.(p)
Between Groups	1.082	3	.361	.748	.527
Within Groups	38.085	79	.482		
Total	39.168	82			
LoA-DEP2	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.(p)**
Between Groups	.445	2	.223	1.147	.323
Within Groups	15.140	78	.194		
Total	15.585	80			

Note: Degree of freedom = Df

Table 4.16, shows F = 0.748 (with df = 3,79; p = 0.53) for DEP1 and F = 1.147 (with df = 2,78; p = 0.32) for DEP2. As the p-value is more than 0.05 in both departments, there was no significance difference in the perception level on occupational safety and health awareness based on their designations.

This means that employees' designations does not influence their difference in perception of the occupational safety awareness. Thus, the statement of H_0 cannot be rejected.

Hypothesis 2: There is difference of perception Level of Awareness(LoA) on Occupational Safety and Health based on their educational background.

The hypothesis was designed to test whether the educational background of employees affects their perception towards Occupational Safety Awareness.

The hypotheses to be tested are:

H_0 : There is no difference in perception level on Occupational Safety Awareness among employees is based on their educational background.

H_A : There is difference in perception level on Occupational Safety Awareness among employees based on their educational background.

One way ANOVA Tests were conducted and the test outputs are shown in Table 4.17. The test results are further discussed as follows.

Table 4.17: Result for the Difference of Employees' Perception Level on Occupational Safety Awareness, Based on their Education Level.

LoA-DEP1	Sum of Squares	Df	Mean Square	F	Sig.(*p*)
Between Groups	1.354	4	.338	.698	.596
Within Groups	37.814	78	.485		
Total	39.168	82			
LoA-DEP2	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.(*p*)**
Between Groups	.464	3	.155	.788	.504
Within Groups	15.120	77	.196		
Total	15.585	80			

Note: Degree of freedom = Df

Table 4.17 shows $F = 0.698$ (with df = 4,78; $p = 0.59$) for DEP1 and $F = 0.788$ (with df = 3,77; $p = 0.50$) for DEP2. As the p-value is more than 0.05 in both DEP1 and DEP2, there was no significance difference in the perception level on occupational safety awareness based on their educational level.

This means that employees' educational background does not influence their difference in perception on occupational safety awareness. Thus, the statement of H_0 cannot be rejected.

Hypothesis 3: There is difference of perception Level of Awareness(LoA) on Occupational Safety and Health based on their age.

The hypothesis was designed to test whether the age of employees affects their perception toward occupational safety awareness.

The hypotheses to be tested are:

H_0 : There is no difference in perception level on Occupational Safety Awareness among employees based on their age.

H_A : There is difference in perception level on Occupational Safety Awareness among employees based on their age.

One way ANOVA Tests were conducted and the test outputs are shown in Table 4.18. The test results are further discussed as follows.

Table 4.18: Result for the difference of employees` perception level on Occupational Safety Awareness based on their age.

LoA-DEP1	Sum of Squares	Df	Mean Square	F	Sig.(p)
Between Groups	2.424	3	.808	1.737	.166
Within Groups	36.744	79	.465		
Total	39.168	82			
LoA-DEP2	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.(p)**
Between Groups	.108	3	.036	.179	.911
Within Groups	15.477	77	.201		
Total	15.585	80			

Note: Degree of freedom = Df

Table 4.18, shows F = 1.737 (with df = 3,79; p = 0.166) for DEP1 and F = 0.179 (with df = 3,77; p = 0.911) for DEP2. As the p-value is more than 0.05 in both DEP1 and DEP2, there was no significance difference in the perception level on occupational safety awareness based on their age.

This means that employees' age does not influence their difference in perception on occupational safety awareness. Thus, the statement of H_0 cannot be rejected.

Hypothesis 4: There is difference of perception Level of Awareness(LoA) on Occupational Safety and Health based on their work experience.

The hypothesis was designed to test whether the work experience of employees affect their perception towards occupational safety awareness.

The hypotheses to be tested are:

H_0 : There is no difference in perception level on Occupational Safety Awareness among employees based on their work experience.

H_A : There is difference in perception level on Occupational Safety Awareness among employees based on their work experience.

One way ANOVA Tests were conducted and the test outputs were in highlighted in Table 4.19. The test results are further discussed as follows.

Table 4.19: Result for the Difference of Employees' Perception Level on Occupational Safety Awareness Based on Their Work Experience.

LoA-DEP1	Sum of Squares	Df	Mean Square	F	Sig.(*p*)
Between Groups	8.438	3	2.813	7.231	.000
Within Groups	30.730	79	.389		
Total	39.168	82			
LoA-DEP2	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.(*p*)**
Between Groups	1.531	3	.510	2.795	.046
Within Groups	14.054	77	.183		
Total	15.585	80			

Note: Degree of freedom = Df

Table 4.19 shows F =7.231 (with df = 3,79; p = 0.00) for DEP1 and F = 2.795 (with df = 3,77; p = 0.046) for DEP2. As the p-value is less than 0.05 in both DEP1 and DEP2, there was significance difference in the perception level on occupational safety awareness based on their work experiences. This means that employees working experience greatly influence their differences in perception on occupational safety awareness in DEP1 and DEP2. Thus, the statement of H_0 can be rejected for both DEP1 and DEP2.

In summary, the results indicated that the respondent demographic data did not influence the difference in the perception level of safety awareness except on working experience factor. This means more experienced workers influenced the perception levels of safety awareness.

4.4.3.2 Test of Correlations

Pearson correlation, *r*, tests were conducted to analyze the significance in relationship between management commitment, employees participation, training and education and communication towards occupational safety and health awareness. The test outputs are shown in Table 4.20. The test results will be further discussed as follows.

Table 4.20: Correlation Between Level of Occupational Safety and Health Awareness and Safety Climate factors for DEP1 and DEP2

		LoA1	LoA2
LoA	Pearson Correlation	1	1
	Sig. (2-tailed)	.	.
	N	83	81
MSMC	Pearson Correlation	.579(**)	.443(**)
	Sig. (2-tailed)	.000	.000
	N	83	81
MSEP	Pearson Correlation	.545(**)	.409(**)
	Sig. (2-tailed)	.000	.000
	N	83	81
MSTE	Pearson Correlation	.697(**)	.503(**)
	Sig. (2-tailed)	.000	.000
	N	83	81
MSCOMM	Pearson Correlation	.725(**)	.666(**)
	Sig. (2-tailed)	.000	.000
	N	83	81

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

Hypothesis 5: There is Relationship Between Management Commitment and Employees' Occupational Safety Awareness.

The hypothesis was designed to test the significance of the relationship between the Management Commitment toward Employees' Occupational Safety Awareness.

The hypotheses to be tested are:

H_0 : There is no relationship between the Management Commitment and Employees' Occupational Safety Awareness.

H_A : There is a relationship between the Management Commitment and Employees' Occupational Safety Awareness.

Table 4.20 answers the question in hypothesis five where the results show $r = 0.579$ (with $p = 0.000$) in DEP1. As p-value was smaller than 0.05 there is significant influence between management commitments and occupational safety awareness. This means that the level of employees' safety awareness was influenced by management commitment. Thus, H_0's statement can be rejected for DEP1.

Table 4.20 answers the other question in hypothesis five where the results show $r = 0.443$ (with $p = 0.000$) in DEP2. As p-value was smaller than 0.05 there is significant influence between management commitments and occupational safety awareness. This means that the level of employees' occupational safety awareness was influenced by management commitment. Thus, H_0's statement can be rejected for DEP2.

Hypothesis 6: There is Relationship Between Employees' Participation and Employees' Occupational Safety Awareness

The hypothesis was designed to test the significant of relationship between the Workers' Participation towards Employees' Safety Awareness.

The hypotheses to be tested are:

H_0 : There is no relationship between the Employees' Participation and Employees' Occupational Safety Awareness.

H_A : There is a relationship between the Employees' Participation and Employees' Occupational Safety Awareness.

Table 4.20 answers the question in hypothesis six where the results show $r = 0.545$ (with $p = 0.000$) in DEP1. As *p*-value was smaller than 0.05 there is significant influence between employees' participation and safety awareness. This means that the level of employees' occupational safety awareness was influenced by employees' participation. Thus, the statement of H_0 can be rejected for DEP1.

Table 4.20 answers the other question in hypothesis six where the results show $r = 0.409$ (with $p = 0.000$) in DEP2. As *p*-value was smaller than 0.05 there is significant influence between employees' participation and occupational safety awareness. This means that the level of employees' occupational safety awareness was influenced by employees' participation. Thus, the statement of H_0 can be rejected for DEP2.

Hypothesis 7: There is Relationship Between Training and Education Toward Employees' Occupational Safety Awareness

The hypothesis was designed to test the significant of relationship between the Training and Education towards Employees' Occupational Safety Awareness.

The hypotheses to be tested are:

H_0 : There is no relationship between the Training and Education Towards Employees' Occupational Safety Awareness.

H_A : There is a relationship between the Training and Education Towards Employees' Occupational Safety Awareness.

Table 4.20 answers the question in hypotheses seven where the results show r = 0.697 (p = 0.000) in DEP1. As p-value was smaller than 0.05 there is significant influence between training and education and occupational safety awareness. This means that the level of employees' occupational safety awareness was influenced by training and education. Thus, the statement of H_0 can be rejected for DEP1.

Table 4.20 answers the other question in hypotheses seven where the results show r = 0.503 (with p = 0.000) in DEP2. As p-value was smaller than 0.05 there is significant influence between training and education and occupational safety awareness. This means that the level of employees' occupational safety awareness was influenced by training and education. Thus, the statement of H_0 can be rejected for DEP2.

Hypothesis 8: There is Relationship between Communication and Employees' Occupational Safety Awareness.

The hypothesis was designed to test the significant of relationship between the Communication and Employees' Occupational Safety Awareness.

The hypotheses to be tested are:

H_0 : There is no relationship between the Communication and Employees' Occupational Safety Awareness.

H_A : There is a relationship between the Communication and Employees' Occupational Safety Awareness.

Table 4.20 answers the question in hypotheses eight where the results show r = 0.725 (with p = 0.000) in DEP1. As p-value was smaller than 0.05 there is significant influence between communications and occupational safety awareness. This means that the level of employees' occupational safety awareness was influenced by communication. Thus, the statement of H_0 can be rejected for DEP1.

Table 4.20 answers the other question in hypotheses eight where the results show r = 0.666 (with p = 0.000) in DEP2. As p-value was smaller than 0.05 there is significant influence between communications and occupational safety awareness. This means that the level of employees' occupational safety awareness was influenced by communication. Thus, the statement of H_0 can be rejected for DEP2.

In summary, the results indicated there were significant relationship between the tested factors. The correlation coefficient, *r*, values were between 0.5 to.0.7. The *p*-value was smaller than 0.05, in both departments. From Table 4.20, it was found that correlations between the factors tested are statistically strong and balance in DEP1. Communication has a high value, 0.725, followed by training and education with 0.697. The values, for employee's participation and management commitment are almost the same with 0.545 and 0.579, respectively. In DEP2, communication had a correlation coefficient of 0.666, followed by training and education, with 0.503 and management commitment and employee involvement with 0.443 and 0.409, respectively. Summaries of relationship between the tested factors are shown in Figure 4.13. In terms of safety climate factors, the results indicate that communication has the highest correlation, followed by training and education, employee participation and management commitment as shown in Table 4.20.

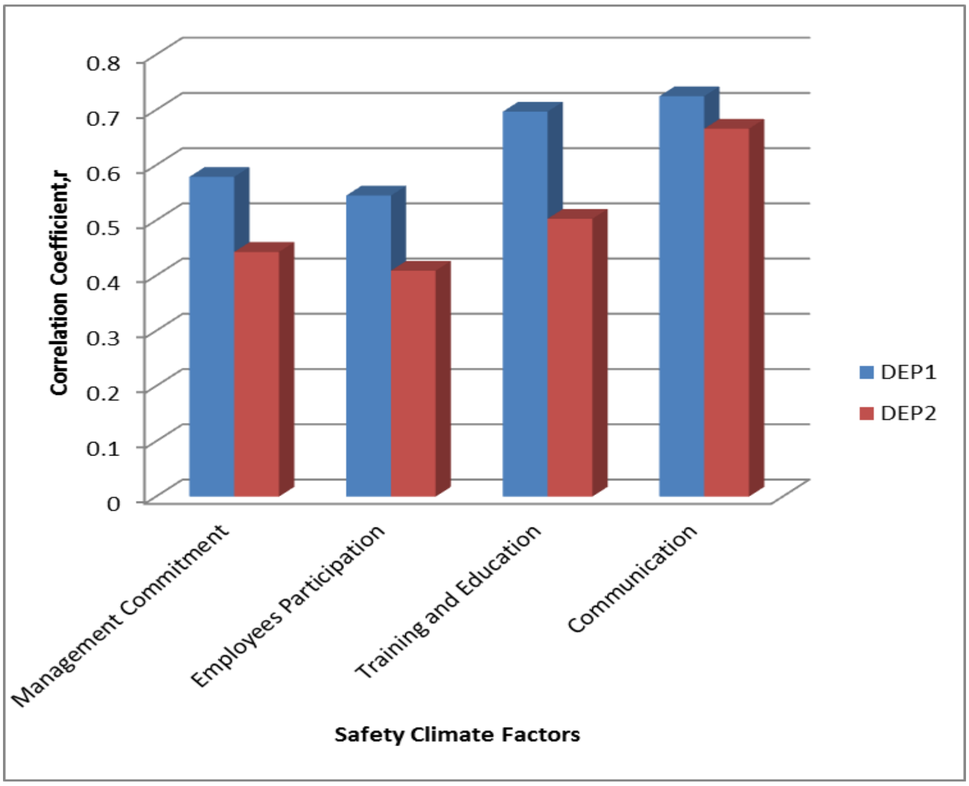


Figure 4.13: Correlation between Level of Occupational Safety and Health Awareness and Safety Climate factors for DEP1 and DEP2.

4.4.4 Summary

Results of statistical analysis show that demographic data tested did not influence respondents' perception of safety awareness in DEP1 and DEP2, accept work experience when the value of *p* is greater than 0.05. Work experience was found to significantly influence the respondents' perception of safety awareness in both departments when the value of *p* is less than 0.05. Although DEP1 practiced safety without the guidelines of OHSAS, there was no difference in the occupational safety awareness compared with DEP2 whereas about 50% of the respondents from DEP1 had more than 16 years experiences while DEP2 had only 30%. This is shown in test of hypotheses and analyses of differences between groups. Knowledge and skill are acquired through education, training and general exposure of the respondents. (Ismail, 2011) found length of experiences relates to skill and knowledge gained. This shows the importance of work experience in finding employees perception of occupational safety awareness at construction sites. While the correlation test results showed that all the tested factors had significant correlations with safety awareness with different values of *r* as shown in Figure 4.13; and communication to be found the highest factor corelated with safety awareness in the both departments.

4.5 Regression Analysis

Regression analyses were carried out to find the most significant factors that influence Occupational Safety Awareness. This section focuses on the regression analysis that leads to safety climate. The section is divided into eight sub-sections including introduction. The second sub-section presents a model summary of the models for regression analysis. In sub-section three, linearity tests are discussed. In the fourth sub-section, coefficient factors are explained. In sub-section five, regression model validation are presented and explained. In sub-section six, hypotheses tests about the population regression line are discussed. The subsection ends with a discussion.

4.5.1 Regression Analysis - Model Summary for DEP1 and DEP2

One of the first steps to take when running a regression model is to look at how well the model fits (Sweet, 1999). A summary of the models in Table 4.21 indicates R = 0.751 and R = 0.666 for DEP1 and DEP2, respectively, as the correlation coefficient between the predictor factors combined and the dependent factor based on the regression model. A value of 1 means that the dependent variables can be perfectly predicted from the independent variables. A value close to 0 means that the independent variables are not linearly related to the dependent variable (Norusis, 2007). The values are quite large, indicating that the model fits and the linear regression models can be predicted from independent variables.

Table 4.21: Model Summary for DEP1 and DEP2

Model	*R*	*R*-Square	Adjusted *R*-Square	Std. Error of the Estimate
DEP1	0.751	0.564	0.553	0.4789
DEP2	0.666	0.443	0.436	0.3314

Dependent Factor: Level of OSH Awareness

R-square is the proportion of the variability in the dependent factor which is taken into account by the regression model. Table 4.21 shows that data analysis results using SPSS, which are *R*-square = 0.564 for DEP1 and *R*-square = 0.443 for DEP2, indicate that all the four factors are identified to be significant for OSH awareness in both DEP1 and DEP2. The factors are communication, employees' participation, training and education and management commitment. The results indicate that about 56% of the variability of OSH awareness in both DEP1 and DEP2 are explained by factors mentioned. The values are quite high and indicating only the remainder of about 44% is not explained. Therefore, it can be concluded that communication, employees' participation, training and education and management commitment influence OSH awareness in DEP1 and DEP2.

Adjusted *R*-square is a better reflection of the proportion of variability explained by the regression model than *R*-square (Montgomery, et al., 2001). In this case, from Table 4.21, there are no significant difference on the values of "*R*-square" and "Adjusted *R*-square" for both models.

4.5.2 Regression Analysis-Linearity Test (ANOVA) for DEP1 and DEP2

The purpose of analyzing the Variance (ANOVA) is to find the relationship between the predictor and the dependent factors. The results show that *F* statistic is significant at $p < 0.005$ and it can be concluded that *R*-square is significantly different from zero. This means that there is a linear relationship between the predictor and the dependent factor in the models (Foster, 2001).

Scatter plots of Regression Standardized Predicted Value against Regression Standardized Residual for DEP1 and DEP2 are shown in Figure 4.14 and Figure 4.15. Level of Awareness (LoA) is the dependent variable. Both plots show evidence that the relationship between the dependent and independent factors were also linear.

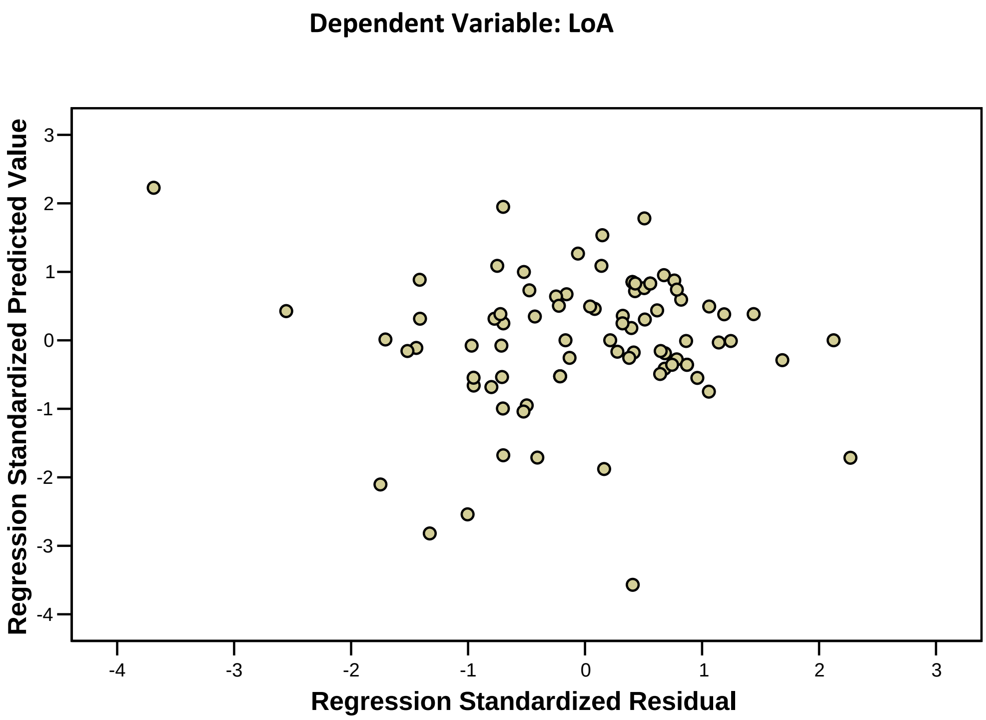


Figure 4.14: Scatter Plot of Regression Standardized Predicted Value Against Regression Standardized Residual for DEP1

Dependent Variable: LoA

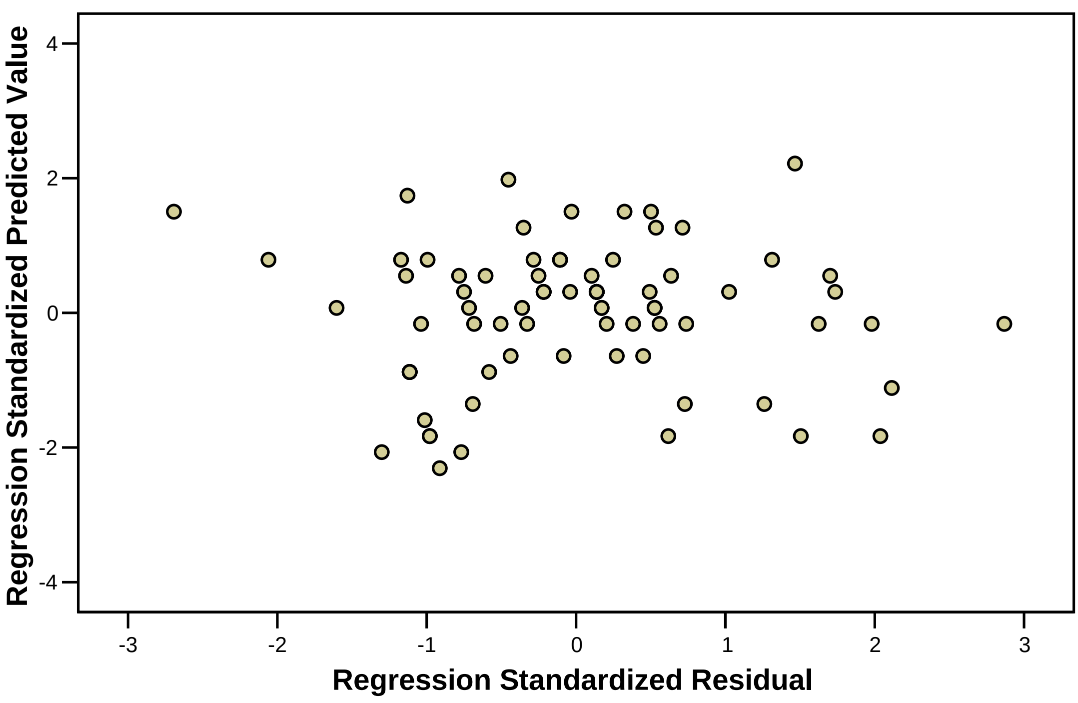


Figure 4.15: Scatter Plot of Regression Standardized Predicted Value against Regression Standardized Residual for DEP2

** The factors are scattered without showing any pattern giving evidence that the dependent and independent factors are linear (Foster, 2001).*

4.5.3 Regression Analysis - Coefficient Factor for DEP1 and DEP2

Table 4.22 depicts the predictor factors and some statistics associated with each one. *B* is the regression coefficient for the factor. The importance of the predictor factors are shown by Beta. *t* values and the probabilities, Sig, indicate whether the regression coefficient for each factor is greater than zero. The results show that the *t* values for all the predictor factors considered are significant at $p < 0.05$. Therefore, it can be concluded that the predictor factors predict OSH awareness in DEP1 and DEP2.

4.5.3.1 Regression Equation (DEP1 and DEP2)

From Table 4.22, the regression equation for DEP1 is found to be:

$$\boldsymbol{OSH\ LoA = 0.588 + 0.510\,COMM + 0.326\,TE}$$

From Table 4.23, the regression equation for DEP2 is found to be :

$$\boldsymbol{OSH\ LoA = 1.016 + 0.770\,COMM}$$

The coefficient variables imply that the predicted OSH awareness increases by the associated coefficient for a change of 1 of the Likert scale of the indicated variable. With reference to Beta, communication is in the first rank in both models. It contributed about 51% to 77% of OSH LoA for both offices. This indicates that communication is the most important factor influencing Occupational Safety and Health Awareness at construction sites. This analysis highlighted the important variables for the model; the variables with little or no influence will not appear in the model equation.

4.5.3.2 Accuracy of the Equations for DEP1 and DEP2

The immediate task is testing the accuracy of equations obtained from the regression analysis. This study that involves Likert-scales of 1 to 5 were used as measurement tools, therefore all the five ranges are tested in order to evaluate the accuracy of the model equation. Evaluation of Likert-scales 1 and 5 are shown here, the rest of the evaluations are shown in Appendix P. The coefficient variables imply that the predicted occupational safety awareness increases by the associated coefficient for a change of 1 of the Likert scale of the indicated variable. For example, if the value of communication in DEP1 model changed from 1 to 2, the value of safety awareness will change from 0.510 to 1.02 on the Likert scale. Based on this, assumptions are made to test the equation as given below.

Prediction values on occupational safety awareness for minimum (1) Likert scale:

- DEP1: The assumed value of 1 on the Likert scale for occupational safety awareness and significant factors in the model gives a total value of 0.836, thus a 0.164 deviation from the assumption.
- DEP2: The assumed value of 1 on the Likert scale for occupational safety awareness and significant factors in the model gives a total value of 0.770, thus a 0.23 deviation from assumption.

Prediction values on occupational safety awareness for maximum (5) Likert scale:

- DEP1: The assumed value of 5 on the Likert scalefor occupational safety awareness and significant factors in the model gives a total value of 4.22, thus a 0.82 deviation from the assumption.
- DEP2: The assumed value of 5 on the Likert scale for occupational safety awareness and significant factors in the model gives a total value of 3.85, thus a 1.15 deviation from assumption.

The average percentages of the deviation are:

DEP1 = 16 % less than assumption

DEP2 = 23 % less than assumption.

Since the accuracy of both equations is about 80%, statistically both models can be used to predict occupational safety awareness (Norusis, 1999b). It was noted that in manufacturing and construction industries design, design efficiency values of less than 50% were generally considered to indicate potential for rationalization (Corbett et al., 1991). The above models offer consistency accuracy values and therefore offer good prediction on occupational safety and health awareness.

4.5.4 Hypotheses Tests on the Population Regression Line.

Hypotheses test is done for the population regression line to determine if there is strong evidence to support the existing of linear relationship between dependent and independent variables. Regression models of DEP1 and DEP2 statistically predict Occupational Safety and Health awareness in technical department. Did the model reflect the population regression line?

The population regression line is the line that describes the relationship between the dependent variables and independent variables in the population (Norusis, 1999b). It is equivalent to test the null hypotheses that the population regression line slope is zero (Norusis, 2007).

H_0 : The population slope is zero

H_1 : The population slope is not zero

Table 4.22 shows the sample slopes for communication and training and education are 4.0 and 3.0 for DEP1, respectively (e.g. for communication factor its standard error is 0.135, so the value for *t* statistic is 0.510/0.135 which is 4.0 in DEP1). It can be seen that the sample slopes are above the hypothesized of zero, therefore, we can reject the null hypothesis. There appears to be a linear relationship between communication and training and education and Occupational Safety and Health Awareness in DEP1.

Table 4.22: Coefficient Factor for DEP1

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.	95% Confidence Interval for *B*	
		B	Std. Error	*Beta*			Lower Bound	Upper Bound
DEP1	(Constant)	0.588	0.291		2.084	.040	.144	.982
	MSCOMM	.510	.135	.465	3.788	.000	.242	.779
	MSTE	.326	.123	.325	2.648	.010	.132	.526

Dependent Variable: LoA1

Table 4.23 : Coefficient Factor for DEP2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for *B*	
		B	Std. Error	*Beta*	*t*	*Sig.*	Lower Bound	Upper Bound
DEP2	(Constant)	1.016	.361		2.815	.006	.297	1.734
	MSCOMM2	.770	.097	.666	7.932	.000	.577	.963

a. Dependent Variable: LoA2

Table 4.23 shows the sample slopes for communication is 8.0 for DEP2 (e.g. for communication factor its standard error is 0.097, so the value for *t* statistic is 0.770/0.097 which is 8.0 in DEP2). It can be seen that the sample slopes are above the hypothesized of zero, therefore, the null hypothesis can be rejected. There appears to be a linear relationship between Communication and Occupational Safety and Health Awareness in DEP2.

4.5.5 Summary

The regression analysis can predict the importance of each factor in the equation. It can also assist in manipulating the factors in determining occupational safety awareness as the relative advantages of one factor over another may be clearly defined in work design. The occupational safety awareness equation described in section 4.3 is intended to provide an insight into how occupational safety awareness can be determined by manipulating various factors. The model highlights that the most significant factors in both departments is communication with *R*-square = 0.526 for DEP1 and *R*-square = 0.443 for DEP2. Training and Education appears only in DEP1 model reflecting the importance of Training and Education in the organization.

Effective communication is very important to ensure the success of a program or task performed. Through effective communication process, a procedure, work instructions, rules, announcements can be reached to the target group successfully. When all of these delivery systems can be properly received by then all the instructions, assignments, etc. are implemented properly. Safety climate measures can find the root causes of OSH problems. Safety climate in construction has been measured through surveys. A four-factor structure has shown the validity and consistency of the components used in the model by Glendon (2001) and Siu et al. (2004).

4.6 Validation of the Models

This section will discuss the validation of the model obtained. This process is important to ensure that the model was validated and reliable. The significant factors found in the regression analysis above are then tested for other departments. Two different departments are chosen. The first sample is Public Work Department (PWD), a technical department with similar type of work (construction site supervision). The second department is Fire and Rescue Department (FRDM), more related to rescue work. The tested departments were addressed as DEP3 and DEP4. Letters were sent to the both Director General of the departments seeking theirs approvals (see Appendix Q and Appendix R). After being briefed by the researcher, approval was given. Once the approval was given, researcher distributed the questionnaires to all respondents. In this section, the validation process is divided into five sub-sections including the introduction in the first sub-section. The survey results for DEP3 and DEP4 are shown in sub-section two. Statistical analysis and regression analysis were carried-out in sub-sections three and four. The section ends with a discussion.

4.6.1 Survey Results for DEP3 and DEP4

To enable the reader to fully understand the validation process, the results of a study conducted in DEP3 and DEP4 are accordingly presented.

4.6.1.1 Demographic Characteristic Data for DEP3 and DEP4

There were 210 respondents who participated as the sample in this validation survey (104 in DEP3 and 106 in DEP4). They were selected based on the different categories of position, academic background, ages and working experiences. The demographic information of the samples is shown below.

4.6.1.1.1 Respondent's Position for DEP3 and DEP4

Six per cent of the respondents were manager's grade J41 to J52 in DEP3 and four per cent in DEP4. For assistant engineer grade J29 to J38, there were thirteen per cent in DEP3 and seventeen per cent in DEP4. Eighty two per cent of technicians grade J17 to J26 in DEP3 while seventy nine per cent in DEP4. As it can be seen technicians formed the biggest group in both departments who took part in the survey. Detailed information is given in Table 4.24, Table 4.25, Figure 4.16, and Figure 4.17.

Table 4.24: Designation in DEP3

DEP3		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	Engineer (J41-J52)	6	(5.8)	5.8	5.8
	Assistant Engineer (J29 - J38)	13	(12.5)	12.5	18.3
	Technician (J17 - J26)	85	(81.7)	81.7	100.0
	Total	104	(100.0)	100.0	

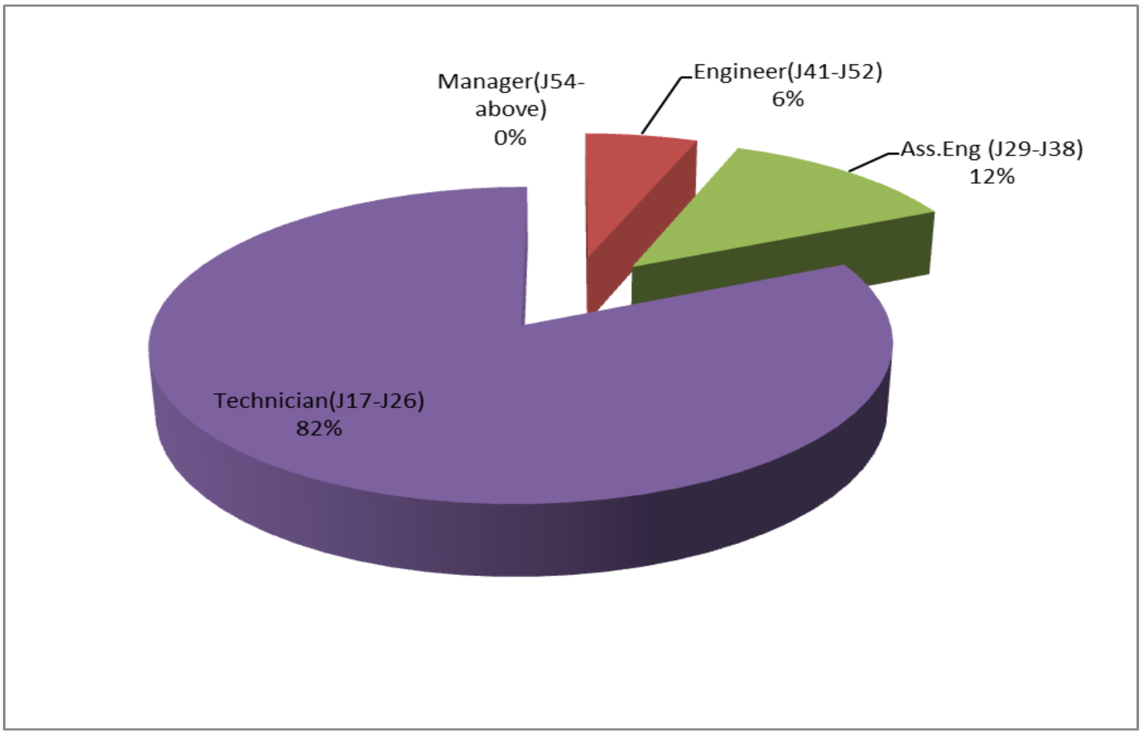


Figure 4.16: Designation in DEP3

Table 4.25: Designation in DEP4

DEP4		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	Engineer (J41-J52)	4	(3.8)	3.8	3.8
	Assistant Engineer (J29 - J38)	18	(17)	17	20.8
	Technician (J17 - J26)	84	(79.2)	79.2	100.0
	Total	106	(100.0)	100.0	

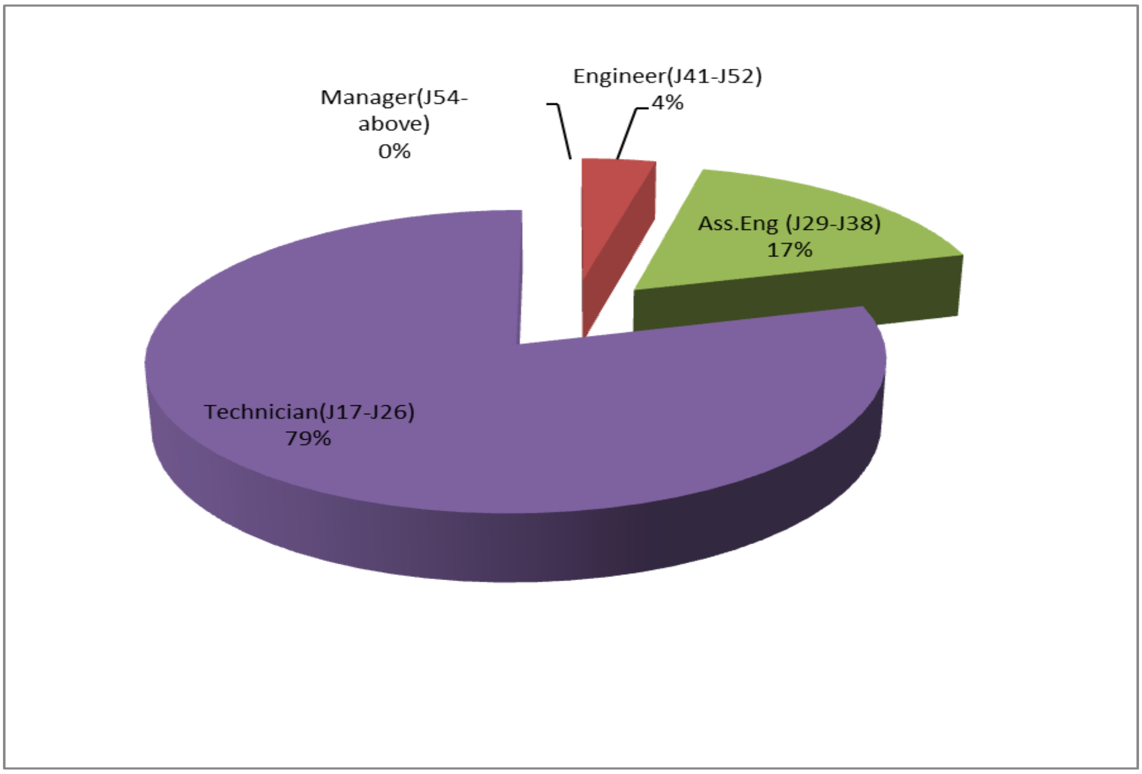


Figure 4.17: Designation in DEP4

4.6.1.1.2 Education Level for DEP3 and DEP4

The respondents were from different academic backgrounds. Table 4.26 shows about thirty per cent with SPM and below. Twenty per cent of them hold technical certificates; about forty one per cent were diploma holders and nine per cent were degree holders. For master's level and above, there were none of them in DEP3. Table 4.27 shows that the number of respondents with SPM and below was sixty eight per cent. Eight per cent of them possessed technical certificates. Twenty per cent were diploma holders and the balance of five per cent had degrees in DEP4. In terms of educational level, it seems fairly balanced proportions between groups except degree holders and above in DEP3. In DEP4 it was found that more than half of them had passed the SPM compared with other groups. Detailed information is given in Table 4.26, Figure 4.18, Table 4.27 and Figure 4.19.

Table 4.26: Education Level in DEP3

DEP3		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	SPM - below	31	(29.8)	29.8	29.8
	Technical certificate	21	(20.2)	20.2	50
	Diploma	43	(41.3)	41.3	91.3
	Degree	9	(8.7)	8.7	100
	Total	104	(100.0)	100.0	

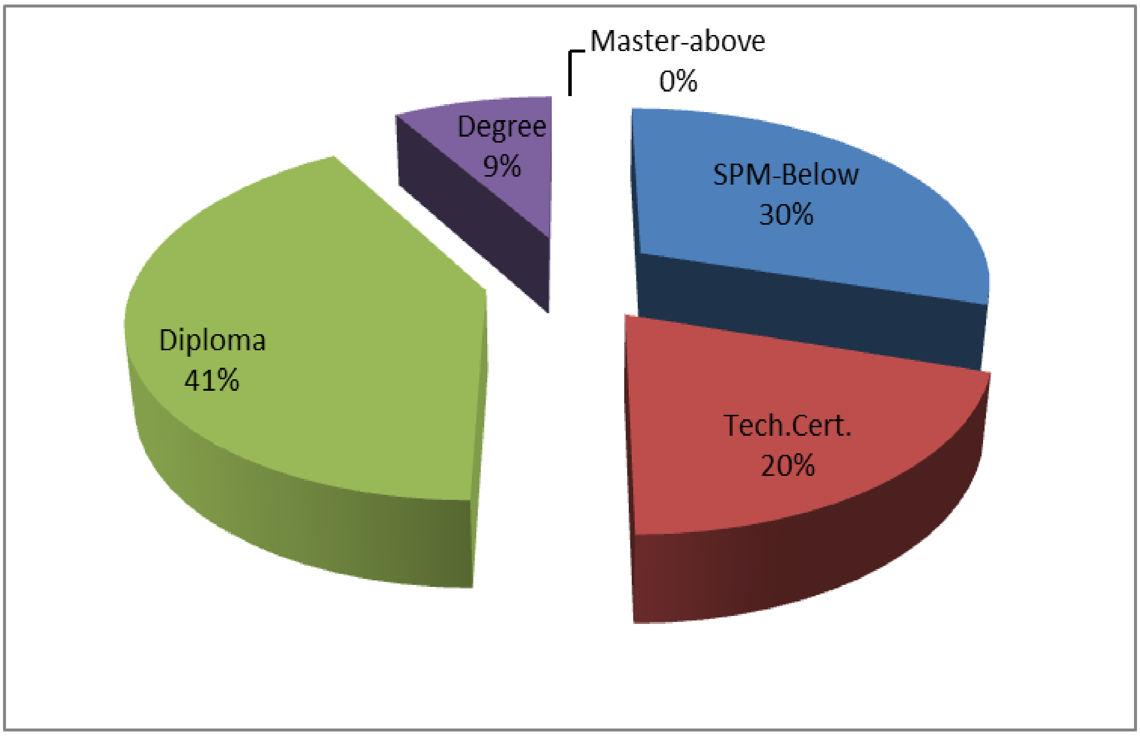


Figure 4.18: Education Level in DEP3

Table 4.27: Education Level in DEP4

DEP4		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	SPM – below	72	(67.9)	67.9	67.9
	Technical certificate	8	(7.5)	7.5	75.4
	Diploma	21	(19.8)	19.8	95.2
	Degree	5	(4.8)	4.8	100.0
	Total	106	(100.0)	100.0	

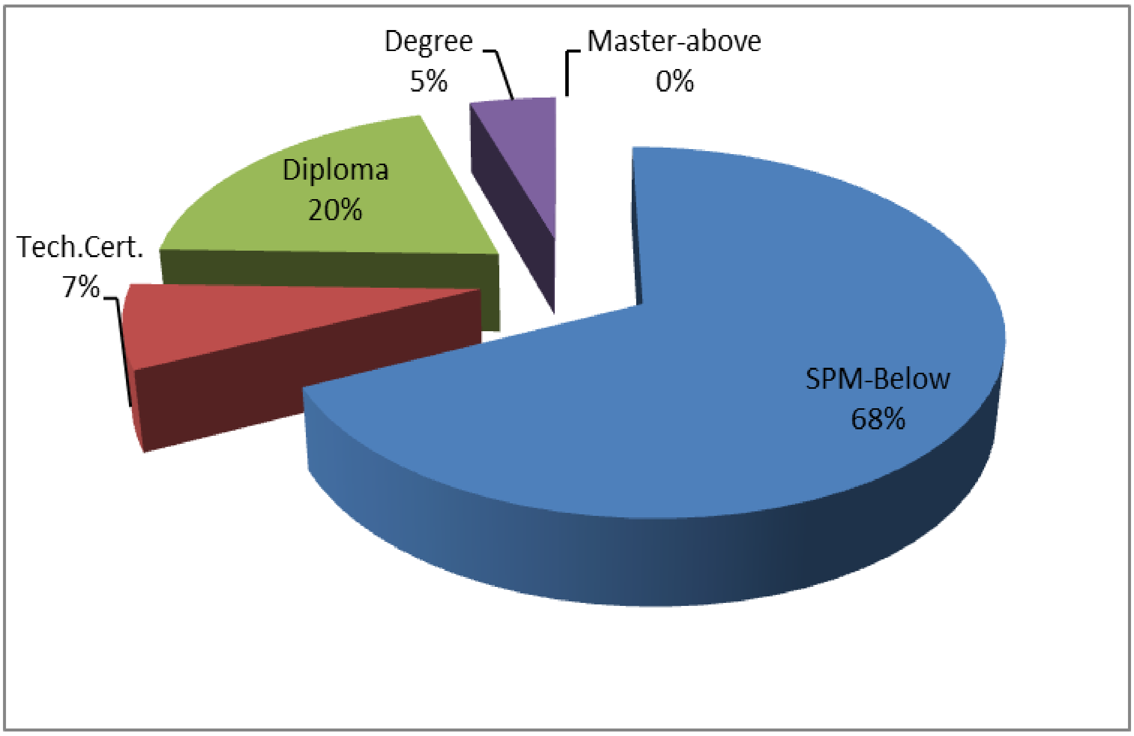


Figure 4.19: Education Level in DEP4

4.6.1.1.3 Age of Respondents for DEP3 and DEP4

In terms of age, the respondents were segregated into four age groups. First group covered the respondents` between the ages of 20 to 29 years old, which was thirty one per cent in DEP3 and thirty seven per cent in DEP4. The second group were between the ages of 30 to 39 years old, which was twenty three per cent in DEP3 and forty three per cent in DEP4. In the third group were the respondents between the ages of 40 to 49 years old, with nine per cent in DEP3 and fifteen per cent in DEP4. Finally, thirty eight per cent and five per cent of the respondents came from the group aged more than 50 years old in DEP3 and DEP4. In general, the proportion of the age groups was quite balanced in DEP3 while in DEP4 it seemed to consist of young people under the ages of 40 years, representing seventy percent of the total percentages. Detailed information is given in Table 4.28, Figure 4.20, Table 4.29 and Figure 4.21.

Table 4.28: Age in DEP3

DEP3		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	20-29	32	(30.8)	30.8	30.8
	30-39	24	(23.1)	23.1	53.9
	40-49	9	(8.7)	8.7	62.6
	50-above	39	(37.5)	37.5	100
	.				100.0
	Total	104	(100.0)	100.0	

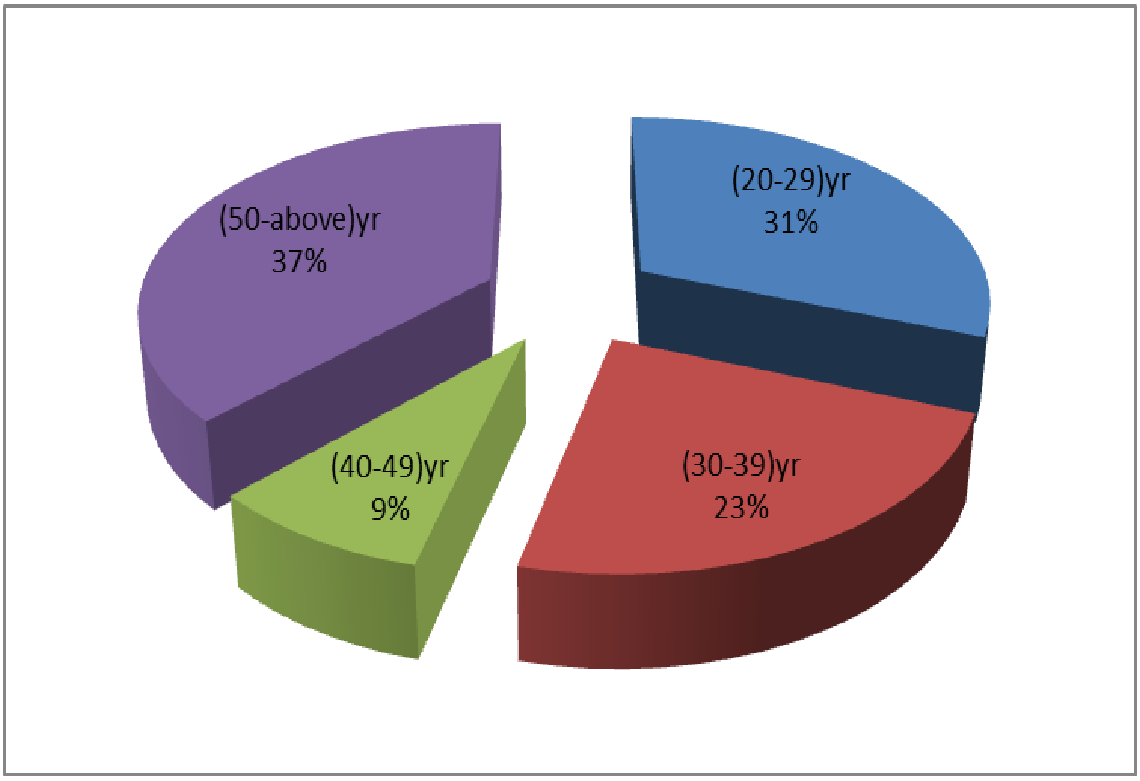


Figure 4.20: Age in DEP3

Table 4.29: Age in DEP4

DEP4		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	20-29	39	(36.8)	36.8	36.8
	30-39	46	(43.4)	43.4	80.2
	40-49	16	(15.1)	15.1	95.3
	50-above	5	(4.7)	4.7	100.0
	Total	106	(100.0)	100.0	

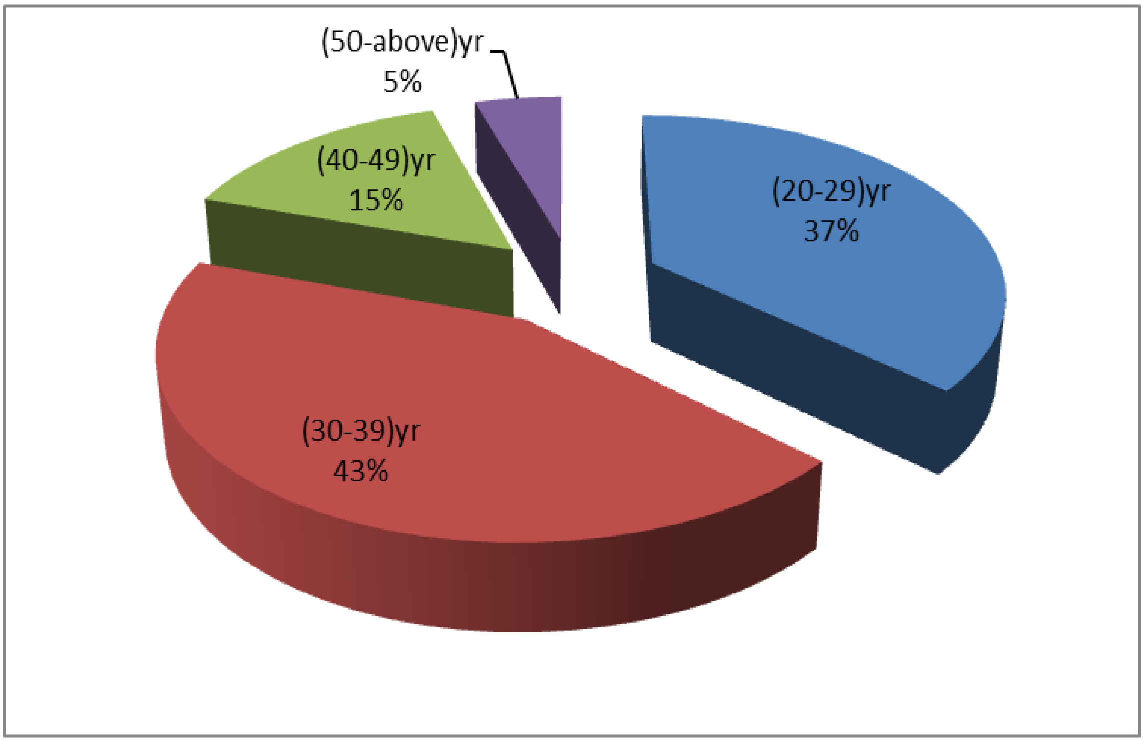


Figure 4.21: Age in DEP4

4.6.1.1.4 Respondent’s Working Experience for DEP3 and DEP4

Another variable of personal profile in question was the respondents working experience. In this section, the respondents were segregated into four groups; the first group was for employees who worked less than five years and the percentage of respondents was twenty two per cent in DEP3 and twenty six per cent in DEP4. The second group with 6 to 10 years of working experience, covered twenty nine per cent in DEP3 and thirty six per cent of respondents in DEP4.The third group with 11 to 15 years of experience, formed three per cent in DEP3 and seventeen per cent in DEP4. The last group had respondents who worked for more than 16 years and formed forty six per cent in DEP3 and made up twenty two per cent of the respondents in DEP4.

In terms of work experience, it was found that respondents in DEP3 were experienced workers while respondents in DEP4 were those who lacked experience. These estimates are taken based on the work term. Detailed information is given in Table 4.30, Figure 4.22, Table 4.31 and Figure 4.23.

Table 4.30: Working Experience in DEP3

DEP3		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	5 - below	23	(22.1)	22.1	22.1
	6-10	30	(28.8)	28.8	50.9
	11-15	3	(2.9)	2.9	53.8
	16-above	48	(46.2)	46.2	100
	. Total	104	(100.0)	100.0	

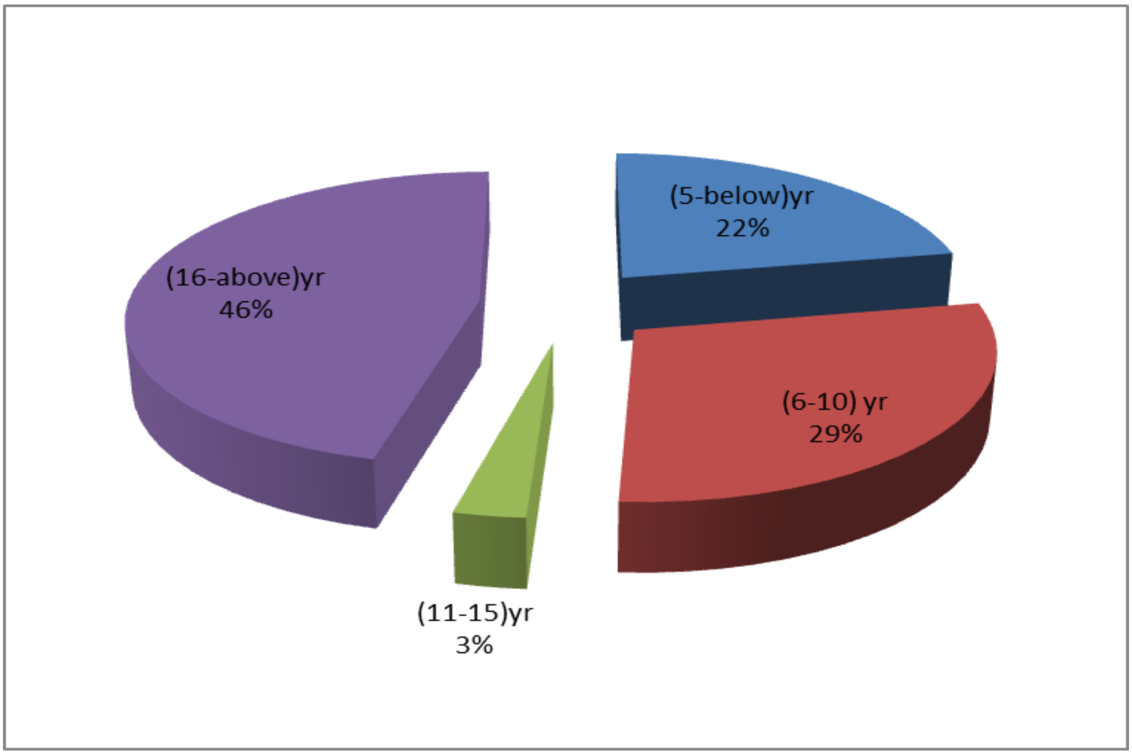


Figure 4.22: Work Experience in DEP3

Table 4.31: Working Experience in DEP4

DEP4		Frequency	(%)	Valid Percent	Cumulative Percent
Valid	5 – below	27	(25.5)	25.5	25.5
	6-10	38	(35.8)	35.8	61.3
	11-15	18	(17)	17	78.3
	16-above	23	(21.7)	21.7	100
	Total	106	(100.0)	100.0	

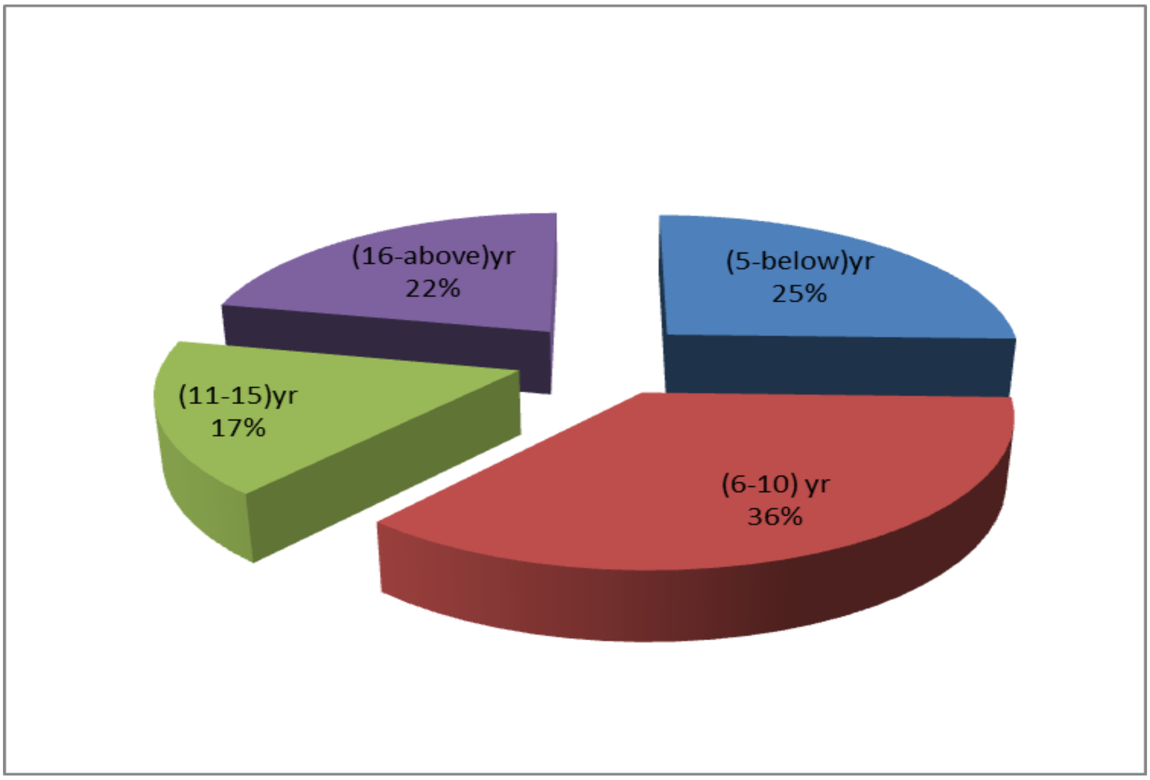


Figure 4.23: Work Experience in DEP4

4.6.1.2 Safety Climate Factors

The safety climate factors are the independent variables in this study. It includes management commitment, employee participation, training and education, and communication. Each of these variables will be shown and discussed in the following subsections.

4.6.1.2.1 Management Commitment for DEP3 and DEP4

From Figure 4.24, about 48% of respondents in both DEP3 and DEP4 had chosen a Likert-scale 4 for management commitment and about 8% in DEP3 and 14% in DEP4 had chosen a Likert scale 5. For Likert scale 3 about 29% were obtained in DEP3 and 25% in DEP4. There were about 2%-14% of respondents in both departments who had chosen Likert Scale 1 and Likert Scale 2.

The overall results showed that about 56% in DEP3 and 62% in DEP4 agreed with the statement given. This indicates that they are ‘moderately satisfied to satisfied’ with their employers.

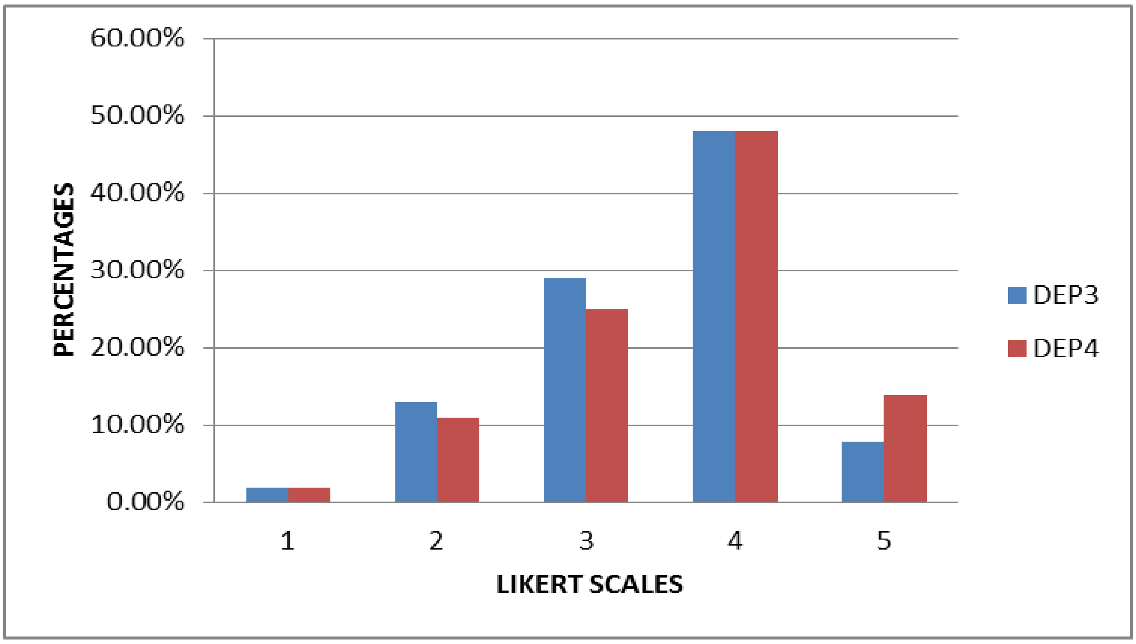


Figure 4.24: Management Commitment in DEP3 and DEP4

4.6.1.2.2 Employees' Participation for DEP3 and DEP4

From Figure 4.25, the responses indicate that, about 53% of the respondents from DEP3 and DEP4 had chosen a Likert scale 4 for employees` participation. About 14% in DEP3 and 15% in DEP4 had chosen Likert scale 5. Likert scale 3 was chosen by about 24% in both departments had chosen. About less than 10% of the respondents in both departments had chosen Likert scale 1 and Likert scale 2. The overall results showed that about 67% of respondents in both departments agreed with the statement given. This shows that they are 'moderately satisfied' to 'satisfied' with their participation in the department.

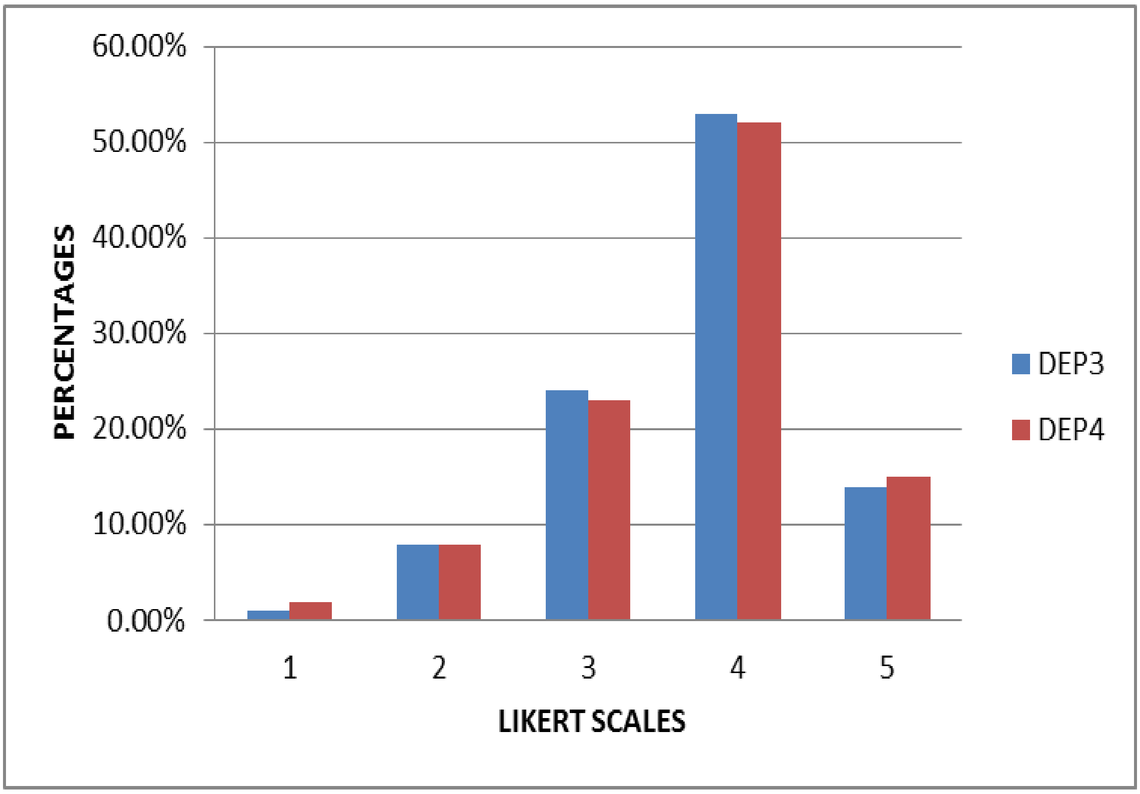


Figure 4.25: Employees' Participation in DEP3 and DEP4

4.6.1.2.3 Training and Education for DEP3 and DEP4

From Figure 4.26, about 44% of the respondents from DEP3 and 58% of respondents from DEP4 had chosen Likert scale 4 for training and education. Likert scale 5, was chosen by about 7% of the respondents in DEP3 and 17% of the respondents in DEP4 . About 33% of respondents in DEP3 and 21% of respondents in DEP4 had chosen Likert scale 3. Less than 10% chose Likert scale 1, 2 and 3. The overall results showed that about 51% in DEP3 and 75% in DEP4 agreed with the statement given. Generally, this shows that they are 'moderately satisfied to satisfied', with the training and education programs in their department.

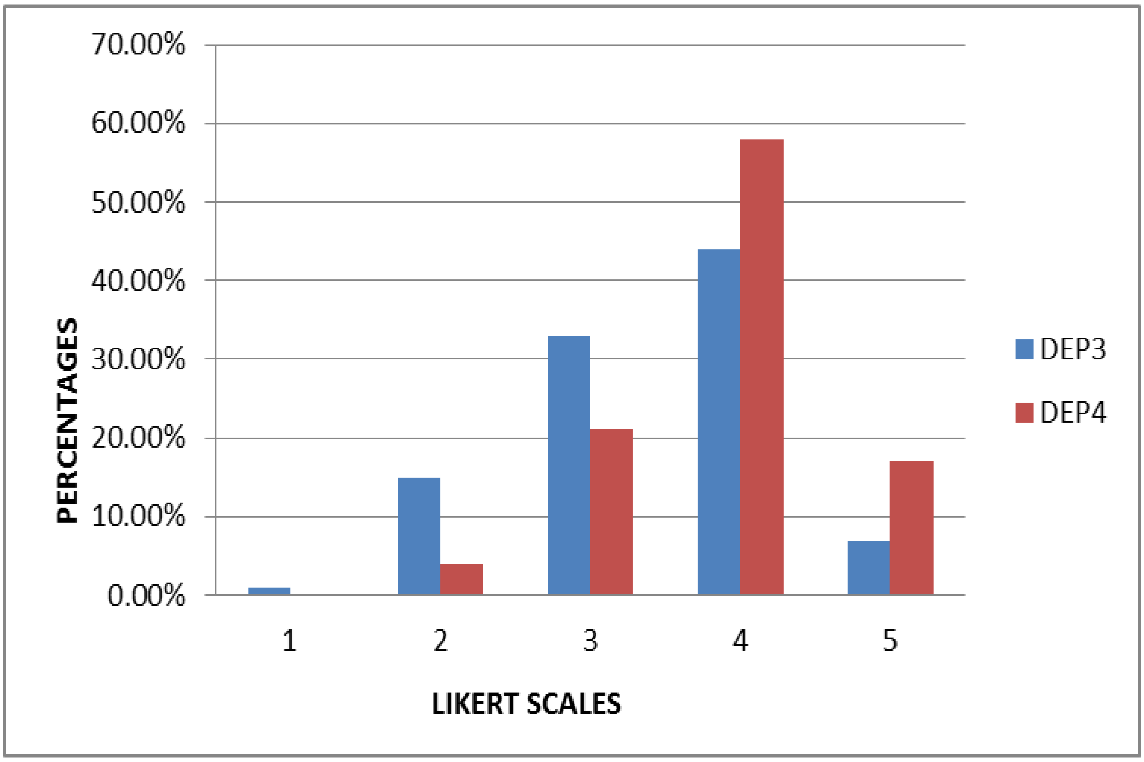


Figure 4.26: Training and Education in DEP3 and DEP4

4.6.1.2.4 Communication for DEP3 and DEP4

From Figure 4.27, the responses indicated that, about 48% of the respondents from DEP3 and 57% in DEP4 had chosen a Likert scale 4 for communication in the department. About 9% in DEP3 and 12% in DEP4 of the respondents had chosen Likert scale 5. For Likert scale 3, about 34% in DEP3 and 25% in DEP4. Likert scale 1 and 2 was chosen by less than 10% of the respondents. The overall results showed about 57% in DEP3 and 69% in DEP4 agreed with the statement given. This shows that they are 'moderately satisfied' to 'satisfied', with communications in the department.

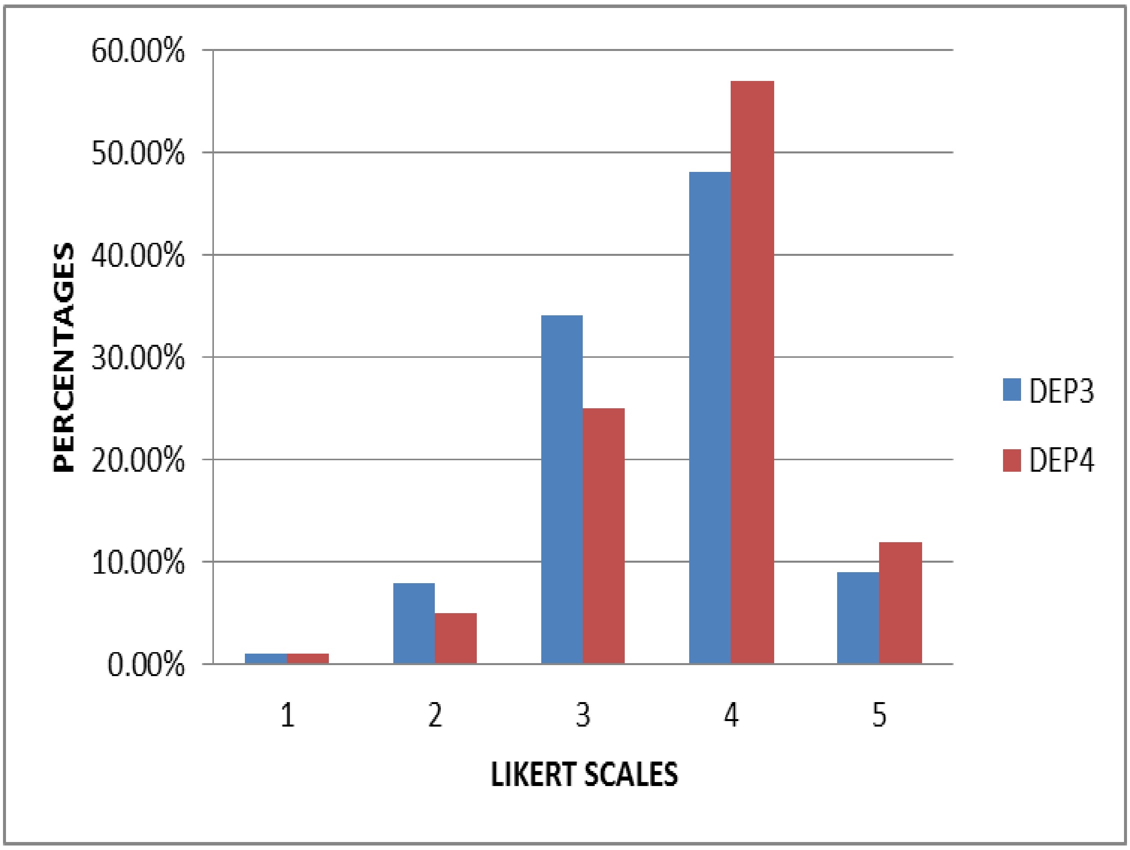


Figure 4.27: Communication in DEP3 and DEP4

4.6.1.3 Level of Awareness of Occupational Safety and Health

The data obtained were processed using descriptive analysis method comprising the table of mean score, standard deviation and the percentage. This analysis was used to explain the demographics of respondents to the questions that have options. Table 4.32 (a, b, c, d and e) shows the data collected to measure the occupational safety awareness for DEP3 and DEP4.

Table 4.32(a): LoA of Occupational Safety and Health in DEP3 and DEP4 - Orientation

			SD	D	M	A	SA	MS/SD
40	I feel safe at workplace.		(f) 0	1	18	71	14	3.94
		DEP3	% 0	1.0	17.3	68.3	13.5	0.588
			(f) 1	1	19	63	22	3.98
		DEP4	% 1.0	1.0	17.9	59.4	20.7	0.717
41	My organization takes all OSH measure to ensure employees safety.		(f) 0	2	25	60	17	3.88
		DEP3	% 0	1.9	24.0	57.7	16.3	0.687
			(f) 1	2	16	64	23	4.00
		DEP4	% 1.0	1.8	15.1	60.3	21.7	0.730
42	My organization has Occupational Safety and Health policy.		(f) 0	6	37	49	12	3.64
		DEP3	% 0	5.8	35.6	47.1	11.5	0.762
			(f) 1	4	17	65	19	3.92
		DEP4	% 1.0	3.8	16.0	61.3	17.9	0.757

About 85 (81.8%) and 85 (80.1%) respondents in DEP3 and DEP4 felt safe at the work site. Their responses indicated that, about 77 (74%) in DEP3 and 87 (82%) respondents in DEP4 agreed that their organization had taken all Occupational Safety and Health measurements to ensure employees safety. About 61 (58.6%) respondents in DEP3 and 84 (79.2%) respondents in DEP4 agreed that their organization had the safety policies.

Table 4.32(b): LoA of Occupational Safety and Health in DEP3 and DEP4 - Policy

			SD	D	M	A	SA	MS/SD
43	The policy meets the legal requirements and best practice of occupational safety and health.		f) 0	5	32	59	8	3.67
		DEP3	% 0	4.8	30.8	56.7	7.7	0.689
			(f) 1	2	19	72	12	3.87
		DEP4	% 1.0	1.8	17.9	67.9	11.3	0.663
44	The policy is up to date.		f) 05	9	40	48	7	3.51
		DEP3	% 0	8.7	38.5	46.2	6.7	0.750
			(f) 0	5	28	62	11	3.75
		DEP4	% 0	4.7	26.4	58.5	10.4	0.705
45	The policy being implemented effectively.		f) 0	9	42	50	3	3.45
		DEP3	% 0	8.7	40.4	48.1	2.9	0.695
			(f) 0	5	34	58	9	3.67
		DEP4	% 0	4.7	32.0	54.7	8.5	0.700

About 67 (64.4%) in DEP3 and 84 (79.2%) of respondents in DEP4 agree, that the policy met the legal requirements. The responses also indicated that 55 (52.9%) in DEP3 and 73 (68.9%) of respondents in DEP4 agreed that the policy is up to date. About 53 (51%) in DEP3 and 67 (63.2%) respondents in DEP4 agreed that the policy is being implemented effectively.

Table 4.32(c): LoA of Occupational Safety and Health in DEP3 and DEP4 - Monitoring

			SD	D	M	A	SA	MS/SD
46	My organization provides safety and health information to employees.	DEP3	f) 0 % 0	9 8.7	41 39.4	47 45.2	7 6.7	3.50 0.750
		DEP4	(f) 0 % 0	3 2.8	32 30.2	62 58.5	9 8.5	3.73 0.655
47	My organization has a safety and health committee.	DEP3	(f) 2 % 1.9	14 13.5	40 38.5	41 39.4	7 6.7	3.36 0.869
		DEP4	(f) 0 % 0	9 8.5	24 22.6	65 61.3	8 7.5	3.68 0.737
48	My organization sets safety and health objectives on the organizational level.	DEP3	f) 1 % 1.0	15 14.4	33 31.7	49 47.1	6 5.8	3.42 0.844
		DEP4	(f) 0 % 0	4 3.8	22 20.7	70 66.0	10 9.4	3.81 0.649
49	My organizational sets safety and health objectives on the individual levels.	DEP3	f) 1 % 1.0	13 12.5	39 37.5	47 45.2	4 3.8	3.38 0.792
		DEP4	(f) 0 % 0	5 4.7	30 28.3	57 53.8	14 13.2	3.75 0.741

About 42 (50.6%) in DEP3 and 58 (71.6%) of respondents in DEP4 agreed that their organization provided safety and health information to them. Their responses also indicated 42 (50.6%) and 65 (80.3%) of respondents in DEP3 and DEP4 agreed that their organization had a safety and health committee. About 42 (50.6%) and 65 (80.3%) of respondents in DEP3 and DEP4 agreed that their organization had set safety and health objectives on an organization level. About 36 (43.2%) 51 (63%) of respondents in DEP3 and DEP4 agreed that their organization had set a safety and health objectives on an individual level.

Table 4.32(d): LoA of Occupational Safety and Health in DEP3 and DEP4 - Risk Assessment

			SD	D	M	A	SA	MS/SD
50	The workplace risk assessment are being carried out.		f) 1	9	44	43	7	3.44
		DEP3	% 1.0	8.7	42.3	41.3	6.7	0.786
			(f) 2	2	27	65	10	3.75
		DEP4	% 1.8	1.8	25.5	61.3	9.4	0.731
51	The systems are in placed to ensure risk assessments are reviewed when appropriate.		f) 1	9	30	59	5	3.56
		DEP3	% 1.0	8.7	28.8	56.7	4.8	0.761
			(f) 0	5	29	61	11	3.74
		DEP4	% 0	4.7	27.3	57.5	10.4	0.708
52	OSH inspection are being carried out.		f) 1	13	33	48	9	3.49
		DEP3	% 1.0	12.5	31.7	46.2	8.7	0.859
			(f) 0	3	28	58	17	3.84
		DEP4	% 0	2.8	26.4	54.7	16.0	0.719
53	My organization has a system for reporting accidents.		f) 0	13	50	36	5	3.32
		DEP3	% 0	12.5	48.1	34.6	4.8	0.754
			(f) 0	4	29	55	18	3.82
		DEP4	% 0	3.8	27.3	51.9	17.0	0.753
54	My organization has an audit system in place		f) 1	8	27	50	18	3.73
		DEP3	% 1.0	7.7	26.0	48.1	17.3	0.873
			(f) 0	3	17	59	27	4.04
		DEP4	% 0	2.8	16.0	55.6	25.5	0.729

About 28 (33.7%) and 47 (58%) of respondents in DEP3 and DEP4 agreed that their organization had carried-out workplace risk assessments. About 40 (48.2%) and 55 (67.9%) of respondents in DEP3 and DEP4 agreed that the systems were in place to ensure risk assessment and were reviewed when appropriate. About 34 (41%) and 57 (70.4%) of respondents in DEP3 and DEP4 agreed that OSH inspection was being carried-out.

About 29 (34.9%) and 55 (67.9%) of respondents in DEP3 and DEP4 agreed that the organization had an accident reporting system. About 50 (60.3%) and 64 (79%) of respondents in DEP3 and DEP4 agreed that the organization had an audit system in place.

Table 4.32(e): LoA of Occupational Safety and Health in DEP3 and DEP4 - Review

				SD	D	M	A	SA	MS/SD
55	My organization has procedure for safety and health	DEP3	(f)	0	8	41	48	7	3.52
			%	0	7.7	39.4	46.2	6.7	0.737
		DEP4	(f)	0	3	21	63	19	3.92
			%	0	2.8	19.8	59.4	17.9	0.700
56	My organization reviews safety and health implementation.	DEP3	f)	0	11	43	46	4	3.41
			%	0	10.6	41.3	44.2	3.8	0.732
		DEP4	(f)	0	3	27	60	16	3.84
			%	0	2.8	25.5	56.6	15.1	0.706

About 45 (54.2%) and 65 (80.3%) of respondents in DEP3 and DEP4 agreed that the organization had the procedure for safety and health. About 37 (44.5%) and 61 (75.3%) of respondents in DEP3 and DEP4 were satisfied with the organization for reviewing safety and health implementations.

4.6.1.4 Overall LoA of Occupational Safety and Health

Table 4.33 shows that respondents in DEP3 provided answers that showed they had high LoA of OSH with 3.83 compared to 3.54 given by respondents in DEP4 who indicated they were at a moderate level. This may be influenced by a number of demographic data and other factors which will be discussed later.

Table 4.33: Overall LoA of Occupational Safety and Health

	MEAN SCORE					OVERALL LoA of OSH (MEAN SCORE)
	ORIENTATION	POLICY	MONITORING	RISK ASSESSMENT	REVIEW	
DEP3	3.97	3.76	3.74	3.84	3.88	**3.83 (HIGH)**
DEP4	3.82	3.54	3.42	3.51	3.47	**3.54 (MODERATE)**

4.6.2 Statistical Analysis for DEP3 and DEP4

The statistical analysis is required to identify the relationship between the variables studied. Analysis was done including the reliability of the questionnaire, tested several hypotheses of the study, identifying the differences between groups and identifying correlations between the independent variables and the dependent variable. This is to ensure that the studies done have high reliability and validity.

4.6.2.1 Reliability Measures for DEP3 and DEP4

In order to ensure high level of trustworthines of the research findings, the questionnaire reliability was tested using Cronbach's alpha, α. Cronbach's alpha is derived from the average correlation of all items on the scale (Rodeghier, 1996). The reliability measures of the questionnaire on management commitment, employees' participation, training and education, communication and occupational safety performance, have been tested as shown in Table 4.34.

The results indicate that the reliability was high for management commitment in both departments with values from 0.656 to 0.701. As for employees' participation the results show that the reliability was high in both departments with values 0.738 to 0.752. Training and Education is considered high in reliability with values 0.918 and 0.916. The results also indicated that communication is considered high in reliability with values 0.891 and 0.880. Finally, LoA of Occupational Safety and Health shows high reliabilities for both departments with values 0.947 and 0.943. This means that the higher the value of the coefficient obtained the more consistent will be the data set. A mark below 0.70 is considered as lack of internal consistency (Chua, 2006; Nunnaly, 1978). This shows the reliability and validity of the questionnaire used in this study.

Table 4.34: Result for Reliability Measures for DEP3 and DEP4

SAFETY FACTORS	DEP3	DEP4
Management Commitment	0.656	0.701
Employees` Participation	0.738	0.752
Training and Education	0.918	0.916
Communication	0.891	0.880
OSH Performance	0.947	0.943

4.6.2.2 Testing of Hypotheses for DEP3 and DEP4

As discussed in Section 4.4, several research hypotheses were made and tested to identify whether demographic factors influence the perception of OSH awareness and also to assess the relationship between the dependent variable and independent variables.

4.6.2.2.1 Analysis of Differences Between Groups

Hypothesis 9: There is difference of perception level on LoA of Occupational Safety and Health based on their designation.

The hypothesis is designed to test whether the designation of employees affects their perception toward occupational safety awareness.

One way ANOVA Tests was conducted and the test outputs were in Table 4.35.

Table 4.35: Result for the difference of employees` perception level on LoA of Occupational Safety and Health based on their designation

ANOVA

LoA-DEP3	Sum of Squares	Df	Mean Square	F	Sig.(*p*)
Between Groups	.400	2	.200	.628	.535
Within Groups	32.123	101	.318		
Total	32.522	103			
LoA-DEP4	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.(*p*)**
Between Groups	.347	2	.173	.648	.525
Within Groups	27.519	103	.267		
Total	27.865	105			

As shown in Table 4.35, the results indicate that there is no difference in perception level on occupational safety and health awareness based on their designations as the *p*-value is more than 0.05 in both departments. This means that employees' designations do not influence their differences on perception of the occupational safety awareness.

Hypothesis 10: There is difference of perception level on LoA of Occupational Safety and Health based on their education background.

The hypothesis was designed to test whether the education background of employees affects their perception toward Occupational Safety awareness.

One way ANOVA Tests were conducted and the test outputs were in Table 4.36.

Table 4.36: Result for the difference of employees' perception level on LoA of Occupational Safety and Healths, based on their education level.

ANOVA

LoA-DEP3	Sum of Squares	Df	Mean Square	F	Sig.(*p*)
Between Groups	2.007	3	.669	2.192	.094
Within Groups	30.516	100	.305		
Total	32.522	103			
LoA-DEP4	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.(*p*)**
Between Groups	.873	3	.291	1.100	.353
Within Groups	26.992	102	.265		
Total	27.865	105			

As shown in Table 4.36, the results indicate that there is no difference in perception level on occupational safety and health awareness based on their educational levels as the *p*-value is more than 0.05 in both departments. This means that employees' educational level does not influence their difference on perception of the occupational safety awareness.

Hypothesis 11: There is difference of perception level on LoA of Occupational Safety and Health based on their age.

The hypothesis was designed to test whether the age of employees affects their perception toward occupational safety awareness.

One way ANOVA Tests were conducted and the test outputs are shown in Table 4.37.

Table 4.37: Result for the Difference of Employees' Perception Level on LoA of Occupational Safety and Health Based on Their Age

ANOVA

LoA-DEP3	Sum of Squares	Df	Mean Square	F	Sig.(*p*).
Between Groups	1.838	3	.613	1.997	.119
Within Groups	30.684	100	.307		
Total	32.522	103			
LoA-DEP4	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.(*p*)**
Between Groups	.976	3	.325	1.235	.301
Within Groups	26.889	102	.264		
Total	27.865	103			

As shown in Table 4.37, the results indicate that there is no difference in perception level on occupational safety and health awareness based on their age as the *p*-value is more than 0.05 in both departments. This means that employees' age does not influence their difference on perception of the occupational safety awareness.

Hypothesis 12: There is difference of perception level on LoA of Occupational Safetyand Health based on their work experience.

The hypothesis was designed to test whether the work experience of employees affects their perception toward occupational safety awareness.

One way ANOVA Tests were conducted and the test outputs are shown in Table 4.38.

Table 4.38: Result for the Difference of Employees' Perception Level on LoA of Occupational Safety and Health Based on Their Work Experience

ANOVA

LoA-DEP3	Sum of Squares	Df	Mean Square	F	Sig. .(*p*)
Between Groups	1.902	3	.432	1.575	.044
Within Groups	30.621	100	.274		
Total	32.522	103			
LoA-DEP4	Sum of Squares	Df	Mean Square	F	Si.(*p*)
Between Groups	1.616	3	.368	1.577	.046
Within Groups	17.665	102	.233		
Total	27.865	105			

As shown in Table 4.38, the results indicate that there was difference perception level on occupational safety awareness based on their work experiences as the *p*-value is less than than 0.05 in both DEP3 and DEP4. This means that employees working experience perfectly influences their differences of perception on occupational safety awareness in DEP3 and DEP4.

4.6.2.2.2 Test of Correlations for DEP3 and DEP4

As discussed in section 4.4.3.2, Pearson, *r*, tests were conducted to analyze the significance of relationship between management commitment, employees participation, training and education and communication towards occupational safety awarenesss. The four hypotheses to be tested are:

Hypothesis 13: There is Relationship between Management Commitment and Employees' Level of Awareness of Occupational Safety and Health

Hypothesis 14: There is Relationship between Employees' Participation and Employees' Level of Awareness of Occupational Safety and Health

Hypotheses 15: There is Relationship between Training and Education Toward Employees' Level of Awareness of Occupational Safety and Health.

Hypotheses 16: There is Relationship between Communication and Employees' Level of Awareness of Occupational Safety and Health.

The test outputs are given in Table 4.39. The test results will be discussed accordingly. Table 4.39 answers the questions asked in all the hypotheses tested, where the results show the correlation coefficient is significant at the 0.01 level (2-tailed) in both DEP3 and DEP4. As *p*-value was smaller than 0.05 there is significant influence between management commitment, employee participation, training and education and communication on occupational safety awareness. This means that the level of employees' occupational safety awareness was influenced by all the factors tested.

Table 4.39: Correlation between LoA of Occupational Safety and Health and Safety Climate factors for DEP3 and DEP4

Correlations

		LoA3	LoA4
LoA	Pearson Correlation	1	1
	Sig. (2-tailed)	.	.
	N	104	106
MSMC	Pearson Correlation	.469(**)	.383(**)
	Sig. (2-tailed)	.000	.000
	N	104	106
MSEP	Pearson Correlation	.710(**)	.525(**)
	Sig. (2-tailed)	.000	.000
	N	104	106
MSTE	Pearson Correlation	.754(**)	.634(**)
	Sig. (2-tailed)	.000	.000
	N	104	106
MSCOMM	Pearson Correlation	.807(**)	.673(**)
	Sig. (2-tailed)	.000	.000
	N	104	106

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

4.6.2.3 Regression Analysis

Regression analyses were carried out to find the most significant factors that influence LoA of Occupational Safety and Health.

4.6.2.3.1 Regression Analysis-Model Summary for DEP3 and DEP4

A summary of the models in Table 4.40 indicates R = 0.842 for DEP3 and R = 0.707 for DEP4 as the correlation between the predictor factors combined and the dependent factors. The values are quite large, indicating that the linear regression models can be predicted from independent variables.

Table 4.40: Model Summary for DEP3 and DEP4

Model	*R*	*R*-Square	Adjusted *R*-Square	Std. Error of the Estimate
DEP3	0.842	0.708	0.700	0.3079
DEP4	0.707	0.500	0.491	0.3676

Data analysis result using SPSS indicates that all the four factors identified are significant for OSH awareness in both DEP3 and DEP4. The factors are communication, employees' participation, training and education and management commitment which is *R*-Square = 0.708 in DEP3 and *R*-Square = 0.500 in DEP4 from Table 4.40. The results indicate that about 70% in DEP3 and 50% in DEP4 of the variability of OSH awareness are explained by factors mentioned. The values are quite high and indicating only the remainder of about 30% to 50% is not explained. Therefore, it can be concluded that communication, employees' participation, training and education and management commitment also influenced OSH awareness in DEP3 and DEP4.

Adjusted *R*-square is a better reflection of the proportion of variability explained by the regression model than *R*-square (Montgomery, et al., 2001). In this case, from Table 4.40, there are no significant difference on the values of "*R*-square" and "Adjusted *R*-square" for both models.

4.6.2.3.2 Regression Analysis-Linearity Test (ANOVA) for DEP3 and DEP4

As mentioned before, the purpose of analysis of Variance (ANOVA) is to find whether there is a linear relationship between the predictor and the dependent factors. The results show that *F* statistic is significant at $p < 0.005$ and it can be concluded that *R*-Square is significantly different from zero. This means that there is a linear relationship between the predictor and the dependent factor in both models (Foster, 2001).

Scatter plots of Regression Standardized Predicted Value against Regression Standardized Residual for DEP3 and DEP4 are shown in Figure 4.28 and Figure 4.29. Occupational Safety Awareness is a dependent variable. Both plots show evidence that the relationship between the dependent and independent factors were also linear.

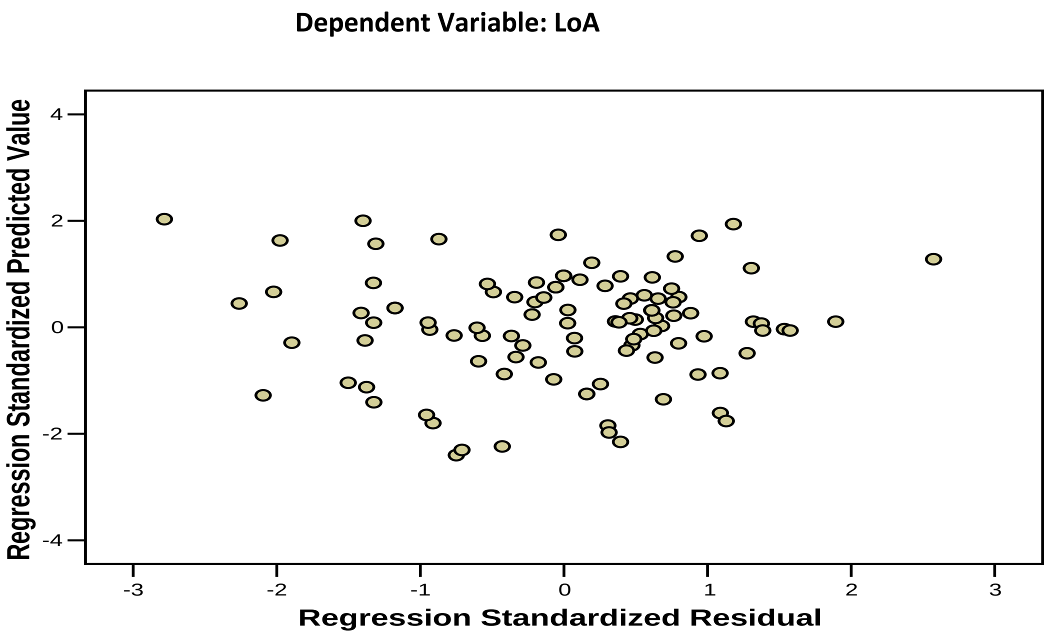


Figure 4.28 : Scatter Plot of Regression Standardized Predicted Value against Regression Standardized Residual for DEP3

Dependent Variable: LoA

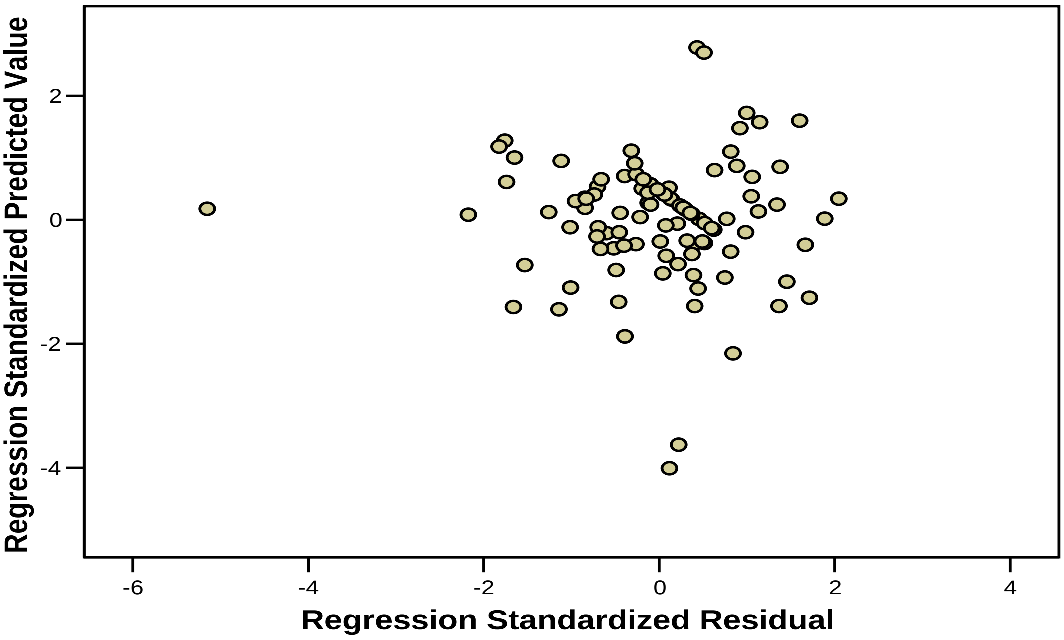


Figure 4.29 : Scatter Plot of Regression Standardized Predicted Value against Regression Standardized Residual for DEP4

** The factors are scattered without showing any pattern giving evidence that the dependent and independent factors are linear (Foster, 2001).*

4.6.2.3.3 Regression Analysis - Coefficient Factor

Table 4.41 shows the coefficient factors for DEP3 and DEP4. *t* values and the probabilities,Sig, indicate whether the regression coefficient for each factor is greater than zero. The results show that the *t* values for all the predictor factors considered are significant at $p < 0.05$. Therefore, it can be concluded that the predictor factors predict OSH awareness in DEP3 and DEP4.

Table 4.41: Coefficient Factors for DEP3 and DEP4

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
DEP3	(Constant)	-.108	.299		-.362	.718
	MSCOMM3	.462	.111	.424	4.145	.000
	MSTE3	.233	.075	.277	3.091	.003
	MSEP3	.325	.118	.222	2.755	.007
DEP4	(Constant)	.373	.364		1.025	.308
	MSCOMM4	.597	.088	.547	6.803	.000
	MSEP4	.327	.104	.252	3.131	.002

a Dependent Variable: MSOSH3 and MSOSH4

Therefore, from Table 4.41, the regression equation for DEP3 is found to be:

$$\boldsymbol{OSH\ LoA = 0.462\ COMM + 0.233\ TE + 0.325\ EP - 0.108}$$

And the regression equation for DEP4 is found to be:

$$\boldsymbol{OSH\ LoA = 0.373 + 0.597\ COMM + 0.327\ EP}$$

4.6.2.3.4 Accuracy of the Equations for DEP3 and DEP4

The accuracy of equations obtained from the regression analysis was tested to ensure that the model is satisfactory to predict the safety awareness. As Likert-scales of 1 to 5 were used as measurement tools, therefore all the five ranges are tested in order to evaluate the accuracy of the model equation. The evaluation of Likert-scales of 1 to 5 is shown in Appendix S. The coefficient variables imply that the predicted occupational safety awareness increases by the associated coefficient for a change of 1 of the indicated variable. For example, if the value of communication in DEP3 model changed from 1 to 2, the value of safety awareness will change from 0.462 to 0.924 on the Likert scale. Based on this, assumptions are made to test the equation as shown in Appendix T.

As the results, the average percentage of deviation is:

DEP3 = 2% more than assumption

DEP4 = 8% less than assumption

The accuracy of equations for both models was more than 90%. Equation model for DEP3 reflect significant factors for the construction department and also offers less and consistent deviation from the assumption. Although, the equation model for DEP4 did not reflect significant factors for supervising construction sites, it offers less and consistent deviation from the assumption. Statistically, regression model for DEP3 and DEP4 are thus satisfactory for predicting occupational safety awareness, therefore this validates the previous models.

4.6.3 Hypotheses Tests About the Population Regression Line.

As discussed in 4.5.4, hypotheses test is done for the population regression line to determine if there is strong evidence to support the existing of linear relationship between dependent and independent variables in DEP3 and DEP4. As mentioned before, the population regression line is the line that describes the relationship between the dependent variables and independent variables in the population (Norusis, 1999b). According to Norusis (2007), it is equivalent to test the null hypotheses that the population regression line slope is zero.

Table 4.41 shows the coefficients for DEP3 and DEP4. It can be seen that in both departments the sample slopes are above the hypothesized of zero, therefore the null hypothesis again can be rejected. There appears to be a linear relationship between communication, training and education and employee participation and LoA of Occupational Safety and Health in DEP3 and DEP4.

4.7 Discussion

The discussion starts by assessing the findings of this study. A study has been carried-out to validate the findings, the write up and result of the validation exercise as shown in the middle of this chapter generally supports the findings of this study.

4.7.1 Objective No.1: Determination of Effects of Employee`s Demographic Background on the Perception of Level of Awareness (LoA) on Ocupational Safety and Health

Table 4.42: Significant Values, *p*, for All Models.

DEMOGRAPHIC DATA	DEP1 **(sig, *p*)**	DEP2 **(sig, *p*)**	DEP3 **(sig, *p*)**	DEP4 **(sig, *p*)**
DESIGNATION	0.527	0.323	0.535	0.525
EDUCATION LEVEL	0.596	0.504	0.094	0.353
AGE	0.166	0.911	0.119	0.301
WORK EXPERIENCE	0.000	0.046	0.044	0.046

The results in Table 4.42, show a position held no influence perceptions of safety awareness when available values of $p > 0.05$ in all departments studied. This means that even if a person has a high level positions in the organization, it does not influence the difference in perceptions of safety awareness than those at lower levels of employment. For level of education, it was found that there were no significant difference in the perception of safety awareness, which means that even if a person has a high level of education it does not affect the perception of safety awareness shown by the value of $p > 0.05$ in all departments studied.

While tests on age shows no significant difference on the perception of safety awareness, although the older one, but it does not influence their perception of safety awareness shown by the value of $p > 0.05$ in all departments tested. Work experience was found to highly influence the perceptions of safety awareness with the value of $p < 0.05$ in all departments tested. This means that a more experienced person gets different perception of safety awareness. This is inline with the study by Yasin (2008), who found the influence of being exposed to different types of safety and health programs organized by the organization.

4.7.2 Objective No.2: Measuring the Level of Awareness on Occupational Safety and Health of the Agencies.

To measure the level of safety awareness, there are two methods used, the first measures directly the perception of the respondents and uses the questions in section three of the questionnaire. The second method uses the equation obtained as a result of the analysis.

Table 4.43: Overall LoA of OSH

	MEAN SCORE					OVERALL LoA of OSH (MEAN SCORE)
	ORIENTATION	POLICY	MONITORING	RISK ASSESSMENT	REVIEW	
DEP1	3.61	3.30	3.32	3.31	3.38	**3.37 (MODERATE)**
DEP2	3.98	3.81	3.88	3.77	3.95	**3.86 (HIGH)**
DEP3	3.97	3.76	3.74	3.84	3.88	**3.83 (HIGH)**
DEP4	3.82	3.54	3.42	3.51	3.47	**3.54 (MODERATE)**

The results in Table 4.43 derived through descriptive analysis made on the data obtained from the survey that directly measures the safety awareness using the questions in Section three of the set of survey questionnaires. Analysis was conducted on the mean scores for orientation, policy, monitoring, risk assessment and a review of all the factors mentioned.

The results showed that the overall safety awareness in DEP1 and DEP4 was found to be in the moderate level while in DEP2 and DEP3 showed a high level. Safety management procedures are in a systematic practice in DEP2 under OHSAS 18000. The workers in DEP2 have applied formal safety practices and they were exposed to various aspects of management and good practices in safety. This is supported from previous studies that found that the high level of safety aspects among those who have heard the safety terms and among those who have an understanding of safety practices (Bergh, 2011). Whereas in DEP3, arguably the majority of respondents are employees who have more work experience. With extensive work experiences they easily understood the intricacies of their jobs. Thus, they tend to give answers that led to a positive safety culture. This is supported by the results of the study which showed that work experience has a big influence on the respondents' perceptions of their current safety awareness on daily duties.

For respondents in DEP1, even if they do not adopt specific safety management systems but they are made up of workers with long work experience. Therefore, work experience, has helped them to carry out their duties in a more secure manner because they understood the procedures for a good job. In terms of safety awareness they are at a moderate level. While in DEP4, although respondents from the group are young people, their nature of work always exposes them to occupational hazards which causes them to be careful always when performing their duties. They are also always exposed to systematic safety management system that is practiced in their department. However, referring to the answers they had given, they are at a moderate level. This is consistent with past studies that say people who had experienced dangerous situations, or accidents, at work had a lower level of safety awareness compared to those who had not experienced any of this (Milczarek, 2004).

When reviewing the job description, it was found that, DEP4's workers experienced more accidents or hazardous events compared to respondents in other departments. Routine scope of work includes rescue work and fire-fighting which is always exposed to occupational hazards. This could explain why the level of safety awareness in DEP4 is moderate.

Table 4.44: LoA of OSH using Equation (Model: all models)

MODEL	EQUATION	LoA of OSH
DEP1	$0.510\,COMM + 0.326TE + 0.588$	3.36 (67%)
DEP2	$0.770\,COMM + 1.016$	3.86 (77%)
DEP3	$0.462\,COMM + 0.233\,TE + 0.325\,EP - 0.108$	3.54 (70%)
DEP4	$0.597\,COMM + 0.327\,EP + 0.373$	3.83 (76%)

Table 4.44, shows the equations gathered from analysis conducted on the data obtained from the survey. Using the mean values obtained for each of the variables measured, are included in the equation, then the value of the safety awareness of each model is obtained as shown in Table 4.44 (see the example below)

Sample calculations are made: For Model DEP1 (for other models please refer to Appendix T)

$$\boldsymbol{LoA\ OSH\ =\ 0.510\ COMM\ +\ 0.326TE\ +\ 0.588}$$

The mean score for Communications for DEP1 = 3:41 (taken from Appendix S)

The mean score for Training and Education for DEP1= 3.18 (taken from Appendix U)

Replace the mean score values COMM and TE in the equation:

$LoA\ OSH$ = $0.510\ (3.41) +\ 0.326\ (3.18) +\ 0.58\ =\ 3.363$

To obtain the percentages:

LoA O$SH\ =\ 3.363/5\ *\ 100 =\ 67\%$

Referring to Table 4.44, the results show the percentages of safety awareness hovered between 60 to 80 percent. This can be concluded that the safety awareness in all departments tested showed safety awareness is moderately high. This means that on the whole implementation of safety aspect is at an acceptable level but there is still room for improvement by all parties involved; management and workers together bringing energy and effort towards creating a more conducive working environment.

4.7.3 Objective No.3:Developing of Statistical Analytical Tool for Measuring and Correlating the Level of Awareness of Occupational Safety and Health and Safety Climate Factors

Table 4.45: Correlation coefficient, *r*, for all models

	DEP1	DEP2	DEP3	DEP4
NUMBER OF RESPONDENTS	83	81	104	106
MANAGEMENT COMMITMENT	0.579	0.443	0.469	0.383
EMPLOYEE PARTICIPATION	0.545	0.409	0.710	0.525
TRAINING AND EDUCATION	0.697	0.503	0.754	0.634
COMMUNICATION	0.725	0.666	0.807	0.673

From the correlation test results shown in Table 4.45, that there was a correlation between the variables tested. The results demonstrate management commitment has the lowest correlations values in all departments. This means that the workers felt management commitment does not greatly affect the awareness level of safety, because they are likely to have been satisfied with the contribution made by the management to ensure they can work safely. For them, their management has provided all the necessary requirements as stipulated in the Act.

Employee participation ranked second lowest in all the departments that were tested. The test results showed low correlation value of around 0.5. This means that respondents felt their involvement did not significantly influence safety awareness. They feel that they had contributed the best in all the safety activities practiced by the department during duties. The test results indicate they are very satisfied with their contribution to safety activities undertaken.

Next, training and education have a relatively large correlation value of around 0.7. This indicates that the respondent feels that training and education have a great influence on the perception of safety awareness. They feel that level of training and education given did not reach the level for them to work safely. The results gives a signal to management that the organization needs to add and organize better safety programs to be given to all employees. Thus they would feel more confident to work in difficult conditions.

Communication showed the highest correlation in all the variables tested in all departments studied. Correlation value obtained is around 0.8. This indicates that communication is affecting the respondents’ perceptions of safety awareness. Respondents think communication is very important in all work done. Effective communication is very essential to ensure that transactions can be done properly and safely. Each instruction/procedure needs to be fully understood by the individuals who receive them, so that they can undertake assigned tasks properly and safely.

Next, the following subsections, discusses the relationship between the predictor with LoA of OSH in the study.

4.7.3.1 LoA of OSH has Correlation with Management Commitment.

Results showed that there were relationships between LoA of OSH with Management Commitment. However, the results in Table 4.45, showed a weak relationship (DEP1 = 0.579, DEP2 = 0.443, DEP3 = 0.469 and DEP4 = 0.383). This means that, in this study, management commitment does not so influence respondents' views on the OSH awareness. They feel the management has played a pivotal role in establishing appropriate safe work environment and climate. The results of this study illustrates that the respondents were satisfied with the role played by their employers. This is consistent with studies that have been done before. Most scholars believe management commitment was one of major factors towards safety awareness. The most influential factor is management support (Aksorn, 2008). Cullen et al. (1993); Piccolo et al. (2010), concluded that management has ethical and moral responsibilities to ensure that employees and others are not exposed to risks or experience harm as a result of a firm's activities. Furthermore, Ogbonna (1990), had demonstrated that companies with the lowest lost-time injury rates were those with the highest level of management commitment and employee involvement.

Similarly, Erickson (2001), doing nation-wide scientific study found that the effect of corporate culture on injury and illness rates within the organization, showed that those elements most predictive of high safety awareness included a positive management commitment to safety and to employees, open communication, encourage employee innovation and suggestions and management feedback to employee among other elements. In fact, according to these professionals, active, continuous and genuine management support is the key to providing a safe, healthy working environment for employees.

All of the above statements were supported by Enz (1986); James (1993), echoes this view when she claims’ clearly, top management is a critical group in examining values because of its control over organizational design and functioning. To understand the role of values in an organizational context requires close examination of the organizational leaders and how their beliefs operate to influence activities within the firm`. The influence of leaders of LoA on OSH of their organizations may be summed up as follow:

“Organizational design-maker, managers and professionals alike hope to ensure that their central values and beliefs influence the LoA of OSH of their organizations by designing functional arrangements and hierarchies to facilitate and support those views.” (Abudayyeh et al., 2006; Hinings et al., 1996; Ranson et al., 1980).

The examples on how management shows its support by being committed to the safety and health efforts, including financial and human resource support. The management also can manage the safety and health in the same manner that productivity and quality are managed. There are a lot of companies that consider safety and health as part of their business. Incorporating safety and health into all organizational functions like strategic planning is another way. Becoming personally involved in the safety and health effort by being visibly seen doing so is another way. All of the examples given above will prove that the management had given their full support to ensure high performance of safety and health (Thomas, 2002).

4.7.3.2 LoA of OSH has Correlation with Employees' Participation

Results in Table 4.45 showed that there were relationships between LoA of OSH with Employees Participation. However, again the results in Table 4.46 showed a weak relationship (DEP1 = 0.545, DEP2 =0.409, DEP3 = 0.710 and DEP4 = 0.525). This means that, in this study, employees' participation does not so influence respondents' views on the OSH awareness. They feel they have equally contributed and played a pivotal role in establishing appropriate safe work environment and climate. The results of this study illustrate that the respondents were satisfied with the role played by them.

One of the human resource practice that is often included and the description of high performance work system, is that of employee's involvement or participation. The importance of employee participation as a business strategy was first stressed in the late 1920 and early 1930. The Hawthorne studies Bramel (1981); Mayo (2003), gave rise to and increasing interest in the human determinants of productivity. The human relations approach to management emphasized the importance of communication between employees and their superiors. More recently management practice has kindled a renewed interest in this issue. This is due to growing evidence that employee participation increases effort, which subsequently improves efficiency and productivity; it reduces the cost of monitoring employees and leads to increased commitment (Doucouliagos, 1995; Thomas, 2002).

Employee participation can take the form of a variety of management practices for example, participative management, employee involvement programs, empowerment or workplace democracy. Each of these practices attempted, in some way to involve employees in the sharing of information and/or making of decisions. Participation may be direct or indirect. Direct participation involves the employees themselves; whereas indirect participation takes place by acting as an intermediary of employee representative bodies, such as workers' councils or trade union (Cooper, 1998; Sisson, 1997).

Two main forms of direct participation include consultative participation and delegate participation (Geary, 1994; Gill, 2000; Gonzalez, 2010). Consultative participation refers to practices where management encourages employees to share their opinions regarding work-related concerns, yet retains the right to make all final decisions. Examples of consultative participation include regular meetings with supervisors, attitude surveys and employees' suggestion plans. Delegate participation, on the other hand, gives employees increased responsibility and autonomy to organize and perform their jobs as they see fit. Two theoretical models addressed proved the potential advantages of direct employee participation. According to cognitive models of participative effects Anthony (1978); Miller (1986); Wagner (1994), employee involvement increases the flow of information in organizations. Often employees performing seemingly unimportant tasks have access to valuable information. Higher-level managers are more likely to gain access to this information through participative management practices. Therefore, practices that encourage employees to more freely share information lead to higher levels of safety awareness (Lawler et al., 1995).

Employees are the people who live inside the operation area where there are a lot of occupational hazards. They face hazards everyday and know better in term of the effects and how to prevent it. This is an important aspect of the management to ensure that their employees' participation is highly encouraged. Management support will further increase the level of employees confident at work place.

Eric (2000), quoted that *"Employee involvement, when employees are aware of management genuine interest in them, they will respond in kind. In this type of environment, employee innovative thinking, suggestions and decision-making evolve, to the benefit of the employee and the organization alike. One tangible benefit is fewer injuries."*

Thus, it shows how important is employee' participation to reduce the number of accidents in the organization. Other than that, the statement supported by Pascale (1984), with the statement that "behaviors that are rewarded will be repeated; as they are rewarded and repeated, they become unconscious." Gardner (1999), believes that employee involvement, participation and input would expect that team-based or highly participate firms are more productive and more positive than traditional counterparts. However, it is true that an appropriate level of employee input involvement and participation is a key element in long-term success of the change effort.

Finally, the Gallop Organization, which studied employee engagement in 7,939 business units in 36 companies, found that employee engagement was positively associated with performance in a variety of areas, including increased customer satisfaction, profitability and productivity, and reduce employee turnover (Clifton, 2003)

4.7.3.3 LoA of OSH has Significant Correlation with Training and Education

The results show that there is a significant correlation between OSH Awareness with Training and Education. Thus the results in Table 4.45, showed a high relationship (DEP1 = 0.697, DEP2 = 0.503, DEP3 = 0.754 and DEP4 = 0.634). This means that, in this study training and education is greatly affecting respondents' views on the OSH awareness. They felt that the level of training and education available is still not enough to guarantee safe working conditions. The management should give priority to this matter. The management must review the training and education programs that have been carried out and modify the system. This is to ensure that employees are satisfied with training and education programs that have been planned. This could also convince the staff to perform their duties safely.

Safety and health training and education programs can provide several advantages in preventing accidents at workplaces. Organizations have to focus more on formal training and education programs on safety and health to minimize construction related accidents. Training and education programs on safety at work can lead to improving safety behavior and attitudes as shown by Tam, et al. (2004) and Toole (2002). A safety program can succeed if all employees undergo periodic educational and training programs. As occupational safety training is likely the most researched issue and practiced technique in safety management, and employees who receive safety training suffer fewer work-related injuries than their untrained counterparts (Cohen, 1990) cited by Zohar (2007). This view was supported by studies made by Osterman (1995), who found that training will directly increase the problem-solving skills of employees.

Furthermore, Barling, et al. (2002), agreed with the study results, noted that training allows employees to acquire greater competencies to control their work, leading them to perform their jobs safely.

Safety training remains the fundamental method for attempting to effect self-protection against workplace hazards. Most safety manuals advocate training as the means of accident prevention, while safety legislation demands the appointing and training of the competent persons to carry out particularly dangerous tasks. It has been found that low accident rate at companies with a strong safety culture had developed integrated job and safety training programs (i.e. the job training included elements of safety training that was specific and relevant to the job). This highlights a general point that the content of safety training has to be relevant to the jobs of the trainees. Of particular importance is the safety training of managers to ensure they are up to date with current safety practices and legal requirements.

However, it must be noted that the implicit assumption of much safety training is that in itself, it is a good thing, because safety trained personnel who know what to do will automatically conduct themselves in a safe manner for extended periods of time, regardless of the consequences on the job. This assumption is inaccurate because normal everyday practice will almost inevitably negate the effects of this training, unless it is reinforced by management and practiced by everyone on a daily basis.

4.7.3.4 LoA of OSH has Significant Correlation with Communication.

The results show there are significant correlation between OSH awareness with Communication. Thus the results in Table 4.45, showed a strong relationship (DEP1 = 0.725, DEP2 = 0.666, DEP3 = 0.807 and DEP4 = 0.673). This means that, in this survey communication is greatly affecting respondents' views on the OSH awareness. Respondents think the guarantee of a safety program achieves the goal it should be understood by all relevant parties. Effective communication is very vital that all directives, regulations, work procedures can be delivered properly, with that the employees can do their jobs safely.

From the psychological perspective of communication theory, communication quality can be defined either as the difference between states, such as the gap between the employees perceived awareness of OSH programs and the organization's communication of the actual performance (Hardie, 1994). Communication in organization included all types of information passing so called delivery system such as meeting, telephone conversation, e-mail, writing memo, information board and face to face communication.

In terms of organization, Erickson (2001), quoted that miscommunication is common in organizations. Open, honest, understandable communication is evident in high safety-performing companies. Information flows in all directions, and the reporting of near misses are encouraged. It was differently quoted by researchers in term of production line where most of them agreed that supervisors are the most important communication tools between management and employees. Breslin (2009); Heron (1947), have cited that "no medium for carrying information can duplicate or displace the supervisor who lives with employees in their daily work".

Pierce (1995), quoted that good communication is vital to successful safety and health programs and to business in general. An organization's culture is defined first by the way we talk-the language, nature and quality of the dialogue we engage in. So, to change the culture, change the conversation. Friedman et al. (2000); Mohr (1995), share their findings that communication quality is a perceptual outcome of the communication exchange. The quality of the communication is one of the most critical aspects of the business relationship (Lira et al., 2006; Mohr et al., 1996). Yet, as Maltz (2000), so aptly concluded in his study on communication modes, all communication is not created equal. The receivers' perception of the communication quality has an influence on the receiver's response to the information (Maltz, 2000; O'Reilly et al., 1998).

To ensure the effectiveness of communication within the organization, two mechanisms improve the quality of the communication need to be considered; the repetition of the message, which decreases the amount of distortion or variance around the message, and the verification of the content, which reduces the bias in the message (Guetzkow, 1954; Lira, et al., 2006).

This is a situation where the communication leads the organization sharing business important information as employees need to understand the relationship of safety and health to the actual business operations that they perform (Eric, 2000).

Organizations with good safety culture can be characterized by a good safety communication system that flows from top to bottom, bi-directionally through both formal and informal communication channels throughout an organization. Recognizing and harnessing the informal channel has been shown to be a feature of low accident facilities, as questions about safety tend to become a part of everyday work-related conversation.

However, both formal and informal communication between line-management and shop floor is one of the most crucial areas for safety information to be disseminated. Unfortunately, this area of communication is often the most neglected as perceived work pressures result only in ‘crisis communications’ when a specific issue needs to be addressed. The greater visibility of management on the shop floor to discuss safety contributes enormously to a positive safety culture and morale in general. Moreover, as dialogue flows between the groups, providing useful feedback to management, improvements in safety are likely to increase at an even greater rate. A related area of safety communications that requires careful preparation is the development of written safety procedures, so that they can be easily understood and followed by the end user. If the language is complex or not clear, or the procedure has vital steps missing, accidents are likely to occur. A company with a strong safety culture tends to enhance all forms of safety communications by involving personnel in every aspect.

4.7.4 Objective No.4: Identifying the significance factors influencing the Level of Awareness of OSH using Multiple Regression Analysis

Table 4.46: Model Equations

NO.	OFFICE	EQUATION
1.	DEP1	$0.588 + 0.510\,COMM + 0.326\,TE$
2.	DEP2	$1.016 + 0.770\,COMM$
3.	DEP3	$0.462\,COMM + 0.233\,TE + 0.325\,EP - 0.108$
4.	DEP4	$0.373 + 0.597\,COMM + 0.327\,EP$

Regression analyses in Table 4.46, show in DEP1 communications, and training and education are variables that influence respondents' perceptions of safety awareness while in DEP2 only communication that influences the perception of respondents. For DEP3 found three variables involved communication, employee involvement and training and education. Communication and employee involvement influenced respondents' perceptions of safety awareness in DEP4. Here it can be seen that all of these three variables have a significant influence in all of the developed model. However, the result indicates that communication is the most significant variable in influencing respondents' perceptions of awareness. This shows how essential communication is a factor in the way how businesses operate. Good and effective communication will be able to produce quality work and safe environment. Results of multiple regression analysis show management's commitment does not influence respondents' perceptions of safety awareness in all of the developed model. This is because the respondents think the management has contributed as stipulated in the act and they give a clear picture that they are very satisfied with their management role.

This means that when the company states that they want to improve their safety culture there is a great variance in what the employees believes is going to be improved. Researchers have emphasized the importance of an effective communication in order to obtain commonly understood goals (Clarke, 2004; Misnan, 2007). In order to illustrate the importance of communicating the safety goals and visions Roughton (2002), compared this with if an airline pilot taking off from an airport without having a written flight plan. If there is failure to communicate a shared and coherent understanding of what the goal is, e.g. what it is that the company wants to improve, then this may have a negative impact on the effectiveness of the safety culture improvements (HSC, 2001; Roughton, 2002). In order to effectively improve a safety culture it is therefore important that everyone refers to the same definition when talking about safety culture and also that they have the same goal in mind (HSC, 2001). Since communication plays an important part in the work on safety culture and safety climate improvements, consideration can be made to review the communication paths within an organization.

4.7.5 Objective No.5: Model Validation for Evidence to Support the Relationship Between Dependent and Independent Variables

For this purpose, there are a number of tests conducted including identifying the *R* value, Analysis of Variance, Scatter plot and 95% Interval Confidence Level.

A summary of the models in Table 4.47 indicates *R* values as the correlation between the predictor factors combined and the dependent factor. It is found that the values are quite large, indicating that the linear regression models can be predicted from independent variables. The results indicate that about 80% in all models of the variability of OSH awareness are explained by factors mentioned. The values are quite high and indicating only the remaining of about 20% is not explained. The observed value of 0.80 indicates the linear regression models predict well (Norusis, 1999b). Therefore, it can be concluded that communication, employees' participation, training and education and management commitment influence OSH awareness in all the four departments.

Table 4.47: Model Summary

Model	*R*	*R*-Square	Adjusted *R*-Square	Std. Error of the Estimate
DEP1	0.751	0.564	0.553	0.4789
DEP2	0.666	0.443	0.436	0.3314
DEP3	0.842	0.708	0.700	0.3079
DEP4	0.707	0.500	0.491	0.3676

Dependent Factor: LoA of OSH

The purpose of analysis of Variance (ANOVA) is to find the relationship between the predictor and the dependent factors. The results show that *F* statistic is significant at $p < 0.005$ and it can be concluded that *R*-Square is significantly different from zero. This mean that there is a linear relationship between the predictor and the dependent factor in all the models (Foster, 2001).

Scatter Plot of Regression Standardized Predicted Value against Regression Standardized Residual for all the models explained in subsection 4.5.2 and subsection 4.6.2.3.2. Level of Awareness (LoA) of Occupational Safety and Health is dependent variable. All the plots show evidence that the relationship between the dependent and independent factors were also linear. The factors are scattered without showing any pattern giving evidence that the dependent and independent factors are linear (Foster, 2001).

It is noted that the 95% confidence interval does not include the value 0 for all factors except constants in all the four models. The 95% confidence interval will include the value 0 only if the observed significance level for the test of the slope 0 is greater than 0.05 and if this the case the null hypothesis cannot be rejected that the population slope is any of the values within the confidence interval (Norusis, 2007). For example (DEP1) the lower limit of the 95% confidence interval for the slope is 0.242 and upper limit is 0.779 as shown in Table 4.48. Therefore, communication, with 0.510, falls within these intervals and which are plausible population values (Norusis, 2007). Thus, the hypothesis that the population regression line is based on the sample results is true for DEP1. It can be seen that the conditions are also true for DEP2, DEP3 and DEP4. Therefore, it is concluded that the relationship between dependent variable and independent variables reflect the population of regression line.

Table 4.48: Model Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for *B*	
		B	Std.Error	*Beta*	*t*	Sig.	Lower Bound	Upper Bound
DEP1	(Constant)	0.588	0.282		2.084	0.040	0.144	0.982
	MSCOMM1	0.510	0.135	0.465	3.788	0.000	0.242	0.779
	MSTE1	0.326	0.123	0.325	2.648	0.010	0.132	0.526
DEP2	(Constant)	1.016	0.361		2.815	0.006	0.297	1.734
	MSCOMM2	0.770	0.097	0.666	7.932	0.000	0.577	0.963
DEP3	(Constant)	-0.108	0.299		-0.362	0.718	-0.701	0.484
	MSCOMM3	0.462	0.111	0.424	4.145	0.000	0.241	0.683
	MSTE3	0.233	0.075	0.277	3.091	0.003	0.083	0.382
	MSEP3	0.325	0.118	0.222	2.755	0.007	0.091	0.559
DEP4	(Constant)	0.373	0.364		1.025	0.308	0.349	1.095
	MSCOMM4	0.597	0.088	0.547	6.803	0.000	0.423	0.770
	MSEP4	0.327	0.104	0.252	3.131	0.002	0.120	0.534

4.8 Concluding Remarks

This chapter discusses features and demographic data, findings, statistical analysis, regression analysis and verification of the overall model. Researcher describes each part in detail to ensure the reader can understand the study as a whole. At the end of this chapter, the researcher explains in the public service delivery system that has a relationship with communication factor accounting for the most significant factor in influencing the respondents' perceptions of safety awareness. This is to prove that an effective delivery system is very important in ensuring the success of the work undertaken.

The next chapter will draw conclusions about the study, highlights the problems encountered, contribution to the industry, future research and few recommendations on creating a systematic and effective of safety program to ensure the welfare of the employee while on duty.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This chapter describes the overall results of this study, demonstrating the problems encountered in the course of the study, showing the contribution of this study to the construction industry, and offer and recommendations and suggest the future research to improve Level of Awareness of OSH management system among the government agencies.

The analyses indicate that the regression models give the best description of supervising safety aspect in construction work design in Malaysia. All models give an accuracy of more than 80%, therefore statistically all the models are satisfactory for predicting LoA of OSH in supervising safety aspects especially at construction sites. The above models offer consistency accuracy values and therefore offer good prediction on LoA of OSH management system.

5.1 Conclusions

This study was carried-out in some selected government departments consisting of respondents with different demographic data. They were selected based on the different categories of position, academic background, ages and working experiences. The mean work experiences were between 10.5 years to 17.4 years. Research tools used is the set of survey questions that was designed to be self-explanatory to ensure that respondents can complete the questionnaire by themselves. During surveys conducted, they were gathered in the meeting room and assisted by researcher if they facing difficulty in answering the questions. This will not only reduce errors while answering questions but can ensure a high response ratio, in which questions are collected once the respondents answered the survey.

A set of tool methodology, to measure safety awareness is developed for government agencies offices' management in Malaysia. This tool also can be used by various companies in Malaysia. The methodology used, i.e. questionnaire design, observation, measurements, data collection, statistical analysis, regression analysis and model validation and also a basic tool of safety awareness measurement have the potential to diagnose workplace safety management and thus improve LoA of OSH at the workplace in return.

The survey required all respondents to answer four questions about demographic data and to rate each of (56) fifty-six questions using a five –point Likert scale about the safety aspects implemented in their departments. It ranges from 1 (strongly disgree) to 5 (strongly agree). Data collected from the survey were treated and analyzed using SPSS version 16. It employed multivariate statistical comprising descriptive statistics, Pearson's correlation coefficient, analysis of variance (ANOVA) and multiple regression analysis.

The results showed that demographic factors such as position, level of education and age did not influence respondents' perceptions of safety awareness except work experience factors which heavily influence the differences of respondents' perception in safety awareness. This means that the more experienced the employee is the more perfectly their differences in perception influence the occupational safety awareness in all departmenst studied.

It was found that overall LoA of OSH in all departments tested were at between 'moderately agreed' to 'highly agree' level. To measure the level of safety awareness, there are two methods used, the first measures directly the perception of the respondents and uses the questions in section three of the questionnaire. The second method uses the equation obtained as a result of the analysis.

This means that on the whole implementation of safety aspect is at an acceptable level but there is still room for improvement by all parties involved; management and workers together bringing energy and effort towards creating a more conducive working environment.

From the statistical analysis it was found that there were positive and significant correlations between LoA of OSH and the four Safety Climate factors i.e. management commitment, employees participation, training and education and communication at different levels of correlation between each other. This shows that all four the climate factors correlated with safety awareness at different rates between each other. The results of multiple regression analysis showed that communication is the most significant factor influencing safety awareness of all developed models. Communication in the organization included all type of information passing so called delivery systems such as meeting, telephone conversation, e-mail, writing memo, information board and face to face communication.

From multiple regression analysis, the model was developed to measure safety awareness. This model has been tested down to the two agencies which have different scope of duties. Results obtained from the validation process at two other agencies showed the model to be accurate within 80% to 90%. This shows that statistically, the model developed in this study has high reliability and validity. The results also indicate similar job concept and practices have similar pattern and model.

Finally, model validation for evidence to support the relationship between dependent and independent variables was done. For this purpose, there are a number of tests conducted including identifying the *R* value, Analysis of Variance, Scatter plot and 95% Interval Confidence Level.

Results of tests carried out, can be concluded as follows:

- Its indicate that the linear regression models can be predicted from independent variables
- The observed value of 0.80 indicates the linear regression models predict well

Therefore, it can be concluded that communication, employees' participation, training and education and management commitment influence OSH awareness in all the four departments.

- There is a linear relationship between the predictor and the dependent factor in all the models
- The factors are scattered without showing any pattern giving evidence that the dependent and independent factors are linear
- The hypothesis that the population regression line is based on the sample results is true

Therefore, it is concluded that the relationship between dependent variable and independent variables reflect the population of regression line.

5.2 Recommendations

Using this model, Level of Awareness of Occupational Safety and Health of a department or organization can be measured. Therefore, the developed model will help an organization to measure safety awareness. By knowing the level of safety awareness, the management will be able to act to review the existing system accordingly. If there are weaknesses then process improvements can be done to ensure that all individuals involved in this industry can work more comfortably and safely.

Results from this study also showed that overall safety awareness is moderately high level in the range of 70% - 80% in all departments tested. This indicates that the level is still acceptable and there is still room in order to enhance the level to get better in the future.

For this purpose a number of improvements are proposed:

1. The management plays a more proactive and innovative role in enhancing participation to provide a more conducive and safe work environment.
2. The employee can be given more opportunities to be involved in the planning and implementation of safety management systems better and systematically to ensure their welfare in carrying out their daily tasks.
3. Effective planning and implementation of training and education always to be evaluated from time to time to ensure that the program is constantly evolving in line with technological developments and the current system, to provide competent individuals in every field or scope of work performed.

4. This study shows that work experience had a great influence in determining the respondents' perceptions of safety awareness. Work experience can be obtained through various methods such as courses, practical training, discussions, visits and so on. Thus the systematic training and education program are inextricably linked with career advancement of an employee in producing a competent worker.

5. Communication is a very important factor in determining the effectiveness of a program and is designed to be implemented properly. The importance of effective communication cannot be denied in ensuring success in any matter or activity performed. Failure to communicate well will cause the failure of a planned activity despite having sufficient financial, the efficiency of training and support from management. Furthermore this can lead to the occurrence of accidents resulting in loss of life and loss of property. Therefore it is clear that the effectiveness of the communication is very important in ensuring the success of programs that have been planned. Since communication plays an important part in the work on safety awareness improvements, it is essential to review the communication paths within an organization.

6. Occupational Health and Safety (OH&S) issues, particularly in the construction industry are still problematic and need to be addressed by all parties concerned. In Malaysia, from literature review , the legislation to address the OH&S issues is deemed sufficient but legislative enforcement is still lacking. To redress this situation, the practical approach shall be to raise the awareness of construction companies regarding the importance of OH&S and implementation of occupational safety and health management system in the construction industry.

5.3 Problems Encountered

There were no complex problems encountered in the conduct of this study. The main problems that occurred were when developing the theoretical framework and in the course of field work. Difficulties encountered in the formulation of the theory in this study was a framework to capture various and different variables in measuring the OSH awareness as perceived by various researchers and show the relationship between the variables. The challenge was in making the framework simple enough to be understood but multifaceted enough that would show correlation.

The problem which arose in the course of fieldwork was the difficulty in fixing appointments due to the busy schedule especially among senior management. These were overcome by relying on networking between intermediate superiors and persistently pursuing the respondents. In addition, some respondents' could have different understanding of the structured questionnaires. With the researcher present while the forms were being filled gave the opportunity to explain to the respondents and maintain motivation and cooperation of the respondents.

5.4 Contribution to Industry

The followings are a few contributions of the study in the industry:

1. The study has developed a methodology in diagnosing Level of Awareness of OSH programs in workplace management which can be used for government agencies. Methods include questionnaire design, data collection, statistical analysis, multiple regression analysis and model validation.

2. This study has also developed a model appropriate to be used for private company to diagnose current industrial workplace safety management or as a reference to the future planning.

3. The Multiple Regression Models developed are case specific for data collected from the four organizations examined in this study. The approach of using this model can be applied in other agencies or bodies, by collecting a new set of data in order to get the new model which is applicable to the relevant agencies or bodies. The model can highlight the significant factors that have the greatest influence for level of awareness of safety culture in the particular organization.

4. Finally, the research results provide new insight into the important issues of safety awareness in workplace management system in Malaysia.

5.5 Future Research

This study deals with public sector projects in Malaysia. It is acknowledged that the findings may differ for private sector projects. As such it is recommended that for future research, a similar study be carried out for private sector projects. This will complete the research on project safety management for construction projects implemented in Malaysia.

The results of this research also show that among the factors, communication is very significant in influencing the effectiveness of the safety awareness of an agency. It is proposed a more comprehensive study to be done on these factors to determine how strong communication factor is in influencing the effectiveness of the safety awareness.

Demographic data may have an impact on respondents' perceptions of safety awareness. In this study only four demographic data were assessed via the position, educational background, age and work experience. It was found that only work experience is affecting the respondents' views on the safety awareness of the four factors tested. It is recommended to test more demographic data including gender, race, religion, marital status, annual income, and so on. Therefore, it is hoped that the findings will later give a clearer picture of the level of safety awareness among employees in the public and private sectors in the country.

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APPENDIX A

PART IV
GENERAL DUTIES OF EMPLOYEES AND SELF-EMPLOYEED PERSONS

General duties of employers and self-employed persons to their employees

15. (1) It shall be the duty of every employer and every self-employed person to ensure , so far as is practicable , the safety , health and welfare at work of all his employees.

(2) Without prejudice to the generality of subsection (1), the matters to which the duty extends include in particular-

the provision and maintenance of plant and systems of work that are , so far as is practicable , safe and without risks to health;
the making of arrangements for ensuring , so far as is practicable , safety and absence of risks to health in connection with the use or operation , handling , storage and transport of plant and substances;
the provision of such information , instruction , training and supervision as is necessary to ensure , so far as is practicable , the safety and health at work of his employees;
so far as is practicable , as regards any place of work under the control of the employer of self-employed person , the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of the means of access to and egress from it that are safe and without such risks;
the provisions and maintenance of a working environment for his employees that is , so far as is practicable , safe , without risks to health , and adequate as regards facilities for their welfare at work.

(3) For the purposes of subsections (1) and (2) –

(a) "employee" includes an independent contractor engaged by an employer or a self-employed person and any employee of the independent contractor; and

(b) the duties of an employer or a self-employed person under subsection (1) and (2) extend to such an independent contractor and the independent contractors employees in relation to matters over which the employer or self-employed person-

has control; or
would have had control but for any agreement between the employer or self-employed person and the independent contractor to the contrary.

APPENDIX B

DEPARTMENT OF IRRIGATION AND DRAINAGE MALAYSIA

(DIVISION AND FUNCTION)

Flood Management Division

Functions

To manage planning and design for flood mitigation development through structural method

To manage and coordinate flood management program through non-structural method

To manage flood mitigation budget

River

Functions

Provide expertise services in river management in an integrated manner including policy making and legislation and to ensure river basin managed perfectly for the conservation of water resources quantity and quality (Clean, Living & Vibrant River)

Coastal

Functions

To execute coastal erosions plan for the protection of all coastal areas in the critical erosion category.

To execute improvement works on river estuaries categorised under critical conditions to facilitate navigation .

To provide technical services towards the implementation of the coastal zone management.

Water Resources Management and Hydrology Division

Functions

To collect and process hydrological data for the development and management of water resources for now and future.

To asses hydrological data for water resources to make sure that the information given is enough to implement the plans for development and management.

To provide hydrological services (floods and droughts) at major river basin in Malaysia

Stormwater Management

Functions

To provide expertise in storm water management through preventive measures for the efficient and effective operation for flood using Storm Water Management Manual (Manual Drainage, Environmental) – MSMA

Building and Infrastructure Division

Functions

To implement and coordinate building planning works including appointment of consultants, designing and preparation of tender documents by consultants.

To focus on construction projects and renovations of buildings for agencies within the Ministry of Natural Resources and Environment (NRE).

To provide support services for planning and design works, preparation of architectural building plans, mechanical and engineering works as well as support services to other Divisions of the Department.

To carry out detailed planning for all maintenance services within a building including the implementation

Design and Dam Division

Functions

To provide expert advice on the structural design, geotechnical, hydraulic and materials technology.

To provide specific design or repair/ rehabilitation of problematic structures.

To resolve problems of structures not functioning as per designed, collapsed structures or structures in critical condition.

To coordinate safety surveillance of major DID structures

To provide infrastructure design for various departments/ agencies under the Ministry of Natural Resources and Enviroment (NRE) and the Ministry of Agriculture and Agro-Based Industry (MOA).

To assist in ensuring the safety of dams owned by DID and other relevant agencies.

Quantity Surveying and Contract Administration

Functions

To Implement Technical Auditing On Documents In Relation To Procurement Management & Contract Administration For Works, Supplies & Services.

To prepare Tender Evaluation & Letter of Acceptance For Tenders Closed in JPS Headquarters.

To Prepare Guidelines , Director General's Directive Letters, JPS Circulars As To Enhance The Quality Of Procurement Management And Contract Administration.

To Compile And Publish Cost Informations For The Department.

To Co-ordinate The Appointment Of Consultants For The Department's.

To Identify Contractors' Claims Submitted To JPS Is 'Prima Facie'.

Special Project Division

Function

- To ensure cost, time, quality targets and customer satisfaction of major projects are archieved.
- To carry technical auditing on Project Quality Assurance, Environmental Management and Occupational Safety & Health of Workers during implementation phase.
- To promote best practices in Project Management
- To formulate and disseminate effective procedures, processes, guidelines, standars, templates and tools in relation to project management.
- To ensure mechanical and electrical services meet the high standards of quality
- To administer contracts efficiently and effectively.

Corporate Division

Functions

Provide in planning service and department and government implementation of policies, monitoring development programme performance, coordinate the information relating service work, coordinate customers complaint and increase image of the department and quality enhancement and audit performance supply ensure services JPS fulfils need and contentment customer.

Mechanical & Electrical Division

Functions

Procurement of appropriate machineries and mechanical equipments, which are required by the Department from time to time.

Enhancement and repair of mechanical equipments as well machineries of the Department in particular tractors, vehicles and pumps (inclusive of fixed and mobile pumps).

Invention and / or collection, commissioning, testing and repair of all Watergates and the components thereof under the scheme of the Department of Irrigation and Drainage.

The design, commissioning, testing and repair of all pump and pump components within the scheme of the Department of Irrigation and Drainage.

The design, commissioning, testing and thereafter the care for all mechanical device utilized by the Department

Managed all selected mechanical and public engineering item.

Trained and skill build-up programs of the Department's staffs in managing and maintaining the Department's mechanical items.

Undertake the research and development with the view to enhance and modernize the mechanical engineering inputs of the Department to maintain the effectiveness in meeting the Department ’s requirements.

Human Capital Development Division

Functions

Assist individuals in developing their competencies through training programmes supported by world class infrastructure and facilities.

Provide exposure to the latest technologies and best practises to assist in competency development.

Integrate career development programme to assist in competency development.

Conduct Assessment of competencies to facilitate the process for confirmation, promotion and rewards.

Provide training programs to developing countrie

Management Services Division

Functions

Human Resources Management Section

Prepare and ensure all the personnel information of Management and Professional Group and Support Group relevant,integrated and realibility. The related matters:

Intake, Placement, Promotions, Acting/Specially For Holder (KUP)

Appointment confirmation, Service Confirmation, Trial Period Extension, Pensionable Status Conferral, Disposal/Resignation, Update and Recorded Service Books, Bearing work, Leave Application, Pension and Application to Foreign

Manage matters Declaration Of Property, Security Filter, Examination Result(PTK), Award, Discipline, Human Resource Management Panel, JKP and LNPT

Apply Information System in Human Resource Management

Financial Management Section

Prepare, manage and ensure the following based on rules treasury:

Manage Bill Payment/Emolument/Allowance/Personal Advance Clain, Imprest Retail Money, Travel Warrant, Loan Transaction(Computer,Vehicle, Housing), Book Management Vote Trust Account, Deposit Revenue Account/ABT dan e-SPKB

Provide Budget Runs act as Secretariat JPKA, Monthly Report Provision Finance

Manage Goods Turnover, Service and Work, e-Perolehan, Local Order, Purchasing, Registration,Maintanance, Asset Disposal, Store Management and act as Secretariat JKP

Secretarial And Administration

Manage and ensure:

Customer Service Management

Correspondence Management Department

File Management,Punch Card

Official Function Business

Building Maintenance/Electrical System, Telephone and Fax, Parking, Pest Control, Canteen Service, Water Supply Cleaning and Handling Of Systems, Air Conditioner,Development, Office Security Managemnt, Building, Tender Provision/Contract/Quatation

Training/Course

Humid Tropics Centre Division

Functions

To standardize project's implementation and cooperation especially in the hydrological and water resources study

To establish a powerful networking between all the agencies in the National IHP and its continent and worldwide center in the exchange of scientific and technical information.

To conduct and conduct appropriate courses, trainings, seminars, workshops and meetings to generate technology ideas.

To publish and distribute hydrological and water resources-related articles

Smart Control Centre

Function - to alleviate flooding problem caused by the overflow of flood waters of the Sungai Klang in Kuala Lumpur to divert flood waters at the confluence of Sungai Klang / Ampang River into the 9.7km tunnel.

Performance Audit

Function

To perform performance and technical auditing on physical developments program to ensure economic, efficient and effective implementation, and to produce balance and unbias report for the top management.

To perform outcome and impact analysis on development programs and projects with the cooperation of the Divisions and States.

To plan, implement and monitor all aspects of creative and innovative work culture through the implementation of Innovation Action Plan.

To coordinate and monitor the progress and achievements of the Annual Business Plan.

To coordinate and monitor the progress and achievements of Key Performance Indicators related to NRE Minister and Secretary General and also the Director General

To implement and analyze the Value Audit Scorecard of the department.

To coordinate the periodic updating of the Department's Works Manual

To coordinate and monitor the implementation of ISO9000, EMS 14000 and OHSAS

18000 initiatives.

Information Management Division

Functions

1. ICT planning in JPS and management of ICT Division

Development of Divisional and ICT Strategic Plan

Secretariat for various ICT steering committees

Procurement management of hardware, software and ICT services

Enculturation of ICT in JPS through training, quality programs etc.

Compliance to ICT procedures and circulars.

Management of divisional administration and finance / expenditure.

2. Management of ICT operations and technical support

Data Centre and server management

System and Database administration

Management of e-mail system

Network management

ICT security management

Technical support and helpdesk

Hardware and software inventory management

3. Development and maintainance of application systems

Development and maintainance of application systems (inhouse and outsource)

Application Systems roll out to states/ divisions offices

Development and maintenance of JPS Website and Intranet

Development of presentation software and Multimedia.

Support the implementation of Electronic Government Systems.

APPENDIX C

Safety Culture and Safety Climate Research 1980-2010

No.	Author/s	Industry & Sample	Data collection & Type of research	Factors	Outcome measures and analysis
1.	Zohar 1980)	Israel/ 20 factories(chemical metal, food, textile)	Data collection: Questionnaire developed for the study (40 items) Research design: Cross- sectional research.	8-Factors- Perceived important of safety training programs, Perceived management attitudes to safety; Perceived effects of safe conduct on promotion; Perceived level of risk in the workplace; Perceived effects of required workplace on safety; Perceived status of safety officer; Perceived effects of safe conduct on social status; Perceived status of safety Committee	Outcome measures: No useable safety outcome data Analysis: Exploratory factor analysis, multiple range test, expert ranking, stepwise discriminant analysis
2.	Brown & Holmes (1986)	US/ Production workers in 10 manufacturing companies (n- = 425, of those 200 suffered an accident in the past year and 225 had not)	Data collection: Zohar's (1980) questionnaire. Research design: Cross- sectional research	8-Factors- Perceived important of safety training programs, Perceived management attitudes to safety; Perceived effects of safe conduct on promotion; Perceived level of risk in the workplace; Perceived effects of required workplace on safety; Perceived status of safety officer; Perceived effects of safe conduct on social status; Perceived status of safety Committee	Outcome measure: Accident vs non-accident groups Analysis: CFA using LISREL to test Zohar's 91980) 8-factor structure, EFA to refine solution

No.	Author/s	Industry & Sample	Data collection & Type of research	Factors	Outcome measures and analysis
3.	Dedobeleer & Beland (1991)	US/ 9 Construction companies (n=384, 71%)	Data collection: Questionnaire designed specifically for the study. Items reflected Brown & Holmes (1986) 3 factor model but the same measure were not used. Research design: Cross- sectional Research	Model 1: Management concerns, management safety activities, employee risk perception. Model 2: Management commitment, worker involvement	Outcome measure: No outcome measure Analysis: Maximum Likelihood and Weight Least Squares using LISREL
4.	Cox and Cox (1991)	Europe: UK, France, Germany, The Netherlands and Belgium/ Data collection: Questionnaire developed for the study (18 items) 5-Factors - Personal skepticism Individual responsibility Safeness of the work environment Effectiveness of arrangements Outcome measure: No outcome measure - 238 - Industrial gases company (n=630) -	Data collection: Questionnaire developed for the study (18 items) Research design: Cross- sectional research	5-Factors -Personal skepticism Individual responsibility Safeness of the work Environment. Effectiveness of arrangementsfor safety Personal immunity	Outcome measure: No outcome Measure. Analysis: Exploratory factor analysis, test-retest paradigm used to check reliability of questionnaire.
5.	Ostrom, Wilhemsen & Kaplan (1993)	Ostrom, Wilhemsen & Kaplan (1993) US/ Nuclear energy laboratory (n=4000 administered across 5 departments)	Data collection: Questionnaire developed for the study (84 items) based on interviews, analysis of manager's safety statements and literature review. Research design: Cross- sectional research	13-Factors- Safety Awareness, Teamwork, Pride and Commitment, Excellence, Honesty Communications, Leadership and Supervision, Innovation Training, Customer Relations, Procedure Compliance, Safety Effectiveness, Facilities	Outcome measure: Accident statistics by department (OSHA recordable injuries in 1991). Analysis: Descriptive statistics for individual items, not factors (do not conduct EFA to identify factors,

6.	Donald & Canter (1994)	UK/ 10 chemical processing plants (n=701, mean response rate= 53.8%)	Data collection: 167 item questionnaire developed for the study and mapping sentences used for question templates Research design: Cross- sectional research	Data collection: 167 item questionnaire developed for the study and mapping sentences used for question templates Research design: Cross- sectional research People (Self, workmates, supervisors, managers, safety representatives) Attitude behaviour (satisfaction, Knowledge, Action, Passive safety behaviour, Active safety behaviour	Outcome measure: Self-reported accidents Analysis: Pearson correlations
7.	Niskanen, (1994)	Finland/road maintenance, construction and repair. Workers n=1890 and supervisors n=562	Data collection: Questionnaire developed for the study (25 itemsworkers; 18 items – supervisors) Research design: Cross- sectional research	4-Factors (workers): Attitudes towards safety in organization, Changes in work demands, Appreciation of the work, Safety as part of productive work 5-Factors (supervisors): Changes in job demands, attitudes towards safety in the organization, value of the work, safety as part of productive work	Outcome measure: High-accident rate vs low accident rate. Analysis: Descriptive analyses, ttests, exploratory actor analysis
8.	Rundmo (1994)	Norway 8 offshore oil platforms from 5 oil companies (n=915)	Data collection: Questionnaire, Developed from literature search/ sources of risks from accidents statistics Research design: Cross-sectional research	4-Factors -Safety and contingency factors, commitment and involvement in safety work, social support, attitudes to accident prevention	Outcome measure: No additional outcome measures Analysis: Exploratory Factor Analysis, SEM using LISREL
9.	Coyle, Sleeman & Adams (1995)	Australia/Clerical and service (total n=880), Organisation 1: (n=340, 56%), Organisation 2: (n=540, 63%)	Data collection: 30-32 questionnaire developed for the study (26 items constant between organisation) developed by interviews and group work. Research design: Cross- sectional research	7-Factors- Maintenance and management issues, Company policy, Accountability, Training and management attitudes, Work environment, Policy/procedures, Personal Authority	Outcome measure: No outcome measure Analysis: Exploratory Factor Analysis, checks for concurrent validity
10.	Hoffmann & Stetzer (1996)	US Chemical processing (n= 204 for analysis)	Data collection: Questionnaire comprising published scales and scales developed specifically for the	4 -Factors- Role overload, perceptions of work group processes, approach intentions, unsafe behaviours	Outcome measures: OSHA recordable accidents for previous 2 years, self reported

			study. 9 items were based on Zohar's (1980) safety climate scale Research design: Cross-sectional research		unsafe behaviours, Analysis: Regression (ordinary least squares), correlations
11.	Williamson, Feyer, Cairns & Biancotti (1997)	Australia/Heavy and light manufacturing; outdoor workers (n=660, 42%)	Data collection: Questionnaire developed from literature and previous themes (62 items – reduced to 32 items) Research design: Cross- sectional research	8-Factors- Safety awareness, safety responsibility, safety priority, management safety commitment, safety control, safety motivation, safety activity, safety evaluation	Outcome measures: self reported accident involvement, perceptions of workplace dangers. Analysis: Exploratory factor analysis, one-way ANOVA.
12.	Diaz & Cabrera (1997)	Spain./Aviation (ground handling, fuel company and airport authority), n=166)	Data collection: Questionnaire developed for the study (45 items). Research design: Cross- sectional research	6-Factors- company policies towards safety, Emphasis on productivity vs safety, Group attitudes towards safety, Specific strategies for prevention, Safety level perceived in the airport, Safety level perceived on the job	Outcome measures: Self reported safety level (including previous/ probability of future incidents. Analysis: Inter-company differences using ANOVA, correlations, regression
13.	Lee (1998)	UK/ Nuclear Power Plant (n=5296)	Data collection: Questionnaire developed for the study (172 items). Research design: Cross- sectional research	38 -factors (reduced to 15 through domain analysis)- Confidence in safety procedures, Personal caution over risks, Perceived level of risk at work, Trust in workforce, Personal interest in job, Contentment with job, Satisfaction with work relationships, Satisfaction with rewards for good work, Personal understanding of safety rules, Satisfaction with training, Satisfaction with staff suitability, Perceived source of safety suggestions, Perceived source of safety actions, Perceived personal control over safety, Satisfaction with design of plant	Outcome measures: 3-day loss-time accidents. Analysis: Exploratory factor analysts, t-tests, discriminant function analysis. (explain each factor interpretation

14.	Mearns, Flin, Gordon & Fleming (1998)	UK/ 10 Offshore oil and gas production (n=722, 33%)	Data collection: Questionnaire developed for this study - Offshore Safety Questionnaire (OSQ - 52 items) Data collection: Cross- sectional research	Work environment (2 scale from Moos & Insel, 1974), job communication, safety behaviour, risk perception, safety attitudes, accident history.	Outcome measures: Selfreported accidents (in previous 2 years on site) Analysis: Descriptive analysis by factor (i.e., % agree/disagree) , Exploratory factor analysis, t-tests, ANOVA.
15.	Cheyne, Cox, Oliver & Tomas (1998)	UK and France/ Multinational manufacturing (n=915)	Data collection: Questionnaire based on Cox & Cox (1991) and Tomas Oliver (1995) (30 items). Data collection: Cross- sectional research	5-Factors-Safety management, Communication, Individual responsibility, Safety standards and goals, Personal involvement	Outcome measures: Employees' self-reported safety activities. Analysis: Structural Equation Modelling (SEM), MANOVA, ANOVA
16.	Caroll (1998)	US/ Nuclear power plant	Data collection: 45 item questionnaire developed for the study plus two open ended question, Group interview based on the results of the questionnaire Data collection: Cross- sectional research.	5 -Factors-Management support, Openness, Knowledge, Work practices, Attitudes.	Outcome measures: No outcome measures. Analysis : Questionnaire data were analyzed in descriptive manner (i.e. % agree/disagree) , interview data were thematically grouped.
17.	Cox, Tomas, Cheyne & Oliver (1998)	UK/ 13 manufacturing companies (n=3329, 73%)	Data collection: 19 item questionnaire developed for use in manufacturing and piloted using discussion groups with safety professionals and employees. Research design: Cross- sectional research	3-Factors-Management actions for safety, Quality of safety training, Personal actions for safety	Outcome measures: Employee appraisals of organizational commitment to safety. Analysis: ANOVA, multiple linear regression, structural equation modelling (SEM).
18.	Cheyne, Tomas, Cox & Oliver (1999)	UK/Manufacturing, Dairy & Transport workforce (n=2429, 67%)	Data collection: Cox et al 1998 questionnaire with minor contextual alterations.	4 -Factors –Management actions and responsibility for safety, Personal actions and responsibility for safety, Quality of safety training, employee	Outcome measures: employee appraisals of organizational commitment to safety.

				appraisals of organisational commitment to safe	Analysis: ANOVA, Structural Equation Modelling (SEM) using EQS.
19.	Clarke (1999)	UK Train operating companies, workforce (train drivers, n=186), supervisors (n=55), senior managers (n=71) Total response rate= 22%	75 item Questionnaire, developed on the basis of accident reports and discussions with managers. (25 unique items completed 3 times: from personal viewpoint then from view of worker/ supervisor/ manager as	5-Factors-Unsafe conditions, managerial decisions, working conditions, local management, line functions	Outcome measures: No outcome measures Analysis: Exploratory factor Analysis, one-way MANOVA
20.	Collinson (1999)	UK/ Oil and gas	Data collection: Interview Research design: Qualitative	Qualitative data.	Outcome measures: No outcome measures. Analysis: qualitative
21.	Griffin & Neal (2000)	Australia/ Manufacturing & Mining (n=1403 workforce members, 1264 used in analysis, response rate not available as data were obtained from archival records)	Data collection: Questionnaire developed for the study. Research design: Cross- sectional research	6-Factors-Manager Values, Safety Inspection, Personnel Training, Safety Communication, safety knowledge, safety compliance, safety participation	Outcome measures: Self reported safety compliance and safety participation. Analysis: Confirmatory Factor Analysis (CFA), Structural Equation Modelling (SEM).
22.	Neal, Griffin & Hart (2000	Australia/ Healthcare (n=525 workforce, 56%).	Data collection: 59-item questionnaire comprising scales that are published (eg. Organizational climate, Hart et.al., 1996), and those that were developed specifically. Research design Cross- sectional Research	Organisational climate, safety climate, determinants of safety performance (knowledge, motivation), components of safety performance (compliance participation)	Outcome measures: Self-reported safety compliance and safety participation. Analysis: Structural Equation Modeling (SEM)

23	Glendon & Litherland (2001)	Road Construction (Australia)	Data collection: Safety Climate Questionnaire (SCQ) developed by Glendon et al (1994) with some modification. Research design:	6-Factors: Communication and support Adequacy of procedures Work pressure Personal Protective Equipment Relationships Safety Rules	Outcome measure: Unsafe behaviour Analysis: EFA, MANOVA, Multiple regression
24	O'Toole (2002)	US/Mining & construction (n=1414, 45.3%)	Data collection: Questionnaire based on Bailey & Peterson Research design: Cross- sectional research	7-Factors - Management's Commitment to Safety Education and Knowledge Safety Supervisory Process Employee Involvement and Commitment Drugs and Alcohol Emergency Response Off-the Job Safety	Outcome measure: Injury rate (however it is not possible to infer with statistical due to nonexperimental design) Analysis: Factor analysis
25	Zohar & Luria (2003)	Israel/Manufac turing (Company A, n=121 line workers, n=13 shop floor supervisor; Company B, n=248 line workers, n=23 shop floor supervisor, Company C,	Data collection: Group Safety Climate 10 items questionnaire with 2 sub-scales: Supervisory Action and Expectation (Zohar, 2000) Research design: Longitudinal	Group Safety Climate 10 items questionnaire with 2 sub-scales: Supervisory Action Expectation (Zohar, 2000)	Outcome measure: Safety behaviour Analysis: Correlation analysis, ttest, percentage
26.	Seo, Torabi, Blair & Ellis (2004)	US/Grain industry (n=722 , 98%)	Data collection: Questionnaire developed for this study. Type of research: Cross-sectional research.	5-Factors- Management commitment , Supervisor support, Co-worker support, Employee participation, Competence level	Outcome measure: No outcome measure Analysis: Descriptive statistics, EFA, CFA
27	Seo (2005)	US/ 722 workers throughout the nation who worked for grain elevator facilities.	Data collection: Questionnaire based on Seo et al., (2004 Type of research: Cross-sectional research.	5-Factors- Management commitment , Supervisor support, Co-worker support, Employee participation, Competence level	Outcome measure: unsafe behaviours Analysis: SEM (using Lisrel)
28	Neal & Griffin (2006)	Australia/700 staffs in an Australian hospital. Year 1 – n= 430 (61%) Year 2 – n=490 (52%) Year 4 – n=301 (46%)	Data collection: Questionnaire based on Neal et al. (2000) Type of research: Longitudinal research.	1-Factor - consists of 3 items: Management places a strong emphasis on workplace health and safety Safety is given a high priority by management. Management considers safety to be important. (Based on Neal et al. 2000)	Outcome measure: Safety behaviour Analysis: EFA, Pearson correlations, ANOVA,
29	Findley, Smith, Gorski & O'neil	US/ Nuclear (n= 1587 workers, 48.1%)	Data collection: Health and Safety Climate Survey Tool (CST)	11-Factors: Organisational commitment and communication Line management	Outcome measure No outcome measure

	(2007)		published by the Health and Safety Executive (1997), the UK's government agency counterpart of the US Department of labour's OSHA. Type of research: Cross-sectional	commitment Supervisor's role Personal role Co-worker's influence Competence Risk taking behaviour Obstacles to safe behaviour Permit-to-work Reporting of accidents and near misses Job satisfaction	Analysis: PCA, mean score
30	Kao, Lai, Chuang & Lee (2008	Taiwan/petrochemical plants (n=533) Data Collection: Adapted from Safety culture developed	Data Collection: Adapted from Safety culture developed by International Atomic Energy Authority he	8-Factors: Safety commitment and support, Safety attitude and behaviour, Safety communication and involvement, Safety training and competence, Safety supervision and audit, Safety management system and organisation, Accident investigation and emergency planning, Reward and punishment and benefit	Outcome measure: Analysis: EFA,ANOVA. Correlation analysis, multiple stepwise regression analysis
31	Ma & Yuan (2009)	China/1060 employees from 144 enterprise; (75.1% response rate)	Data collection: Using safety climate scale of Lin et al., (2008) a questionnaire with 21 items was designed for all of the industrial sectors in Fujian province in Southeastern China But using 6factor instead of 7 factor (Lin et al. 2008)	Employees safety commitment, Management support, Risk judgement, Safety communication, Employees safety competency, Safety training	Outcome measure: No outcome measure Analysis: CFA, one way ANOVA
32	Abdullah, Spickett, Rumchev, & Dhaliwal, . (2009)	Malaysia/Healthcare (n=418, 43.15% response rate)	Data Collection: Adapted from Flin, Mearns & Burn (2004) Safety Climate Assessment Tool. Type of research: Cross-sectional	10-Factors: Safety communication, Safety involvement, Training & competence, safety reporting, Work pressure, Management safety commitment, Safety objectives, Role of supervisor in safety and health, Leadership style	Outcome measure: Safety satisfaction and feedback Analysis: Descriptive statistics EFA, ANOVA, ttest
33	Luria & Yagil (2010)	90 employees in 11 manufacturing organisation. Metal & aviation industries (5) Food industries (4) Chemical industry (1) Plastic industry	Data collection: Semi-structured interview and survey. Type of research: Cross-sectional	19 themes based on content analysis: Relationship between employees Transactional leadership People-oriented leadership Task-oriented safety leadership Overall leadership evaluation Safety training Rewards and sanctions for Safety,safety resources	Outcome measure: No outcome measure Analysis: Content analysis, ANOVA

APPENDIX D

BAHAGIAN PEMBANGUNAN MODAL INSAN
JABATAN PENGAIRAN DAN SALIRAN MALAYSIA
Cawangan Jalan Ampang, Km. 7, Jalan Ampang,
55100 Ampang, Kuala Lumpur.
Tel : 03-42895400 Fax: 03-42513064

Ruj Kami : (5)dlm.BPMI/A/P.5887
Tarikh : 12 Januari 2010

PM Dr. Zubaidah bt. Ismail
PM Dr. Che Rosmani bt. Che Hassan
Fakulti Kejuruteraan, Universiti Malaya.

Tuan/Puan,

SURAT SOKONGAN MENJALANKAN KAJIAN DI JABATAN PENGAIRAN DAN SALIRAN MALAYSIA

Dengan segala hormat, saya merujuk perkara tersebut di atas.

2. Adalah dimaklumkan bahawa Bahagian Pembangunan Modal Insan, JPS Malaysia sangat menyokong kajian yang akan dijalankan oleh En. Abu Hanipah bin Ramli dalam Bidang Pengurusan Keselamatan dan Kesihatan Pekerjaan di Jabatan Pengairan dan Saliran Malaysia.

3. Sokongan ini dibuat kerana kami mendapati kurangnya kajian ini dijalankan dalam sektor awam dan diharapkan hasil kajian beliau akan dapat meningkatkan keberkesanan Pengurusan Keselamatan dan Kesihatan dalam sektor awam pada masa akan datang.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(IR. WAHID ANUAR BIN AHMAD)
Pengarah,
Bahagian Pembangunan Modal Insan
Jabatan Pengairan Dan Saliran Malaysia

APPENDIX E

Dear Respondent,

The research is conducted for the purpose of completing my PhD at the University of Malaya. I am studying the occupational safety and health (OSH) management practices on Department of Irrigation and Drainage Malaysia. The title of this research is ***`Relationships between Safety Climate Factors and Occupational Safety and Health (OSH) Level of Awareness in Malaysian Government Agencies'.***

I would greatly appreciate your participation in this project, by completing the attached questionnaire and allow follow-up interview to explore issues in more depth. All Information obtained from this questionnaire will be treated confidential and participant`s identity will remain anonymous. The results will be used for academia proposes only, and might be included in an academia publication.

This questionnaire seeks information about the degree of implementation of OSH practices in your office. You will ask to consider how these various elements are managed in your organization. In answering each question, please be objective as possible remembering /that biases sometimes ` cloud` the real answer. Your responses should reflect the situation in your section/ organization. The validity of this research largely depends on the accuracy of your answer.

Thank you in advance for your participation in the completion of this questionnaire.

ABU HANIPAH BIN RAMLI

FACULTY OF ENGINEERING,

UNIVERSITY OF MALAYA,

Kuala Lumpur.

E-mail: jdabhar@um.edu.my

HP: 013-3574909

SURVEY QUESTIONNAIRE

Section 1: Respondent personel profile

Please circle the answer that is relevant to you.

Designation

[a.] Manager (J54-above)
[b.] Engineer (J41-J52)
[c.] Assistant Engineer (J29-J38)
[d.] Technician (J17-J26)

Education Level

[a.] SPM-below…
[b.] Technical Certificate
[c.] Diploma
[d.] Degree
[e.] Master and above…

3. Age ______________ years old.

4. Working Experience ______________ years.

Note :

OSH = Occupational Safety and Health

PPE = Personel Protective Equipment

Section 2: We would like to know how much you agree or disagree with each of the following statements related to your organization. Responses are indicated by a single digit on the severity of agreement/disagreement scale illustrated below :

MANAGEMENT COMMITMENT

	Please tick the appropriate box to indicate your level of agreement	Strongly Disagree (1)	Disagree (2)	Moderate (3)	Agree (4)	Strongly Agree (5)
1.	The organization puts sufficient resources into OSH.					
2.	Senior managers take OSH issues into account when making decisions.					
3.	Management readily acts upon OSH suggestions from staff.					
4.	I get good response from my manager when I raise a OSH issue with him.					
5.	I am provided with suitable and sufficient PPE for my job.					
6.	Management places a low priority on Health and Safety Training.					
7.	Managements only looks at OSH after there has been an accident.					
8.	There is a reward and recognition program for innovation in OSH.					
9.	Management's promotion of a work culture is supportive of OSH .					

EMPLOYEES PARTICIPATION

	Please tick the appropriate box to indicate your level of agreement	Strongly Disagree (1)	Disagree (2)	Moderate (3)	Agree (4)	Strongly Agree (5)
10.	I have responsibilities for the OSH of myself and my colleagues.					
11.	I am aware of the safety system of the work before I start a job.					
12.	Discussions on OSH at meetings(team and safety related meeting) are frank and open.					
13.	I have opportunity to discuss the day –to-day job plan with my manager or immediate superior.					
14.	Management and the workforce work together as a team to tackle OSH and other work related problems.					
15.	Everybody understand their OSH responsibility and acts accordingly.					
16.	When I see a potential OSH hazard, I am willing to correct it myself if possible.					
17.	My workmates would react strongly against a person who breaks safety and health procedures /rules.					
18.	People here always work safely even when they are not being supervised					
19.	I am willing to warn my co-employees about working unsafely.					
20.	I sometimes take shortcuts in performing my job when sensible to do so.					

TRAINING AND EDUCATION(safety prevention/control system)

	Please tick the appropriate box to indicate your level of agreement	Strongly Disagree (1)	Disagree (2)	Moderate (3)	Agree (4)	Strongly Agree (5)
21.	The training I had attended covered all Safety and Health risks associated with the work for which I am responsible.					
22.	I have received training in the emergency procedures and arrangements for my workplace.					
23.	Accident investigations are mainly used to identify OSH hazards in the workplace.					
24.	I have been briefed to identify OSH hazards in the workplace.					
25.	Organization's senior leaders received specific OSH education.					
26.	Employees have been given specific OSH education.					
27.	OSH component is included in all new employee orientation programs.					
28.	All staff, employees and managers receive specific training in procedures to identify and report OSH concerns, adverse events, near misses and errors.					

COMMUNICATION

	Please tick the appropriate box to indicate your level of agreement	Strongly Disagree (1)	Disagree (2)	Moderate (3)	Agree (4)	Strongly Agree (5)
29.	There are good communications here about Safety and Health issues.					
30.	I received useful and accurate OSH information.					
31.	The company encourages suggestions on how to improves safety and health conditions.					
32.	There is good feedback from management on reported OSH issues.					
33.	I can report an accident or near-miss without fear of blame of retribution.					
34.	Accident which happen here are always reported.					
35.	Information on current OSH performance is easily available.					
36.	I am given sufficient information on management's decisions regarding matters of OSH.					
37.	I believe that management have communicated a clear vision of OSH to them.					
38.	Some safety and health procedures/rules are not really practical.					
39.	The company has a good system for identifying and dealing with OSH problems.					

LEVEL OF AWARENESS(LoA) OF OCCUPATIONAL SAFETY AND HEALTH

OSH Orientation

	Please tick the appropriate box to indicate your level of agreement	Strongly disagree	Disagree	Moderate	Agree	Strongly Agree
40.	I feel safe at my workplace**.**					
41.	My organization takes all OSH measure to ensure employees safety.					
42.	My organization has Occupational Safety and Health policy.					

Policy

	Please tick the appropriate box to indicate your level of agreement	Strongly disagree	Disagree	Moderate	Agree	Strongly Agree
43.	The policy meets the legal requirements and best practices of occupational safety and health.					
44.	The policy is up to date.					
45.	The policy is being implemented effectively.					

Monitoring

	Please tick the appropriate box to indicate your level of agreement	Strongly disagree	Disagree	Moderate	Agree	Strongly Agree
46.	My organization provides safety and health information to employees.					
47.	My organization has a safety and health committee.					
48.	My organization sets safety and health objectives on an organization level.					
49.	My organization sets safety and health objectives on an individual level.					

Risk Assessment

	Please tick the appropriate box to indicate your level of agreement	Strongly disagree	Disagree	Moderate	Agree	Strongly Agree
50.	The workplace risk assessment are being carried out.					
51.	The systems are in placed to ensure risk assessment are reviewed when appropriate.					
52.	OSH inspection are being carried out.					
53.	My organization has a system for reporting accidents.					
54.	My organization has an audit system in place.					

Review

	Please tick the appropriate box to indicate your level of agreement	Strongly disagree	Disagree	Moderate	Agree	Strongly Agree
55.	My organization has procedures for safety and health .					
56.	My organization reviews safety and health implementation.					

Thank you for your cooperation

ABU HANIPAH BIN RAMLI

FACULTY OF ENGINEERING

UNIVERSITI OF MALAYA.

Kuala Lumpur.

E-MAIL: jdabhar@um.edu.my

HP: 013-3574909

APPENDIX F

Kepada Responden,

Kajian ini dijalankan dengan tujuan bagi melengkapkan pengajian saya di peringkat PhD di Universiti Malaya. Saya mempelajari mengenai Pengurusan Keselamatan dan Kesihatan Pekerjaan yang dipraktikkan di Jabatan Pengairan dan Saliran, Malaysia. Tajuk Kajian saya *ialah* ***'Hubungan Antara Faktor-faktor Iklim Keselamatan terhadap Tahap Kesedaran Keselamatan dan Kesihatan Pekerjaan Di Dalam Agensi-Agensi Kerajaan di Malaysia.'***

Saya sangat menghargai penyertaan anda di dalam kajian ini, dengan melengkapkan borang soal-selidik yang disertakan dan membenarkan temu bual susulan bagi mengkaji isu ini dengan lebih mendalam. Segala maklumat yang diperolehi dari soal-selidik ini adalah sulit dan identiti responden tidak dikenali. Hasil kajian akan digunakan bagi tujuan akademik dan mungkin akan diterbitkan dalam penerbitan akademik.

Soal selidik ini mengenal pasti maklumat mengenai tahap implementasi Keselamatan dan Kesihatan Pekerjaan di pejabat anda. Maklumat yang anda berikan boleh mempengaruhi situasi di dalam organisasi anda. Kesahan kajian ini sangat bergantung pada ketepatan jawapan yang anda berikan.

Terima kasih diucapkan di atas penyertaan anda dalam kajian ini.

ABU HANIPAH BIN RAMLI

FAKULTI KEJURUTERAAN

UNIVERSITI MALAYA.

Kuala Lumpur.

E-MAIL: jdabhar@um.edu.my

HP: 013-3574909

-

SOALAN SOALSELIDIK

Seksyen 1: Maklumat Peribadi Responden

Sila jawab soalan berikut mengenai diri anda.

Jawatan

[a.] Pengurusan (J54-ke atas)

[b.] Jurutera (J41-J52)

[c.] Penolong Jurutera (J28-J38)

[d.] Juruteknik (J17-J26)

Taraf Pendidikan

[a.] SPM-ke bawah

[b.] Sijil Teknikal

[c.] Diploma

[d.] Sarjana Muda

[e.] Sarjana- ke atas

3. Umur _____________ tahun.

4. Pengalaman Bekerja _____________ tahun.

Nota :

K&K = Keselamatan Dan Kesihatan

Seksyen 2: Anda diperlukan menyatakan sejauh mana anda bersetuju atau tidak bersetuju dengan setiap pernyataan mengenai organisasi anda merujuk kepada skala berikut:

SOKONGAN PENGURUSAN.

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhana (3)	Setuju (4)	Sangat Setuju (5)
1.	Organisasi menyediakan sumber mencukupi terhadap K&K					
2.	Pengurusan Kanan mengambil kira isu K&K apabila membuat keputusan.					
3.	Pengurusan bersedia mengambil tindakan terhadap cadangan mengenai K&K daripada pekerja.					
4.	Saya diberi perhatian oleh Pengurus apabila mengemukakan isu K&K kepada beliau.					
5.	Saya dibekalkan dengan Peralatan Keselamatan yang lengkap untuk menjalankan kerja.					
6.	Pengurusan tidak mengutamakan Program Latihan K&K.					
7.	Pengurusan hanya mengambil tindakan selepas berlaku kemalangan.					
8.	Pengurusan menyediakan anugerah dan pengiktirafan terhadap program Inovasi dalam K&K.					
9.	Pengurusan sangat menyokong program membudayakan K&K di tempat kerja.					

Nota:

K&K = Keselamatan Dan Kesihatan

PENGLIBATAN PEKERJA

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhana (3)	Setuju (4)	Sangat Setuju (5)
10.	Saya mempunyai tanggungjawab terhadap K&K diri sendiri dan rakan sekerja.					
11.	Saya sedar akan 'Sistem Kerja Selamat' sebelum memulakan kerja.					
12.	Dalam mesyuarat, perbincangan mengenai K&K adalah terbuka dan bebas.					
13.	Saya berpeluang berbincang mengenai 'pelan kerja harian' bersama Pengurus/ Pegawai Kanan.					
14.	Pengurusan dan keseluruhan kakitangan akan bekerjasama bagi mengendali masalah K&K dan masalah lain.					
15.	Semua orang memahami tanggungjawab masing-masing terhadap K&K dan bertindak sewajarnya.					
16.	Apabila saya nampak akan potensi masalah K&K, saya akan menyelesaikan bersendiri an sekadar mampu.					
17.	Rakan sekerja saya akan bertindak sewajarnya terhadap sesiapa yang melanggar peraturan /prosedur K&K.					
18.	Pekerja di sini sentiasa bekerja secara selamat walaupun mereka tidak diawasi.					
19.	Saya akan memberi amaran kepada rakan sekerja yang tidak mementingkan K&K.					
20.	Saya kadang-kadang mengambil jalan mudah dalam menjalankan kerja, jika berpeluang melakukannya.					

Nota:

K&K = Keselamatan Dan Kesihatan

PENDIDIKAN DAN LATIHAN(pencegahan keselamatan/sistem kawalan)

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhana (3)	Setuju (4)	Sangat Setuju (5)
21.	Program Latihan yang telah saya hadiri merangkumi kesemua risiko yang berkaitan dengan K&K dalam kerja yang saya lakukan					
22.	Saya menerima latihan berkenaan Prosedur dan Aturan Kecemasan bagi tempat kerja saya.					
23.	Penyiasatan kemalangan sangat digunakan dalam mengenal pasti bahaya K&K di tempat kerja.					
24.	Saya telah diajar untuk mengenal pasti bahaya K&K di tempat kerja.					
25.	Pengurusan Kanan Organisasi telah menerima latihan K&K yang khusus.					
26.	Semua pekerja telah diberi pendidikan K&K secara khusus.					
27.	Semua aspek K&K termasuk di dalam Program Orientasi Pekerja Baru.					
28.	Semua kakitangan, pekerja dan Pengurusan menerima latihan khusus dalam prosedur untuk mengenal pasti dan melaporkan urusan K&K, pelanggaran peraturan, kemalangan nyaris dan kesilapan.					

Nota:

K&K = Keselamatan Dan Kesihatan

KOMUNIKASI (PERHUBUNGAN)

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhana (3)	Setuju (4)	Sangat Setuju (5)
29.	Komunikasi berkaitan isu-isu K&K sangat baik di tempat kerja saya					
30.	Saya menerima maklumat K&K yang berguna dan tepat					
31.	Organisasi menggalakkan cadangan bagaimana untuk memperbaiki keadaan K&K.					
32.	Pengurusan memberikan tindakan susulan yang baik terhadap Laporan isu-isu K&K.					
33.	Saya boleh melaporkan tentang kemalangan tanpa rasa takut.					
34.	Setiap kemalangan yang berlaku di tempat kerja dilaporkan					
35.	Maklumat mengenai prestasi semasa K&K mudah diperolehi					
36.	Saya diberi maklumat yang mencukupi mengenai keputusan Pengurusan terhadap perkara-perkara berkaitan K&K.					
37.	Saya percaya bahawa Pengurusan telah memahami `hala tuju` yang jelas mengenai K&K.					
38.	Sebahagian Prosedur/Peraturan K&K tidak praktikal untuk dilaksanakan.					
39.	Organisasi mempunyai sistem yang baik dalam mengenal pasti dan berhadapan dengan masalah K&K.					

Nota:

K&K = Keselamatan Dan Kesihatan

TAHAP KESELAMATAN DAN KESIHATAN PEKERJAAN (K&K).

Orientasi K&K

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhana (3)	Setuju (4)	Sangat Setuju (5)
40.	Saya rasa selamat di tempat kerja .					
41.	Organisasi saya mengambil kira kesemua aspek K&K bagi memastikan para pekerja selamat.					
42.	Organisasi saya mempunyai Polisi K&K.					

Polisi

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhana (3)	Setuju (4)	Sangat Setuju (5)
43.	Polisi tersebut mencapai keperluan dan amalan-amalan baik Perundangan K&K .					
44.	Polisi tersebut dikemas kini .					
45.	Polisi tersebut dilaksanakan secara berkesan .					

Pengawasan

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhana (3)	Setuju (4)	Sangat Setuju (5)
46.	Organisasi saya menyalurkan maklumat mengenai K&K kepada para pekerja .					
47.	Organisasi saya mempunyai Jawatankuasa Keselamatan dan Kesihatan Pekerjaan(K&K).					
48.	Organisasi saya menetapkan objektif K&K di peringkat Organisasi					
49.	Organisasi saya menetapkan objektif K&K di peringkat Individu .					

Penilaian Risiko

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhan a (3)	Setuju (4)	Sangat Setuju (5)
50.	Penilaian Risiko di tempat kerja dilakukan					
51.	Organisasi sentiasa bersedia bagi memastikan Penilaian Risiko dijalankan apabila perlu .					
52.	Pemeriksaan Keselamatan dan Kesihatan (K&K) dijalankan.					
53.	Organisasi saya mempunyai Sistem Pelaporan Kemalangan .					
54.	Organisasi saya mempunyai Sistem Audit .					

Kajian Semula

	Sila tanda petak yang sesuai untuk menunjukkan tahap persetujuan anda	Sangat Tidak Setuju (1)	Tidak setuju (2)	Sederhan a (3)	Setuju (4)	Sangat Setuju (5)
55.	Organisasi saya mempunyai Prosedur K&K .					
56.	Organisasi saya mengkaji semula Pelaksanaan K&K .					

Terima Kasih di atas Kerjasama Anda.

ABU HANIPAH BIN RAMLI

FAKULTI KEJURUTERAAN

UNIVERSITI MALAYA.

Kuala Lumpur.

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APPENDIX G

BAHAGIAN PEMBANGUNAN MODAL INSAN
(Human Capital Development Division)
JABATAN PENGAIRAN DAN SALIRAN MALAYSIA
(Department of Irrigation and Drainage Malaysia)
KOMPLEKS JPS AMPANG, JALAN AIR BUKIT OFF KM 7 JALAN AMPANG, 55100 AMPANG, KUALA LUMPUR
Tel: 03-4289 5400 Fax: 03-4251 3064 (Pentadbiran) 03-4256 2619 (DICODE KL) http: www.water.gov.my/division/hrd/

(76) dlm. BLKK/A/(PL) 3 Jld. 4

8 Jun 2010

Jabatan Keselamatan Kesihatan dan Pekerjaan
Wilayah Persekutuan Kuala Lumpur,
Tingkat 17, Menara PERKESO
281, Jalan Ampang
50534 Kuala Lumpur
(u.p: En Shahrul Nizam bin Shaharudin – Unit Tapak Bina)

Tuan,

PENYELIDIKAN PERINGKAT DOKTOR FALSAFAH DALAM BIDANG KESELAMATAN KESIHATAN DAN PEKERJAAN

Sukacita dimaklumkan kami merujuk perkara di atas, perbualan antara En. Abu Hanipah bin Ramli dengan En Shahrul Nizam pada 7 Jun 2010 adalah dirujuk.

2. Sehubungan dengan itu, kami memohon jasa baik daripada pihak tuan memberi kerjasama sepenuhnya kepada pegawai kami, En Abu Hanipah bin Ramli (No. K.P: 661201-06-5387) yang sedang menjalankan penyelidikan di peringkat Doktor Falsafah dalam bidang Keselamatan Kesihatan dan Pekerjaan di Universiti Malaya, Kuala Lumpur.

Diharap mendapat perhatian dan kerjasama sepenuhnya daripada pihak tuan.

Sekian, terima kasih.

Yang Benar,

WAHID ANUAR BIN AHMAD
Pengarah Pembangunan Modal Insan
Jabatan Pengairan dan Saliran Malaysia

APPENDIX H

Pusat Pengembangan Pengetahuan
Institut Tadbiran Awam Negara (INTAN)
Jabatan Perkhidmatan Awam Malaysia

BORANG PERMOHONAN BAGI SESI KHIDMAT NASIHAT
UNTUK PENGANALISISAN DATA
(Hanya terbuka untuk Kumpulan Pengurusan dan Profesional sahaja)

BAHAGIAN A: BUTIR-BUTIR PERIBADI

1. Nama: ABU HANIPAH BIN RAMLI. 2. Gelaran Kehormat: ...TIADA...................
(misalnya Dr., Dato', Tan Sri, dsb.)

3. Jantina [√] Lelaki [ ] Perempuan

4. Umur [ ] ≤ 25 [ ] 26 - 35 tahun
[√] 36 – 45 tahun [ ] 46 – 55 tahun

Lain-lain sila nyatakan ....

5. Nama Jabatan/Badan Berkanun/ PBT/ Agensi (Terakhir): ..JABATAN PENGAIRAN DAN SALIRAN MALAYSIA.

6. Alamat Bertugas: ..BAHAGIAN KHIDMAT PENGURUSAN..
....

7. Gred Jawatan & Skim Perkhidmatan (Terakhir): ...J48....

8. Tempoh Berkhidmat dengan kerajaan;

[ ] 5 tahun dan kurang [ ] 6 – 10 tahun
[ ] 11 – 15 tahun [√] Melebihi 15 tahun

9. No. Tel. Bimbit: .....013-3574909.......................................

10. No. Tel Pejabat: ....03-26972434.................

11. Emel peribadi: ....jdabhar@gmail.com.............

11. Dua (2) Kelulusan Tertinggi:

Tahun	Kelulusan	Pengkhususan
1990	B.Eng(Hons)	Civil Engineering
2003	Msc.	Industrial Safety Management

~ 1 ~

BAHAGIAN PEMBANGUNAN MODAL INSAN
JABATAN PENGAIRAN DAN SALIRAN MALAYSIA
Cawangan Jalan Ampang, Km. 7, Jalan Ampang,
55100 Ampang, Kuala Lumpur.
Tel : 03-42895400 Fax: 03-42513064

Ruj. Kami : (12) dlm. BPMI/A/P.5887
Tarikh : 10 Januari 2011

Pengarah,
Bahagian Perkhidmatan Mekanikal & Elektrik,
Jabatan Pengairan dan Saliran Malaysia,
Tingkat 1, Blok D,
Kompleks Kerajaan Bukit Perdana,
Jalan Dato` Onn
50515 Kuala Lumpur.

Tuan,

KEBENARAN MENJALANKAN KAJIAN AWAL (`PILOT STUDY`) DI JABATAN

Adalah dimaklumkan bahawa Bahagian Pembangunan Modal Insan, JPS Malaysia sangat menyokong kajian yang akan dijalankan oleh En.Abu Hanipah bin Ramli dalam Bidang Pengurusan Keselamatan dan Kesihatan Pekerjaan di Jabatan Pengairan dan Saliran Malaysia.

2. Sehubungan dengan itu mohon kerjasama Dato`/Datin/Tuan/Puan agar dapat membantu beliau menjayakan kajian beliau dalam semua aspek bantuan yang diperlukan demi kejayaan beliau dalam pengajiannya. Adalah diharapkan hasil kajian beliau akan dapat meningkatkan keberkesanan Pengurusan Keselamatan dan Kesihatan dalam sektor awam pada masa hadapan.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(IR. WAHID ANUAR BIN AHMAD)
Pengarah,
Bahagian Pembangunan Modal Insan
Jabatan Pengairan Dan Saliran Malaysia

UNIVERSITI MALAYA

31 May 2011

Semua PPSN
Sila beri kerjasama
Ahz.
2/6/11

Director General

Department of Irrigation and Drainage Malaysia

Jalan Sultan Salahuddin

Kuala Lumpur

DATO' Ir. HJ. AHMAD HUSAINI B. SULAIMAN
Ketua Pengarah
Jabatan Pengairan dan Saliran
Malaysia.

Yang Berbahagia Dato',

A Doctoral Research on Occupational Safety and Health Management: Mr Abu Hanipah Bin Ramli (KHA 090032)

The above subject is kindly referred.

Managing occupational safety and health (OSH) is not only required by law but it is also a very important element in the manufacturing/construction because it affects the level of employee's productivity and the quality of the product. Firms/Organizations that manage OSH well may gain many advantages in global competition and may experience higher level of profitability.

This study is to understand the OSH management practices in Department in Irrigation and Drainage Malaysia. The title of this research is "Development of Regression Model Based on Perception on Safety Culture Among Managerial Employees and its Influence on Occupational Safety and Health (OSH) Performance: A Case Study in Development of Irrigation and Drainage Malaysia (DID)." The main of objective of this research is to identify the correlation between factors influencing OSH performance among managerial employees at DID Malaysia construction sites. With this information, it is hoped that DID Malaysia will have a better understanding and control on safety and health issues at the workplace.

Department of Civil Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, MALAYSIA.
Tel: (603) 7967 5203 / 5351 • Faks: (603) 7967 5318 • E-mail: ketua_kejawam@um.edu.my • http://www.um.edu.my

APPENDIX K

TEST OF NORMALITY

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig. (p)	Statistic	df	Sig.
DEP1	.150	83	.096	.927	83	.124

a. Lilliefors Significance Correction

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig. (p)	Statistic	df	Sig.
DEP2	.098	81	.053	.978	81	.169

a. Lilliefors Significance Correction

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig. (p)	Statistic	df	Sig.
DEP3	.114	104	.152	.972	104	.084

a. Lilliefors Significance Correction

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig. (p)	Statistic	df	Sig.
DEP4	.162	106	.246	.949	106	.136

a. Lilliefors Significance Correction

***According to Kolmogorov-Smirnov test, if the sig (p)≥ 0:05, the data are normally distributed**

APPENDIX L

Safety Climate Factors identified by DID Top Management

No.	Safety climate factors
1.	Good Communication
2.	Clear and Realistic Goals
3.	Effective Enforcement Scheme
4.	Management Support
5.	Program Evaluation
6.	Continuing participation of employees
7.	Delegation of Authority and Responsibility
8.	Safety equipment acquisition and Maintenance
9.	Teamwork
10.	Appropriate Supervision
11.	Personal Competency
12.	Positive group norms
13.	Personal attitude
14.	Personal motivation
15.	Sufficient Resource Allocation
16.	Appropriate Safety Education and Training
17.	Supervisory Actions
18.	Safety Incentives
19.	Hospitality
20.	Safety Inspection
21.	Safety Behaviour
22.	Confident Level
23.	Appropriate Tool design
24.	Standard Operation Procedures
25.	Job satisfaction

APPENDIX M

BAHAGIAN PEMBANGUNAN MODAL INSAN
JABATAN PENGAIRAN DAN SALIRAN MALAYSIA
Cawangan Jalan Ampang, Km. 7, Jalan Ampang,
55100 Ampang, Kuala Lumpur.
Tel : 03-42895400 Fax: 03-42513064

Ruj. Kami : (3) dlm. BPMI/A/P.5887
Tar ikh : 05 Januari 2010

Kepada,

Senarai Edaran:

Tajuk/Perkara : **SURAT SOKONGAN MENJALANKAN KAJIAN DI JABATAN PENGAIRAN DAN SALIRAN MALAYSIA.**

Dato`/Datin/Tuan/Puan,

Adalah dimaklumkan bahawa Bahagian Pembangunan Modal Insan, JPS Malaysia sangat menyokong kajian yang akan dijalankan oleh En.Abu Hanipah bin Ramli dalam Bidang Pengurusan Keselamatan dan Kesihatan Pekerjaan di Jabatan Pengairan dan Saliran Malaysia.

2. Sehubungan dengan itu mohon kerjasama Dato`/Datin/Tuan/Puan agar dapat membantu beliau menjayakan kajian beliau diJabatan Pengairan dan Saliran Malaysia dalan semua aspek bantuan yang diperlukan demi kejayaan beliau dalam pengajiannya. Adalah diharapkan hasil kajian beliau akan dapat meningkatkan keberkesanan Pengurusan Keselamatan dan Kesihatan dalam sektor awam pada masa hadapan.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(IR. WAHID ANUAR BIN AHMAD)
Pengarah,
Bahagian Pembangunan Modal Insan
Jabatan Pengairan Dan Saliran Malaysia

Senarai Edaran:

1. Pengarah Bahagian Pengurusan Sumber Air & Hidrologi
2. Pengarah Bahagian Pengurusan Lembangan Sungai dan Zon Pantai
3. Pengarah Bahagian Rekabentuk dan Empangan
4. Pengarah Bahagian Perkhidmatan Mekanikal & Elektrik
5. Pengarah Bahagian Projek Khas
6. Pengarah Bahagian Projek Khas
7. Pengarah Bahagian Saliran Mesra Alam
8. Pengarah Bahagian Pengurusan Banjir
9. Pengarah Bahagian HTC Kuala Lumpur
10. Pengarah Ukur Bahan & Pengurusan Kontrak
11. Pengarah Bahagian Bangunan dan Infrastruktur
12. Pengarah Bahagian Pengurusan Maklumat
13. Pengarah Bahagian Khidmat Pengurusan
14. Pengarah Bahagian Audit dan Prestasi
15. Pengarah Bahagian Pengairan dan Saliran Pertanian
16. Pengarah Pusat Kawalan SMART
17. Pengarah JPS Negeri Perlis
18. Pengarah JPS Negeri Kedah
19. Pengarah JPS Negeri Pulau Pinang
20. Pengarah JPS Negeri Perak
21. Pengarah JPS Negeri Selangor
22. Pengarah JPS Negeri Melaka
23. Pengarah JPS Negeri Sembilan
24. Pengarah JPS Negeri Johor
25. Pengarah JPS Negeri Pahang
26. Pengarah JPS Negeri Terengganu
27. Pengarah JPS Negeri Kelantan
28. Pengarah JPS Negeri Sabah
29. Pengarah JPS Negeri Sarawak
30. Pengarah JPS Negeri WP Kuala Lumpur

APPENDIX N

MINIMUM VALUES OF CVR

One Tailed Test, p=0.05

No. Of Panelists	Min Value
5	0.99
6	0.99
7	0.99
8	0.75
9	0.78
10	0.62
11	0.59
12	0.56
13	0.54
14	0.51
15	0.49
20	0.42
25	0.37
30	**0.33**
35	0.31
40	0.29

Source: Lawshe, 1975

APPENDIX O

Please rank the statement, as what you think it should be......

1= Essential 2= Useful but not essential 3= Not necessary

No.	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	CVR
1	Good Communication	1	2	1	1	1	2	1	1	1	1	1	1	2	1	3	1	2	1	1	1	1	3	1	1	1	2	1	1	1	1	0.53
2	Hospitality	1	1	1	2	1	1	2	1	1	1	3	1	1	1	1	3	3	1	2	1	2	1	2	1	2	1	3	1	2	2	0.20
3	Clear and Realistic Goals	1	1	1	2	1	1	1	1	2	1	1	1	1	2	1	1	1	2	1	1	2	1	3	1	1	3	1	1	1	2	0.46
4	Effective Enforcement Scheme	1	2	1	1	1	3	1	1	3	1	1	2	1	1	2	1	1	2	1	1	1	2	1	1	3	1	1	1	3	3	0.33
5	Safety Incentives	2	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	2	2	1	1	1	2	1	2	1	1	2	2	2	2	0.26
6	Management Support	3	1	1	1	1	1	3	1	1	1	1	3	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	0.66
7	Safety Inspection	2	2	1	1	1	1	1	1	1	1	1	3	1	1	3	3	1	1	1	2	1	2	1	1	2	1	2	3	3	1	0.26
8	Program Evaluation	2	1	1	1	2	1	1	1	2	1	1	1	1	3	1	1	1	1	3	1	1	1	1	1	1	2	1	1	1	1	0.60
9	Confident Level	1	2	1	1	1	2	1	2	1	2	1	2	1	1	1	3	1	3	1	3	1	3	1	3	1	2	1	2	1	1	0.20
10	Continuing participation of employees	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	3	1	1	1	1	1	3	3	1	1	2	0.66
11	Delegation of Authority and Responsibility	2	1	1	1	1	1	1	2	1	1	1	1	3	1	1	1	1	1	3	1	1	1	1	1	2	1	2	2	1	1	0.53

12	Standard Operation Procedures	1	2	2	1	1	1	2	1	1	3	1	3	1	1	1	1	1	1	1	1	2	2	1	2	2	1	1	2	1	2	0.26
13	Safety equipment acquisition and Maintenance	1	1	1	2	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	0.46
14	Teamwork	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0.73
15	Job Satisfaction	1	3	1	3	1	1	3	1	1	1	2	1	1	2	1	2	1	1	1	1	3	3	1	1	3	1	1	1	3	3	0.26
16	Appropriate Supervision	2	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	0.66
17	Personal Competency	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	2	0.66
18	Positive group norms	1	1	1	1	2	1	2	1	1	1	1	1	3	2	1	1	3	1	1	1	1	1	2	1	1	1	2	1	2	2	0.40
19	Personal attitude	2	1	1	1	3	1	1	1	3	3	1	1	2	1	1	2	1	1	1	2	1	1	1	2	1	1	2	1	3	1	0.33
20	Safety Behavior	1	1	2	1	1	2	1	1	3	1	1	3	1	1	1	3	3	3	1	1	1	1	3	3	1	1	1	3	2	3	0.20
21	Personal motivation	1	2	1	1	2	1	1	2	1	1	1	3	1	1	1	1	1	2	1	1	1	1	2	1	1	2	1	1	1	1	0.53
22	Sufficient Resource Allocation	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	2	2	0.60
23	Supervisory Actions	3	3	3	2	1	1	1	2	2	1	1	1	2	1	3	1	1	1	3	1	1	2	1	1	1	1	1	2	1	2	0.20
24	Appropriate Safety Education and Training	1	1	1	1	1	2	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	0.73
25	AppropriateTool Design	1	1	3	1	3	1	1	1	2	1	1	2	1	2	1	1	3	1	1	1	2	1	2	2	1	2	1	1	2	1	0.26

Lawshe `s equation:

$$CVR = (ne - N/2)/(N/2)$$

CVR = Content Validity Ratio

N = total number of respondents

$N_{e=}$ Number of respondents indicatig Essential

APPENDIX P

Prediction values on occupational safety Awareness for minimum (2) Likert scale:

DEP1 : The assumed value of 2 for occupational safety awareness and significant factors in the model gives a total value of 1.672, thus a 0.328 deviation from the assumption.

DEP2 : The assumed value of 2 for occupational safety awareness and significant factors in the model gives a total value of 1.540, thus a 0.46 deviation from assumption.

Prediction values on occupational safety awareness for minimum (3) Likert scale:

DEP1 : The assumed value of 3 for occupational safety awareness and significant factors in the model gives a total value of 2.508, thus a 0.492 deviation from the assumption.

DEP2 : The assumed value of 3 for occupational safety awareness and significant factors in the model gives a total value of 2.310, thus a 0.690 deviation from assumption.

Prediction values on occupational safety awareness for minimum (4) Likert scale:

DEP1 : The assumed value of 4 for occupational safety awareness and significant factors in the model gives a total value of 3.344, thus a 0.656 deviation from the assumption.

DEP2 : The assumed value of 4 for occupational safety awareness and significant factors in the model gives a total value of 3.080, thus a 0.920 deviation from assumption.

APPENDIX Q

JABATAN KERJA RAYA MALAYSIA
PEJABAT KETUA PENGARAH KERJA RAYA
IBU PEJABAT JKR MALAYSIA,
JALAN SULTAN SALAHUDDIN,
50582 KUALA LUMPUR.

Telefon : (03) 26919011
Telefax : KRT MA 30415
Kawat : MINWORK, KUALA LUMPUR
Fax : (03) 2694 8477 (Tkt. 2)
: (03) 2692 1202 (Tkt. 4)
Laman Web : http://www.jkr.gov.my

JKR

Ruj. Kami : (44).dlm.JKR.KPKR.020.020.32.1 Jld. 2
Tarikh : 4 November 2011

SENARAI EDARAN

Y.Bhg. Datuk/Dato'/Datin/Tuan/Puan,

KEBENARAN UNTUK MENJALANKAN KAJIAN SOAL SELIDIK OLEH PELAJAR PENGAJIAN IJAZAH KEDOKTORAN DI JABATAN KERJA RAYA MALAYSIA

NAMA PELAJAR	:	**ENCIK ABU HANIPAH BIN RAMLI**
BIDANG PENGAJIAN	:	**IJAZAH DOKTOR FALSAFAH (Ph.D) DALAM BIDANG KESELAMATAN DAN KESIHATAN PEKERJAAN**
UNIVERSITI/INSTITUSI	:	**UNIVERSITI MALAYA**

Dengan segala hormatnya, saya merujuk kepada perkara di atas dan surat daripada Universiti Malaya bertarikh 11 Oktober 2011 adalah berkaitan.

2. Untuk makluman Y.Bhg. Datuk/Dato'/Datin/Tuan/Puan, Encik Abu Hanipah bin Ramli merupakan pegawai yang bertugas di Jabatan Pengairan dan Saliran Malaysia dan sedang melanjutkan pengajian di peringkat Ijazah Kedoktoran dalam bidang Keselamatan dan Kesihatan Pekerjaan melalui Hadiah Latihan Persekutuan.

3. Sehubungan dengan itu, pihak Jabatan Kerja Raya Malaysia tiada halangan dan mengalu-alukan tujuan beliau bagi menjalankan Kajian Soal Selidik untuk mengenal pasti maklumat mengenai Tahap Implementasi Keselamatan dan Kesihatan Pekerjaan di Jabatan Kerja Raya Malaysia.

4. Mohon kerjasama sepenuhnya daripada Y.Bhg. Datuk/Dato'/Datin/Tuan/Puan untuk membantu beliau dalam Kajian Soal Selidik bagi mencapai objektif yang diharapkan.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(Ir. ABDUL KARIM BIN MOHD TAHIR)
b.p Pengarah Cawangan Pengurusan Korporat
Ibu Pejabat JKR Malaysia
MALAYSIA

Pegawai untuk dihubungi:
Amir Asrol bin Ahmad Bangi
Tel: 03-2696 8246
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SISTEM KUALITI BERDAFTAR · KERAJAAN MALAYSIA ·
NO. SIRI SIJIL MS ISO 9001: 0326

ENVIRONMENTAL SYSTEM SIRIM UKAS 074-C
MS ISO 14001 CERT. NO J011301102

1/8

APPENDIX R

IBU PEJABAT,
JABATAN BOMBA DAN PENYELAMAT,
MALAYSIA,
LEBUH WAWASAN, PRECINCT 7,
62250 PUTRAJAYA.

Telefon : 603-88880036
Faks : 603-88880840
Laman Web : www.bomba.gov.my
E-mail : korporat@bomba.gov.my

"CEPAT DAN MESRA"

Ruj. Tuan:

Ruj. Kami: JBPM/IP/KOR:100-3/4

Tarikh : 24 Februari 2012

YS Pengarah
Jabatan Bomba dan Penyelamat Malaysia
Negeri Selangor

YS Pengarah
Jabatan Bomba dan Penyelamat Malaysia
Kuala Lumpur

Tuan,

KEBENARAN UNTUK MENJALANKAN KAJIAN SOAL SELIDIK OLEH PELAJAR PENGAJIAN IJAZAH KEDOKTORAN DI JABATAN BOMBA DAN PENYELAMAT MALAYSIA

NAMA PELAJAR	:	**ENCIK ABU HANIPAH BIN RAMLI**
BIDANG PENGAJIAN	:	**IJAZAH DOKTOR FALSAFAH (Ph.D) DALAM BIDANG KESELAMATAN DAN KESIHATAN PEKERJAAN**
UNIVERSITI	:	**UNIVERSITI MALAYA**

Dengan segala hormatnya, saya merujuk kepada perkara di atas dan surat daripada Universiti Malaya bertarikh 11 Oktober 2011 adalah berkaitan.

2. Untuk makluman tuan, Encik Abu Hanipah bin Ramli merupakan pegawai yang bertugas di Jabatan Pengairan dan Saliran Malaysia dan sedang melanjutkan pengajian di peringkat Ijazah Kedoktoran dalam bidang Keselamatan dan Kesihatan Pekerjaan melalui Hadiah Latihan Persekutuan.

3. Sehubungan dengan itu, Jabatan ini tiada halangan dan mengalu-alukan tujuan beliau bagi menjalankan Kajian Soal Selidik untuk mengenal pasti maklumat mengenai Tahap Implementasi Keselamatan dan Kesihatan Pekerjaan di Jabatan.

4. Mohon kerjasama sepenuhnya daripada pihak tuan untuk membantu beliau dalam Kajian Soal Selidik bagi mencapai objektif yang diharapkan.

CERTIFIED TO ISO 9001 : 2008

2/-

APPENDIX S

Prediction values on occupational safety awareness for minimum (1) Likert scale:

DEP3 : The assumed value of 1 for occupational safety awareness and significant factors in the model gives a total value of 1.02, thus a 0.02 deviation from the assumption.

DEP4 : The assumed value of 1 for occupational safety awareness and significant factors in the model gives a total value of 0.924, thus a 0.076 deviation from assumption.

Prediction values on occupational safety awareness for minimum (2) Likert scale:

DEP3 : The assumed value of 2 for occupational safety awareness and significant factors in the model gives a total value of 2.04, thus a 0.04 deviation from the assumption.

DEP4 : The assumed value of 2 for occupational safety awareness and significant factors in the model gives a total value of 1.848, thus a 0.152 deviation from assumption.

Prediction values on occupational safety awareness for minimum (3) Likert scale:

DEP3 : The assumed value of 3 for occupational safety awareness and significant factors in the model gives a total value of 3.06, thus a 0.06 deviation from the assumption.

DEP4 : The assumed value of 3 for occupational safety awareness and significant factors in the model gives a total value of 2.772, thus a 0.228 deviation from assumption.

Prediction values on occupational safety awareness for minimum (4) Likert scale:

DEP3 : The assumed value of 4 for occupational safety awareness and significant factors in the model gives a total value of 4.08, thus a 0.08 deviation from the assumption.

DEP4 : The assumed value of 4 for occupational safety awareness and significant factors in the model gives a total value of 3.696, thus a 0.304 deviation from assumption.

Prediction values on occupational safety awareness for minimum (5) Likert scale:

DEP3 : The assumed value of 5 for occupational safety awareness and significant factors in the model gives a total value of 5.10, thus a 0.100 deviation from the assumption.

DEP4 : The assumed value of 5 for occupational safety awareness and significant factors in the model gives a total value of 4.62, thus a 0.380 deviation from assumption.

APPENDIX T

Calculations for Model DEP2:

OSH LoA = 0.770 COMM + 1.016

The mean score for Communications for DEP2 = 3:70 (taken from appendix I)

Replace the mean score values COMM into the equation:

$$\boldsymbol{OSH\ LoA\ =\ 0.770\,(3.70)\ +\ 1.016}$$

$$\boldsymbol{=\ 3.865}$$

To obtain the percentages:

OSH LoA = 3.865/5 * 100

= 77%

Calculations for Model DEP3:

$$\boldsymbol{OSH\ LoA\ =\ 0.462\,COMM\ +\ 0.233\,TE\ +\ 0.325\,EP - 0.108}$$

The mean score for Communications for DEP3 = 3:56 (taken from appendix I)

The mean score for Training and Education = 3.44 (taken from appendix I)

The mean score for Employee Participation = 3.71 (taken from appendix I)

Replace the mean score values COMM, TE and EP into the equation:

$$\boldsymbol{OSH\ LoA\ =\ 0.462\,(3.56)\ +\ 0.233\,(3.44)\ +\ 0.325\,(\,3.71) -\ 0.108}$$

= 3.54

To obtain the percentages:

OSH LoA = 3.54/5 * 100

= 70%

Calculations for Model DEP4:

$$\boldsymbol{OSH\ LoA = 0.597\,COMM + 0.327\,EP + 0.373}$$

The mean score for Communications for DEP4 = 3:76 (taken from appendix I)

The mean score for Employee Participation = 3.72 (taken from appendix I)

Replace the mean score values COMM and EP into the equation:

OSH LoA = 0.597 (3.76) + 0.327 (3.72) + 0.373

= 3.83

To obtain the percentages:

OSH LoA = 3.83/5 * 100

= 76%

Meanscores for Safety Climate Factors.

FACTORS	DEP1	DEP2	DEP3	DEP4
MANAGEMENT COMMITMENT	3.31	3.42	3.49	3.60
EMPLOYEE PARTICIPATION	3.57	3.61	3.71	3.72
TRAINING AND EDUCATION	3.18	3.60	3.44	3.87
COMMUNICATION	3.41	3.70	3.56	3.76