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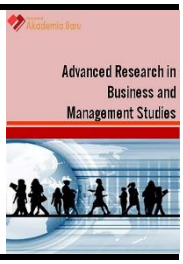

Identifying Accident Factors in Developing a Systematic Guideline on Occupational Safety and Health Management

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ABSTRACT

The purpose of this study is to propose a guideline to improve the quality of safety management in the workplace thereby consistently able to be decreasing industrial accidents. It focuses to SME (Small and Medium Industry) organizations that don't have ISO certification due to certain constraints such as resources to have ISO certification. This study focuses on food manufacturing industries on palm oil based. The basic PDCA (Plan-Do-Check-Action) principle was developed as a basis for this study. It uses quantitative methods on accident statistics for 5 years as key data to conduct a study. Factors that because accidents are thoroughly analysed for each incident. These data are categorized according to the 5 elements and the Human factor as the focus. However, it still analysed along with other direct factors consisting of Machines, Methods, Equipment-Tool-Materials and Workplace-Structural Environment. Then, that human factor was developed into factors related to age, work experience, working time, and gender and so on. Cross-examination to be carried out on existing safety management such as workplace inspection information, hazard observation and assessment program to identify deficiencies and weaknesses. Finally, appropriate guidelines will be proposed to improve safety management in workplace.

1. Introduction

Occupational Safety and Health has flourished in Malaysia since the late 1800s. In 1967, the Factories and Machinery Act was introduced by the government to ensure that workplace safety management was in line with the development of the industry in Malaysia. As the FMA 1967 is more specific and technical, 1994 the new act has been introduced which can cover all areas of employment in the country and is known as the Occupational Safety and Health Act 1994. After the manufacturing industries in Malaysia were growth up, it has opened more job opportunities. It not only developing from the major industry but from the suppliers and subcontractor industry were born to meet the high demand from major industries like electronic company will require electronic component part supply from part supplier companies such as printed circuit board companies, injection molding companies, connectors and interconnect components, hard disk, speaker manufacturing companies and so on. This development not only brings abundance of sustenance

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and employment opportunities to locals and foreign worker who are employed in the organization but also creates hazards due to process in the organization operation. These hazards will cause industrial accidents if there is no proper hazard management. Each year, the industry accident trend report records an increase from all industry sectors that exist in Malaysia. Although the rapid increase in industrial accident statistics in Malaysia is in line with the development of the economic sector, it is not something to be taken lightly. Ideally, as a country that will move towards a developed country, the accident trend in Malaysia should show a downward trend.

The high market demand for oil palm-based products produced requires companies to increase their production. Increased productivity is essential to ensure that companies remain competitive and relevant in the internal and global markets. New technologies and machines were introduced in the company's operations. In addition to increasing production capacity, other requirements are also given attention such as management systems, IT technology, supply chain, documentation, waste management and so on. The introduction of new technologies and new machines will create the new hazards that can lead to accidents if not managed properly. Therefore, some workplace safety improvements are also implemented by the organization to ensure safety to employees and workplace. However, its implementation is more to meet legal requirements and the organization is more focusing on improving productivity and quality to meet customer requirement including certification and accreditation such as ISO 22000, HACCP, GMP and HALAL.

In general, several programs and activities have been carried out to improve safety in the workplace from time to time. Organizations implement certain measures in regulating hazards that exist but it not able to decrease the number of accidents and remain at a certain level. Therefore, the purpose of this research is to examine all the possible factors that contribute to accidents but overlooked and be the cause of failure to reduce the number of accidents. However, this research will focus more on human factors and any improvement safety implementation that can be implemented to reduce the number of accidents and improving quality safety management at the organization.

2. Methodology

2.1 Background

A study at a food manufacturing company located in Pasir Gudang, Johor found that company have implemented various safety requirements in the workplace that are generally fulfill legal requirement and similar safety practices in other food manufacturing companies. However, the accident trend does not show a positive signal that the implementation of current safety programs in the workplace is successful because the numbers of accidents stated fail to decrease consistently. Observation on statistics since 2016 recorded the accident hovering 5 to 10 cases in the 5 years with almost the same accident situation continues to be contributors an accident statistic inside the organization. A structured and systematic workplace safety implementation needs to be implemented to address weaknesses in previous safety implementations.

The aim of this research was to analyze data from accident records, corrections, corrective actions, implementation at workplace and to investigate possible hidden factors that contribute to the number of accident statistics that does not show a consistent decreasing trend. It is hoped that the research information in safety implementation obtained can be used to improve safety culture in organizations and industrial accidents can be reduced especially to companies that have constraints to implement international certification such as ISO.

The accident data obtained contains information on the factors that contribute to the occurrence of accidents. It will examine the direct factors and to identifying the underlying factor of

the accident inside the company. This accident information is the main reference data to identify the contributing factors related to the accident. The information factors that can be obtained from the accident data such as a human involved (age, gender, work experience, rank, skills, and health), type of accident (major, minor, near missed etc.) and Incident place (physical condition, environment situation, confine space, height level, and congested area). Meanwhile, conducting accident investigations allows us to obtain the direct cause information of the accident and correction action to be done.

2.2 Data Collection

2.2.1 Accident data collection

Each contributing factor should be considered and be seen in the overall view. An accident that occurs is not only cause by one factor but usually involves many factors. One causal factor alone to be the cause for the occurrence of an accident is highly unlikely. It usually involves some violation stemming from materials, tools, equipment, activities carried out, the environment of the scene and so on [1]. When these factors intersect with each other, the probability the accident will occur is high. In this study, the focus will be given to the 'Human' factor, but other factors are still needed to identify the overlap of factors that contribute to accidents [2]. Various methods of accident identification theories have been implemented for a long time. Published methods have their own strengths and weaknesses. These theories should be implemented in an integrated manner as each of the theories is complementary to each other [3]. Latent factors become catalysts if combined with suitable workplace environmental conditions and result in the occurrence of accidents. Understanding and researching accidents is the best method to ensure safety in the workplace [4]. Data collection will be more accurate and integrated implementation makes it more systematic.

2.2.2 Literature review

The analysis of the Literature Review from the previous research related to this matter to be obtained the similarities and differences that exist. Literature review also will help us to obtain information of action or program have been made directly or indirectly of safety management. Different organizations will exhibit differences of requirement in safety implementation at the workplace. However, it still revolves around the same basics such as education, continuing training, use of PPE and so on [5]. The literature review conducted will focus on the ‘contributing factors' elements and the ‘effectiveness of systematic safety management’ implementation.

2.2.3 Current implementation

Information current implementation of safety management at the workplace in this organization should also be examined. Cross examination can help us to identify weaknesses or shortcomings that may exist. Without proper research, the implementation of safety management in an organization will certainly not be able to achieve what has been set whether the organization has ISO certification or otherwise. Preliminary approaches related to safety policies as embodied in legislation have an important role in risk assessment, communication, and OSH management in the workplace. It becomes a basic guideline for the implementation of safety in the workplace. Management factors are also affected by control methods that have implemented such as daily inspections, punishment, analysis and OSH culture that exists in the workplace. Implementation from various methods and angles of implementation will not create contradictions but it will help

each other in strengthening implementation [6]. Existing gaps are identified and it will also serve as a guide and reinforce to the available data. From there, information on the effectiveness of workplace safety implementation can be obtained. The Systematic implementation measures can be implemented to prevent and reduce accidents from the policy level will involving to education, continuous training, experience building and so on [7].

2.2.4. Accident investigation

Accident investigations can be done in a variety of ways. Information is obtained through existing data/current assessment and examination of the incident (accident), Identification is done covering various things such as activities performed, areas of responsibility, performance, reporting information/ records and so on [8]. Accidents do involve several factors, whether related to 'humans' or the workplace environment. These weaknesses create path gaps that eventually lead to the occurrence of accidents. The balance of the employee's personal characteristics and the demand of the job make the job a part of a healthy life. However, it may be affected due to physical or psychosocial factors that cannot meet the needs of the work involved [9].

Each method will provide facts that can help to improve but is it accurate and perfect or is only part of the information still hanging. Apart from current assessment information, data from other sources through location inspections or hazard observations through the sequence of the task (from the start process until the end) can contribute in supporting the facts of the incident [10].

Although the number of accidents can be reduced but the severity of an accident is individual in nature depends on the causes and factors that contribute to the accident [11]. Therefore, investigation of each accident is important to ensure that the improvements made are accurate with the cause of the incident. All research results that have been conducted were written in the research report. It consists of finding, recommendations on research results and conclusions. Every accident will generally be caused by unsafe act and unsafe condition. Unsafe act represents events that are directly related to humans and unsafe conditions are related to workplace conditions. Analysis of the causal factors of an accident is very important to be identified.

2.2.5 Assessment on contributing factor

The 'Human' factor should be seen more broadly and not just focused on unsafe acts committed by 'Human' alone. Demographics factors indirectly affect and contribute to accidents. This is because every human being has his or her own special characteristics and it varies from person to person. However, classification can be used to identify the contributing factors from a holistic angle and to represent specific groups. Various human factors that can contribute to accidents can be listed, however it depends on the data what we have. Among the factors that are the focus to identify accident factors can be made based on gender, knowledge, level of education, day off from work, work intensity and behaviors. However, better safety knowledge builds confidence and controls the situation so that safety can be improved [12].

We will get information on the positive relationship between the factors and the relationship based on several things such as knowledge, awareness, management systems, cooperation and support, policies, dangers and use of technology [13]. It should not be forgotten that attitudes and behaviors are part of the human self and they can contribute to accident factors. Cooperation between the occupants of the organization especially between lower employees and upper management needs to be evaluated. This culture will add value to the decrease in accident rates [14].

Both types of data (inspection and assessment) are part of the programs that are usually implemented in the organization. Cross examination of the accident data, hazard observation and assessment conducted will provide much needed information. The process of data analysis and mapping is a contributing factor showing the complex relationship between factors. This is because each factor will be interrelated, and these intersecting factors contribute to the occurrence of accidents [15]. Comprehensive management is required to ensure that the factors that exist do not intersect and subsequently accidents can be better overcome or controlled.

2.3 Implementation of Improvement

2.3.1 Improvement method

Various methods of improvement can be implemented to prevent accidents from recurring or reduce the effects of accidents should they occur. Several of the popular improvement methods have been implemented such as 6 Hierarchy of control (Elimination, Substitution, Isolation, Engineering Control, Administrative control, PPE), 4M1E (Man, Machine, Method, Material, Environmental) and so on. As the contributing factors are interrelated, success in the implementation of OSH in the organization requires the involvement and commitment of every level of implementers in the organization. Top management involvement is reinforcement to the direct impact of the success of the implementation performed [16].

The safety culture of a workplace does indeed contribute to the positive factors of OSH effectiveness in the workplace. Building a safety culture is not easy given that there are differences in acceptance among employees. The coordination and implementation of systematic management such as policies, structured procedures and practices that emphasize OSH in the workplace can be considered by employees as conducive to safety in the workplace. Subsequently, the culture can be formed and nurtured and enhanced.

2.3.2 Management system

An organization has an advantage in governance if it has various ISO certifications in the management system (quality / environment / safety / food safety / etc.) at their premises and is managed in an integrated manner [17]. This gives an advantage to the organization in the governance of their organization and if viewed from the workplace safety contact it certainly has a positive impact. One of the methods of continuous improvement that can be implemented in OSH management in the workplace is according to the Plan-Do-Check-Act (PDCA) method. This method is one of the basic elements in the ISO certification, so it can be used as a management framework and it is in line with other ISO certifications that may exist in the premises. Activities such as workplace inspections, employee involvement, corrective and preventive action to provide better protection to employees from hazards and mitigation programs are in line with the Plan-Do-Check-Act (PDCA) method [18]. Therefore, the synchronized of the management system is very helpful to the organization [19].

Safety in the workplace involves all processes within the premises whether in production operation, maintenance, supply change, administration or plant operation. Therefore, there should be an integrated method of implementation where it involves work systems, rules of procedure, leadership, communication, processes, competencies, technology, performance and so on [20]. Strengthening should be done in every division to ensure that the OSH in the organization is able to survive and remain relevant. The strengthening of OSH must be implemented by all parts of the organization and it must always move in line with others. Comprehensive integration (implemented

in the same framework) in the organization (system), ensuring it can be implemented successfully [21]. Therefore, safety in the workplace will not be implemented alone but it is involved inclusively in all activities.

The ability to obtain ISO certification in the workplace safety may be a constraint to some organizations especially for SME industries that have limited resources. Based on safety in every way or safety is compulsory as enshrined in legislation, the implementation of workplace safety should not be hindered due to limited resources on some of organizations to obtain ISO certification. It should have a systematic guideline and can be used by anyone to implement a good workplace safety, especially for organizations that have constraints to obtain ISO certification [22]. Proactive actions are required with implementation of OSH management as a reinforcement or addition to government regulations. It will create a positive impact on the whole of organization on the implementation of OSH in the workplace [23]. As the basis of implementation in ISO certification, the basis of PDCA method can be used for this purpose. It should be able to use this principle in implementing workplace safety for organizations that do not have ISO certification. The addition of certain elements according to the suitability of the organization may be necessary but more importantly the results will definitely have a positive impact on the organization [24]. Safety management in the workplace must be implemented inclusively. It should not move individually but it should be seen as a common element with any form of system management [25]. An organization that practices Total Quality Management strives to integrate Safety Management System into their system and in turn make it a Total Management System that will improve workplace safety [26]. This principle of adaptation is of added value in workplace safety management. This integrated system can provide benefits to management and business [27].

2.4 Research Method

2.4.1 Raw data

Initially, the accidents record will be analyzed to identify the root cause and underlying cause where it is a main source of data's. The data involved in relationship are (but not limited to) unsafe condition (machinery, material, tool, equipment, substance and environments), method implementation, human action/ behavior and human demographics (gender, designation level, age, work experience, gender, educational level, local workers/ foreign workers) and so on.

Research and analysis of data will be used to obtain the contributing factors to the occurrence of accidents and it is the primary data. Quantitative methods will be used in this study and analysis involving 6 years of accident data (2016 to 2021). ISO framework element is used as a reference to examine the implementation of current safety management program. Improvement Activities / CAPA (corrective action, preventive action) implemented will be coordinated with the ISO framework element. Each program will use the PDCA (Plan, Do, Check, Act) method. 41 accident cases recorded (between 6 years) will be used as the primary source. It is to look at the broader contributing factors that may exist and the improvements that can be made.

After data identification, an analysis of the factors contributing to the accident will be examined. In general, the data will be related to elements of unsafe condition, unsafe act and demographics of human that contribute directly or indirectly to the accident. These contributing factors become important indicators for identifying the actual elements that contribute to accidents. Each contributing factor will be considered as an 'individual factor' and each frequency recorded becomes a reflection of the severity that is the main contributor to the incident. The elements that will be examined from the 41 cases recorded are as unsafe condition, method, unsafe act and human demographic factor. These contributing factors will be thoroughly examined

with to identify the relationship between the factors. Due the constraints in time and information, the analysis will focus on factors related to 'Human'.

2.4.2 Current implementation

To be success implementation of OSH at the workplace depends on the skills and capabilities of the implementer/ safety practitioner such as the OSH committee or personnel OSH. Therefore, each organization has a different level of OSH implementation in the workplace. OSH programs that are implemented mostly are individually programs and some of implementations will have shortcomings in some areas and improvements should be made. As stated above, the ISO management framework will be used as a reference to recommend safety and health management system guidelines in this organization. The use of the ISO management framework as a reference coincides with the effectiveness of this framework where it is already widely used in other organizations.

Next, a review of the current implementation will be made. It will involve information from location inspections / hazard observations, review assessments and safety programs that have been implemented. Cross -examination will find meeting points (intersection) and identify weaknesses or shortcomings that exist. Once weaknesses are identified, improvements will be made to those weaknesses.

2.4.3 Data analysis

A descriptive statistical analysis to determine graphs, charts, modes, means, medians, variances, ranges, and standard deviations, as well as correlation coefficients. Rules related to statistical analysis will use correlation test table by Chua (2014) as shown in Table 1 to analysis the correlation between data [28]. In addition, normality test is also conducted to determine the distribution of data whether normally distributed ($p > 0.05$) or not to use Parametric data analysis or non-parametric data analysis and the use of Pearson correlation or Spearman's rho methods and so on. Assessment analysis was made using SPSS analysis system.

The analysis used Kruskal Wallis H which is a 'Non-Parametric Test' because the data obtained are abnormal data. The principal method of this is H0 (H null) stated 'No significant difference in Dependent Variable (DV) data'. From that we will obtain information whether the data we test is accepted as 'No significant difference' or there is 'a significant difference' between the data. The information that will use this analysis consists of 'demographic factor' data which is abnormal data. This identification method is used to find relationship based on independent variables and dependent variables [29].

Table 1
Correlation test table

Correlation Coefficient, r	Correlation strength, relationship	Colour reference
±0.91 to ± 1.0	Very strong	
±0.71 to ± 0.9	Strong	
±0.51 to ± 0.7	Moderate	
±0.31 to ± 0.5	Weak	
±0.1 to ± 0.3	Very weak	
0	No correlation	

2.4.4 OSH Program

To ensure the implementation of OSH programs in the organization is implemented optimally, guidelines need to be drafted as a reference for OSH practitioners. An organization without certification on ISO in OSH Management System is highly dependent on skills and experience. The guidelines created will make the implementation of OSH inside the organization can be optimized. To create guidelines for OSH implementation that can optimize the implementation of OSH and further decrease the accidents, research on the 3 basic elements of OSH in the workplace and streamlined with accident statistical analysis such as data analysis mentioned in the previous subchapter will be done. These 3 basic elements are ISO high level structure framework (Plan-Do-Check-Act), legal requirement (Occupational Safety Health Act 1994, Factory Machinery Act 1967, Uniform Building By Law 1984 and etc.) and current OSH implementation inside the organization. From these three things we will examine the 'Intersection' that exists as a main activity must be implemented in an organization. Emphasis will be given to program which compulsory need to be implemented in the organization. For example, the implementation of programs related to the erection of scaffolding (temporary structure) is not something that is a major program in an organization such as a manufacturing plant but is one of the major programs that need to be implemented for a construction site. So the implementation hierarchy can be done more systematically [30].

3. Results

3.1 Accident Data

From 41 accident cases recorded, we obtain demographic data (age, experience, gender, citizenship, and education level), human behavior (unsafe act) and unsafe condition (condition of machine, substance or material, work environment, media). The combination of these conditions and factors is the cause of accidents at work area. As stated before, we will focus on human-related contributing factors [31]. From the above information, 2 types of factors related to human beings are demographic factor and human behaviour factor (Unsafe act) [32].

This section discusses the results obtained from the surface pressure measurement study. The effects of angle of attack, Reynolds number and leading edge bluntness are discussed in the next sub section.

3.1.1 Demographics information data

In this study, the demographic information of the data from each case is highly emphasized as it is 'Human Factor' related information. The data obtained from the accident case information are gender, citizenship, designation, education level, employment status, age and experience.

39 cases (95.1%) involved male workers and only 2 cases (4.9%) involved female workers. This is because the company consists of more than 80% male employees compared to women. Most male workers are field workers who are more vulnerable to more dangerous situations compared to females who are more involved in office work and documentation.

The citizenship of workers involved in accidents is from local workers as well as foreign workers too. From the 41 accident cases, more than 70% of the cases occurred to local workers (f = 29; %= 70.7%) and the rest were from foreign workers with 12 cases (29.3%). Non-executive employees accounted for a large number of accidents with 37 cases (90.2%) and the rest were contributed by

the executive level with 4 cases (9. 8%). Of these accident cases, it was also found that 37 accident cases (90.2%) involved company employees and 4 cases (9.8%) involved contract employees and lorry drivers.

In terms of academic qualifications, there were 12 cases (29.3%) whose academic level could not be matched with the academic level in Malaysia because it was obtained from foreign workers. However, in general, foreign workers who work in Malaysia are composed of those who have only basic education in their country. While the remaining statistic of 70.7% are local workers with 26 cases (63.4%) secondary school and below, 2 cases (4.9%) have education up to diploma level and only 1 case (2.4%) accident involving local workers with bachelor's degree and above.

Statistics related to 'Age of employees' and 'Work experience at incident area' were divided into 3 groups because the amount of data was small. Age of employees is divided into groups with employees less than 35 years old (≤ 35 years old), employees aged between 35 years to 50 years and employees older than 50 years (≥ 50 years old). From the findings of the data shows that employees involved in accidents aged less than 35 years old (≤ 35 years old) have contributed 21 cases of accidents (51.2%) out of 41 cases recorded over 6 years. While those aged over 50 years (≥ 50 years old) contributed a total of 11 cases (26.8%) and from employees aged from 35 - 50 years old contributed a total of 9 cases (22.0%).

The experience at incident area is divided into three groups which are workers with less than 10 years (<10 years), 10 to 20 years and more than 20 years (> 20 years). The data stated that the main contributors of accidents at work were from workers with less than 10 years of experience of 28 cases (68.3%) followed by workers with more than 20 years of experience with 10 cases (24.4%). While employees with work experience between 10 to 20 years have contributed 3 cases (7.3%) of accidents at work.

3.1.2 Human behaviour data

The next factor that contributes to accidents at work is human behaviour (unsafe act). It is also a factor that can be attributed to humans. From the 41 accident cases recorded those 11 cases (% = 26.8) accidents that occurred did not involve 'contributing factors' from human behaviour (unsafe act) by employee. While the remaining 30 cases (73.2%) showed that unsafe act involvement with 24 cases with 1 'action' by employee, 5 cases involving 2 'actions' and 1 case involving 3 'actions' from employee.

From 30 cases related to human behaviour (with at least 1 'action') recorded a total of 37 'actions' were performed by the employees where 10.8% of actions were performed in 2016, 2017 and 2021. 13.5% actions were recorded in 2020, 21.7% in 2018 and 32.4% action in 2019. If the assessment is based on 'actions' then there are 37 'actions' that have been performed.

The information below displays a statistical record on 37 actions of human behaviour (unsafe act) from the accident. Research on contributing factors of human behaviour related to age of employee showed 22 actions (60%) performed by workers less than 35 years old (≤35years old). It is followed by employees aged between 35 years to 50 years with 9 actions (24%) and 6 actions (16%) from employees aged over 50 years (≥50 years old). While from the bar chart shows that every year employees who are less than 35 years old (≤35years old) are always been a contributing factor (human behaviour) to accidents.

Research on the contribution factors from human behaviour at 'experience factor' shown that employees with less than 10 years of experience (<10 years) have always been an annual contributor to accident cases. Overall, the data showed that employees with less than 10 years of experience (<10 years) contributed 68% of the accident factor, 25% of contributors were from

employees with more than 20 years of experience (>20 years) and 7% of contributors from employees had between 10 and 20 years of experience. If referring 'gender factor' shown that most of the employees in this organization are men, so most men are contributors to accidents. For 6 years, the data showed that 4 actions (11%) actions were contributed by female employees. We also found that 65% of the action was contributed by local workers and the remaining 35% was contributed by foreign workers.

3.1.3 Type of accident cases

There 7 types of accidents were recorded over the 6 years of observation. This recorded 'type of accident' is an accident that may have occurred in other organizations that also process oil palm - based products. The types of accidents are like 'Burn with chemical', fire, steam, hot water, hot pipe, hot oils', 'Hit by heavy item', 'Hit by movement equipment, tool or vehicle', 'Scratches by protruding item', 'Slip and fall at the difference level', 'Slip and fall at the same level' and 'Stuck between 2 metals'.

Analysis of the data found that accidents involving 'Burn with chemical, fire, steam, hot water, hot pipe, and hot oils' were the largest contributor at 36.6%. This situation shown that workers exposed to combustible elements are at higher risk of being involved in accidents. It is followed by 'Slip and fall at the difference level' with 9 cases (22.0%), 'Slip and fall at the same level' with 5 cases (12.2%), 'Scratches by protruding item' with 4 cases (9.7%), 'Hit by heavy item' with 2 cases (4.9%) and 'Hit by movement equipment, tool, or vehicle with 1 case (2.4%).

3.1.4 Location of accident

Analysis of accident data shows that there are 6 areas where accidents occur. It is the main area that exists in the premises and is an area that has activities by employees. The area is at 'Plant area', 'Tank Farm' area, 'Packing area', 'Office building' area, 'Opening area near plant' and 'Warehouse' area. From the accident data found that 'Plant area' contribute for 44.0% of the accident statistic, 'Packing area' & 'Office building' each contributed 14.6%, 'Opening area near plant' & 'Warehouse' contribute for 9.7% accidents and the lastly at 'Tank Farm' area contribute 7.4%.

3.2 Data Analysis

Various analysis and tests of the data will be performed. Among the analysis and tests performed is descriptive analysis, normality test, correlation coefficient test (correlation between variables) and scatter plot (distribution of data between 2 variables) and do Kruskal Wallis H Test (for abnormal distribution of data). This test is done to see the relationship between the data obtained and the possibility of its contribution to accidents in the organization.

3.2.1 Normality test

The 'Normality Test' to determine whether this data is normally distributed data or abnormally distributed data. It is necessary before further analysis can be done to ensure that the method used is appropriate. If $P<0.05$ was determine that the data is abnormally distribution data or non-parametric data and $P>0.05$ was determine that the data is normally distribution data.

The test results conducted through SPSS system found that 'Age' has a data reading of 0.076 and this shows that it is normally distributed where p> 0.05. For other variables, readings of P <0.05 were recorded indicating other variables consisted of abnormal distribution data or non - parametric data. The reading is for variable gender (male & female), citizen (local workers & foreign workers), designation (non-executive & executive), education level (unspecified, secondary school, diploma-certificate & bachelor's degree & above), experience (> 10 years, 10 to 20 years & above 20 years), employment (own employee & others) and human behaviour (unsafe act).

3.2.2 Descriptive analysis

Analysis through 'Descriptive Analysis' was conducted to obtain information on mean, median, mode, range, variance, standard deviation, histogram and correlation coefficient. It is conducted on variables related to gender, citizen, designation, and education level, age of employee, experience and experience. The relevant information will be used for further analysis which will be implemented later. What is important is to look at data relevance as a contributing factor to accidents.

Table 2
Descriptive analysis of mean, median, mode, and standard deviation

	Gender	Citizen	Designation	Education	Age	Experience	Human Behaviour
N valid	41	41	41	41	41	41	41
Mean	1.05	1.29	1.10	1.83	37.767	10.1734	0.9024
Median	1.00	1.00	1.00	2.00	34.420	2.2500	1.0000
Mode	1	1	1	2	18.0	0.17	1.00
Std Deviation	0.218	0.461	0.300	0.667	14.182	13.3598	0.70017
Variance	0.048	0.212	0.090	0.445	200.130	178.486	0.490
Minimum	1	1	1	1	18.0	0.00	0.00
Maximum	2	2	2	4	67.2	40.66	3.00
Sum	43	53	45	75	1548.4	417.11	37.00

3.2.3 Correlation analysis

Further analysis related to Correlation Coefficients has been performed. It looks at the extent to which 2 variables move in alignment with each other. This analysis identifies whether it is moving in the same direction (positive) or moving in a different direction (negative). Correlation Coefficients will record readings between '0' to '1' where '0' is 'No Correlation' and '1' is 'Very Strong' correlation. These Correlation Coefficients are applied to 'Gender', 'Citizen', 'Designation', Education level', 'Age of employee', 'Experience at incident area', 'Employment 'and 'Human Behavior'.

Evaluation of the strength of the relationship between variables through correlation coefficients will use the Chua 2014 table. This table states that '0' means no correlation, '± 0.1 to ± 0.3' has 'Very Weak' correlations, '± 0.31 to ± 0.5' indicates 'Weak' correlations, Readings between '± 0.51 to ± 0.7' are 'Moderate' correlations, '± 0.71 to ± 0.9' are 'Strong' correlations and readings of '± 0.91 to ± 1.0' are 'Very Strong' correlations. From there we will know the strength of the relationship between the variables. The use of colour is to represent the strength of 'Relationship' as a guide like table 1 above.

From the analysis of Correlations Coefficient found that most of the variables show correlations coefficient that is 'Very Weak' between them (± 0.1 to ± 0.3). However, no reading of '0' (No correlations) was recorded.

The table recorded that there are 3 variables have 'Weak Correlations' (± 0.31 to ± 0.5) involving the variable' Citizen '(local workers & Foreign workers) with' 'Age of employee' (-0.317), 'Citizen' with 'Experience at accident' area '(-0.390) and' Gender 'with' Employment '(+0.371). Furthermore, the Correlations Coefficient between 'Age of employee' and 'Experience at accident area' recorded 'Moderate' correlations with a reading of 'positive' (+0.691'). Although from this analysis does not show a high reading / Strong Correlations, but it shows that senior workers (older age) will be more experienced with their duties at that workplace and the data shown that more experienced workers contribute less as an accident factor.

Data research using Scatter Plot of correlation has been done. From the raw data, it is found that the correlation between 'Experiences at accident area' with 'Age of employee' can be carried out. From the analysis conducted the R^2 Linear reading displays 0.569. This shows that there are positive correlations between the two variables but it is just a 'Moderate' relationship as shown in figure 1.

Table 3
Correlations table

Spearman's rho (Nonparametric correlation)		Gender	Citizen	Designation	Education	Age	Experience	Employment	Human Behaviour
N		41	41	41	41	41	41	41	41
Gender	Correlation coefficient	1	-0.146	-0.074	0.089	-0.287	-0.153	0.371	0.244
	Sig. (2-tailed)		0.363	0.644	0.582	0.069	0.339	0.017	0.124
Citizen	Correlation coefficient		1	-0.212	-0.911	-0.317	-0.390	-0.181	0.198
	Sig. (2-tailed)			0.184	0	0.043	0.012	0.258	0.215
Designation	Correlation coefficient			1	0.257	0.236	0.160	-0.092	0.079
	Sig. (2-tailed)				0.105	0.137	0.318	0.566	0.625
Education	Correlation coefficient				1	0.199	0.274	0.110	-0.139
	Sig. (2-tailed)					0.212	0.083	0.494	0.386
Age	Correlation coefficient					1	0.691	0.040	-0.211
	Sig. (2-tailed)						0	0.806	0.186
Experience	Correlation coefficient						1	-0.234	-0.271
	Sig. (2-tailed)							0.142	0.087
Employment	Correlation coefficient							1	-0.09
	Sig. (2-tailed)								0.577
Human behaviour	Correlation coefficient								1
	Sig. (2-tailed)								

Previous data analysis showed that out of 41 accident cases, it was found that only 30 cases had the human behaviour factor (Unsafe act). Scatter Plot analysis of the 30 cases can be done for the

variable 'Age of employees' with 'Experience at accident area'. The analysis conducted showed that the R^2 Linear reading displayed 0.482 with positive correlations between the two variables. It is slightly lower than the R^2 Linear reading for total actual cases (41 cases) but still shows correlations between the two variables as shown in figure 2.

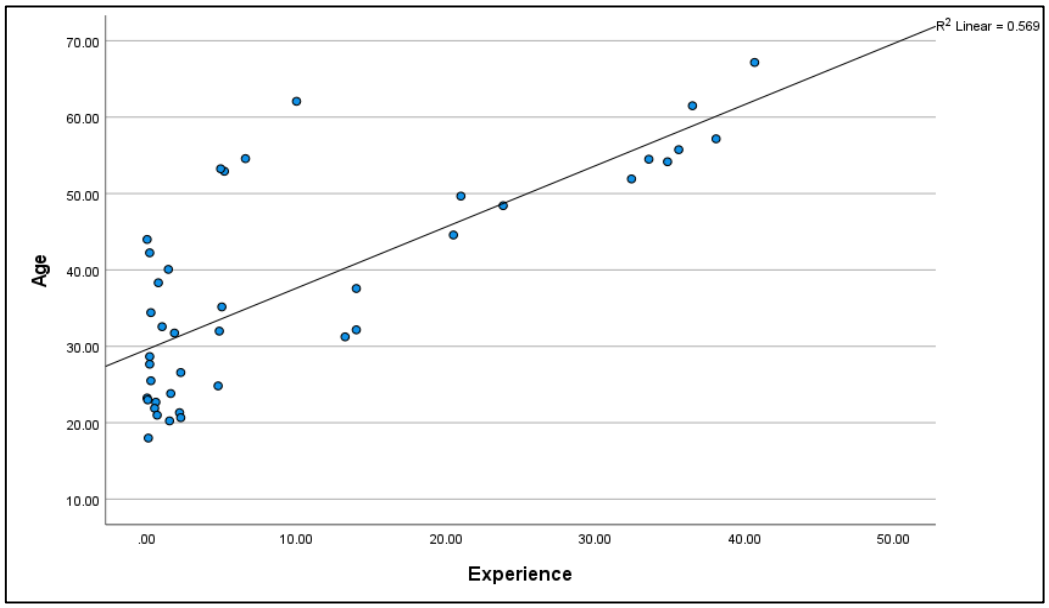

Fig. 1. Scatter Plot of Correlation between 'Experience at incident area' and 'Age of employee' for Demographic Factor

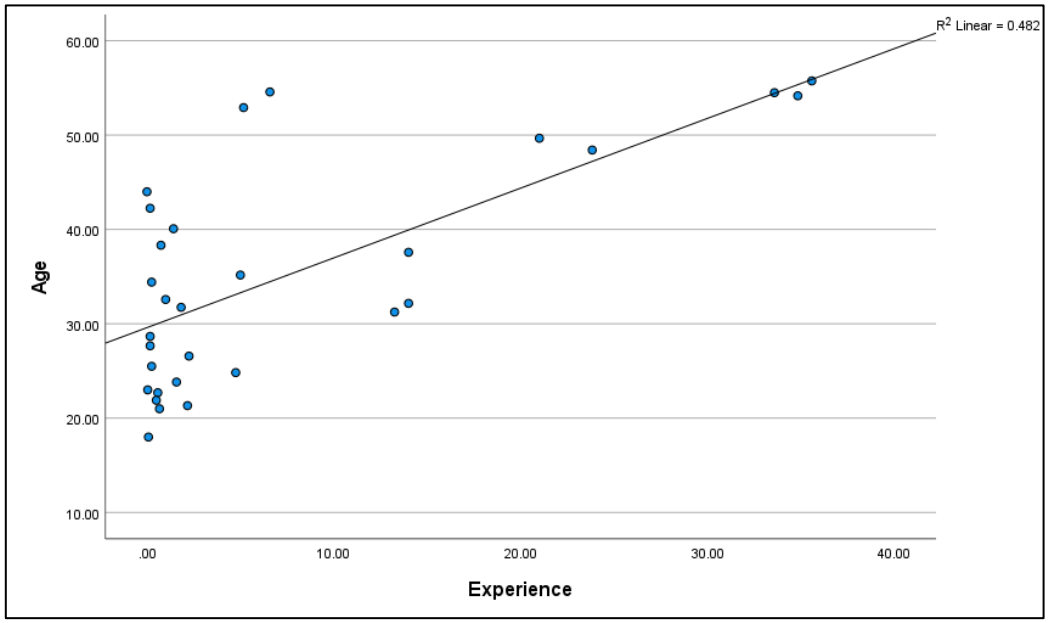

Fig. 2. Scatter Plot of Correlation between 'Experience at incident area' and 'Age of employee' related to Human Behaviour contribution

Although R^2 displays the readings are not very significant but there is no denying the relationship between Experience and Age of employee.

3.3 High Level Structure

PDCA (Plan-Do-Check-Act) uses a High-Level Structure methodology where each element has specific activities and programs to implement. These activities and programs are organized systematically so that no activities and programs are left behind [33]. High level structure is able to increase the effectiveness of program implementation and quality OSH Management in the workplace [34]. For this case, the activities and programs are as in the table 4.

Table 4
PDCA guideline, activities, and element

PDCA	Guideline	Activities and element
Plan	Context of organization, expectation, interested parties, scope system Leadership, Commitment, Policy, roles, responsibility, and authorities Planning, Objective, achievement, risks and opportunities Support, resources, competence, awareness, communication, and documented information.	Documentation, Initial assessment, stated the scope. Committee, meeting, discussion, site organization. Assessment, HIRARC, JHA, Register and summary. Training, dissemination of information, communication.
Do	Operational, control and emergency preparedness	Onsite implementation, maintaining, servicing, production, process flow, Emergency response
Check	Evaluation, monitoring, analysis, measurement, inspection, audit and management review.	Inspection, monitoring, analysis, Assessment, Investigation, program review
Act	Improvement, corrective action and continual improvement	Corrective action, preventive action, continual improvement

3.4 Legal Requirement Implementation inside the Organization

Organization is an oil palm-based manufacturing plant. There are some OSH legislations that need to be implemented in the organization and there are also some that do not need to be implemented because there are no related activities on the premises. In this study, further study of legislation is focused on 2 types of OSH legislation that Occupational Safety and Health Act (OSHA) 1994 & Factory and machinery Act (FMA) 1967 which are the main legislation related to OSH in a workplace. The identification of legislation that needs to be implemented in the organization is necessary to optimize implementation.

3.5 Current OSH Program

Backing up the program to the management system does not cause conflict and confusion because the official Management System has implemented a 'High Level Structure' and it has been integrated. Therefore, it can be implemented in parallel with other ISO Management System such as ISO 9001, ISO22000 and so on. OSH activities that need to be implemented to ensure the success of OSH in the workplace including OSH documentation, OSH training, competency & awareness, OSH Information, communication from top until lower level, implementation at site & physical, emergency & contingency program, monitoring, site inspection, audit, investigation, and continual improvement that able to be implemented.

From the programs and activities implemented, there is direct and indirect human involvement. Human involvement for each activity and program to be consider human-related factors in each implementation.

4. Conclusions

The implementation of OSH Management in Malaysia emphasizes on 6 hierarchies of control (Elimination, Substitution, Isolation, Engineering Control, Administrative Control & Personal Protective Equipment (PPE)) to ensure that OSH improvements can be implemented in the organization. However, the contributing factors are seen as an overall only without emphasis on any type of factor.

The analysis found that the accident consists of several main factors such as Demographic factor, Unsafe act (Human behaviour), Method of implementation, Machine condition, Material used for the process and environment at the work area. Therefore, contributing factors can be placed in 2 main groups that factors related to 'Human' and 'Others' factors that do not involve 'Human' directly. 'Human' contributing factor can be categorizing into demographic factor and human behavior factors. Of the 41 cases recorded, there were only 30 cases that had human behaviour (unsafe act) causing an accident. While 10 other cases have no source of contribution from human behaviour.

Although the results of the analysis through Correlation Analysis did not show a significant reading like 'R^2 Linear', it still showed that there was a relationship between the data. This may be because we only had 41 cases of raw data for a period of 6 years. If the amount of data can be increased, the analysis result will more accurate. To ensure the data is original and accurate, data can be obtained from other factories consisting of the same company characteristics.

Demographic factors are examined through several things such as age, gender, citizen, employment, experience, education level, designation. It is generally found that younger workers contribute to the accident factor, Employees who have more experience, contribute less to the accident factor. Employees with lower levels of education contribute more accident factors when compared to those with higher levels of education. The analysis also found that when the age of workers increases, the working experience also increases (especially to senior/ older employees) and more experienced workers contributing less to accidents cases [35]. Although statistically it is not very significant/high contribution (correlation) but it still can provide additional input on the implementation of OSH Management inside the organization. In Malaysia, there are specific laws for the implementation of OSH in the workplace. It is made part of the guideline that will be introduced.

The implementation of High-Level Structure in ISO 45001 is also examined [36]. It is used as the main framework to produce guidelines. The research is focused on the implementation through the P-D-C-A used [37]. Generally, the guidelines can be implemented as in the table below. Key points are stated inside the table before the actual implementation is implemented in the workplace.

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