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UNIVERSITI TEKNOLOGI PETRONAS

CLUSTERING SAFETY KNOWLEDGE WORKERS AND AUTOMATION OF INCIDENT REPORTING IN MALAYSIA

by

IBRAHEEM MUHAMMAD DOOBA

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CLUSTERING SAFETY KNOWLEDGE WORKERS AND AUTOMATION OF INCIDENT REPORTING IN MALAYSIA

by

IBRAHEEM MUHAMMAD DOOBA

A Thesis

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BANDAR SERI ISKANDAR,

PERAK

SEPTEMBER 2013

DECLARATION OF THESIS

Title of thesis	CLUSTERING SAFETY KNOWLEDGE WORKERS AND AUTOMATION OF INCIDENT REPORTING IN MALAYSIA

I _____ IBRAHEEM M. DOOBA _____

hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTP or other institutions.

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DEDICATION

I dedicate this thesis to my parents; my wife, Hadizah; my son, Kalim; my Palestinian friend, Riyad Salim Issa; and Uncle Musa Bukar Sani who are and always will be such an important part of my life.

ACKNOWLEDGEMENTS

Friends and colleagues often ask me why I wanted to pursue a PhD. I tell them that it has been my goal since I was a child. It may sound silly, given that a PhD is not even a job title, but for some reason, this was always my dream. When I finally had the chance to follow this dream, it was not an easy ride. There were many hurdles and much stress along the way. However, not for a moment did I entertain the thought of relinquishing my goal or forgetting why I was undertaking the degree in the first place. I have always believed that through earning a PhD I would be able to make my own small contribution to society.

To me, the importance of safety goes beyond the functions that shape, create and operate in the environment. Safety is also about how we understand the differences of ideas. Therefore, when there are ideas that can save the lives of individuals or society at large, incident reporting of safety issues can be used to facilitate the diffusion of these ideas. This thinking has been reflected in my thesis title, extraction-of-safety-knowledge.

I would like to thank my university, the Universiti Teknologi Petronas for their generosity in supporting me throughout my PhD journey.

Foremost, I would like to thank my supervisors Associate Professor Ahmad Kamil Mahmood, Dr. Jafreezal Jaafar and Dr. Alan G. Downe (who started with me) for believing in me, and for sharing your scholarly thoughts and life experience to nurse me and inspire me. I would also like to thank Assoc. Dr. P.D. Dominic, Dr. Suziah, Dr. Nordin, Dr. Low, Prof. Alan Oxley and Assoc. Prof. Mohd Fadzil Hassan (Dean of CGS) for their sound guidance along my PhD journey.

ABSTRACT

In spite of efforts by organizations to maintain safe working environments, occupational hazards abound: lives get maimed and lost regularly. However, research has linked incident reporting with a decrease in such unfavourable safety outcomes. Yet, there are many incident reporting procedures, and the literature is silent on which procedure is linked with more favourable safety outcomes. Further, literature has also claimed that there is safety knowledge embedded in the persons and artifacts - including incident reports - of an organization, yet there is paucity of research on how safety knowledge flows from incident reports. Therefore, it was the aim of this study to explore safety knowledge from incident reporting processes, to generate a taxonomy of incident procedures and to determine the automation of incident reporting process. A mixed-method sequential approach integrating a qualitative approach and survey method of quantitative approach was adopted. Data were collected using a semi-structured interview technique which coalesced 'why why' prompt of inquiry, grammar-targeted interview and storytelling. The collected data were charted using a systematic charting technique. The two-step clustering technique was used to determine the classes of different incident reporting procedures and which of them performed better than others on safety outcome. Results show four basic components and five safety knowledge carriers necessary for safety knowledge to flow from incident reports. Also, three classes of incident reporting procedures were generated and results show that cluster 3 named "Type Inclusive" by this study, performed better than others on safety outcome. An algorithm based on Type Inclusive was generated and an application to automate the incident reporting procedure was designed.

ABSTRAK

Di sebalik usaha oleh organisasi untuk mengekalkan persekitaran kerja yang selamat, bahaya pekerjaan melimpah ruah: kehidupan mendapat dikudungkan dan hilang secara berkala. Walau bagaimanapun, penyelidikan telah dikaitkan laporan kejadian dengan penurunan dalam hasil keselamatan seperti tidak menguntungkan. Namun, terdapat banyak prosedur pelaporan kejadian, dan kesusasteraan adalah senyap di mana prosedur menggunakan amalan terbaik atau dikaitkan dengan hasil keselamatan yang lebih baik. Selain itu, sastera juga telah mendakwa bahawa ada tertanam dalam pengetahuan keselamatan orang dan artifak - termasuk laporan kejadian - organisasi, namun terdapat kekurangan penyelidikan mengenai bagaimana pengetahuan keselamatan diekstrak daripada laporan kejadian. Oleh itu, ia adalah matlamat kajian ini untuk menjawab lima persoalan kajian: 1. Bagaimana pengetahuan keselamatan diekstrak daripada proses pelaporan kejadian? 2. Apakah taxons (kelas) iaitu jenis proses pelaporan insiden di Malaysia? 3. Apakah yang sedang proses pelaporan insiden yang terbaik daripada kelas yang mungkin membuahkan dalam persoalan kajian kedua? 4. Bagaimana algoritma boleh direka berdasarkan laporan kejadian terbaik proses yang soalan ketiga dijana? 5. Bagaimana permohonan boleh dihasilkan berdasarkan keputusan empat soalan untuk mengautomasikan proses pelaporan insiden di Malaysia? Untuk menjawab soalan-soalan ini, pendekatan yang bercampur-kaedah berurutan mengintegrasikan tradisi kajian kes pendekatan kualitatif dan kaedah kajian kuantitatif telah diterima pakai. Data telah dikumpulkan menggunakan teknik separa berstruktur yang coalesced 'mengapa mengapa' segera siasatan, tatabahasa advertising temuduga dan bercerita. Data yang dikumpul telah mencatatkan menggunakan teknik charting sistematik.

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CHAPTER 1

INTRODUCTION

1.1 Chapter Overview

The main purpose of this chapter is to introduce the work produced in this thesis about incident reporting process and classification in Malaysia and the resulting algorithm designed to automate the process. It synthesizes the main topics of the research which are elaborated in their designated chapters; such as the research background, scope, objectives, questions, significance, methodology and implications. It concludes with an overview of the content of this dissertation in the thesis outline section.

1.2 Background to the Research Problem: a sad Story

Haslinda Noordin struggled to hold back her tears and control her sadness on the second day of the Universiti Utara Malaysia 25th Convocation in 2012. She was there to collect the scroll of her youngest sister who died a week before the convocation. Nurul Akma died due to injuries sustained from a workplace accident in Kuala Lumpur.

The hall fell silent as Haslinda walked on stage. All the graduates and their families shared her sadness [1].

"*I nearly lost it*," Haslinda said.

"*It made me so sad thinking how happy my sister would be when I was about to walk on the stage. She was excited about her graduation day and had endlessly talked about it, but now she is gone*," said the sister.

According to New Straits Times [1] Nurul Akma before her death graduated with a Bachelor in Information Technology Management with CGPA of 3.65.

She sustained serious head traumas when she slipped in the toilet facility at her workplace. She lapsed into a three-day coma before she succumbed to her injuries. She was declared dead at the University Malaya Medical Centre in Kuala Lumpur.

Her father, Noordin Tompang, 56, said the family had accepted the incident as fate.

"*We truly missed her*," the father Noordin Tompang said. "I hope by coming here and accepting the scroll, it could console us."[1]

Incidents like this happen all the time all over the world. Incidents in the workplace are almost inevitable. However, since research has shown that incident reporting is positively correlated with safety outcome, there are some steps we can take to minimize such incidents.

Therefore, the significant question is, how do we minimize incidents in the workplace and perchance save lives such as Nurul Akma's? That is what this thesis sets out to partly answer.

1.3 Requirement of Report and Theoretical Framework

In the instance of a staff incident, accident or perhaps direct exposure, the actual injured or exposed persons or their supervisors have to fill out as well as submit an incident report, in most places. Additionally, the victim or the supervisors have to adhere to federal and state incident reporting specifications, which include timely submission of the form. This process allows Environmental Health and Safety (HSE) department, regulators, and sometimes manufacturers to be able to execute comprehensive incident investigations in order to remedy occupational hazards.

However, although an accident and the resulting incident report have the capacity to immediately call attention of stakeholders, including regulating agencies to safety issues, and provide immediate access to contextualized safety knowledge, extant literature is to some extent silent on how safety knowledge is extracted from incident reports. Little is also known about how incident reporting relates to safety outcome. Furthermore, the electronic systems of incident reporting emanate from deficient methodologies because they overlook the interrelationships between incident reporting and safety outcomes and most importantly, do not utilize sufficient case studies to sieve out the best practices in the industry before generating such systems. Actually, the understanding of how safety reports lead to the improvement of work-related safety and the theorization of organizational safety has become one of the most daunting issues in safety knowledge research [2].

Interestingly, the success of safety programmes is dependent upon employees' willingness to adopt safety procedures and report incidents [2]. Nevertheless, several organizations and safety systems globally continue to encounter the problem of how to utilize such reports as safety knowledge in order to remedy organizational safety challenges [3-6].

Further, the transfer of safety knowledge from employees' documentation of incidents is situated in a tense, social-political atmosphere. Consequently, it should be thoroughly tackled not just through technological aspects, but additionally from safety climate, safety knowledge transfer and safety outcomes. Without understanding the aforementioned key concepts, it will be difficult to fashion effective incident reporting systems [2]. Nonetheless, much of our understanding of the flow of safety knowledge from incident report is lacking for the moment and is inadequate as a result of the following reasons:

a. While organizational safety knowledge continues to be extensively researched in contexts such as the transfer of safety knowledge from research publications [7], comparatively only a few studies have focused entirely on safety knowledge flow from incident reports [2].

b. There is an insufficient empirical investigation which views incident reports as ready source of safety knowledge [8].

Therefore, significantly more empirical research is needed in the area of knowledge creation from incident documentation to assist government authorities and organizations in their understanding of the issues concerning incident reporting interrelationships with safety outcomes. Moreover, a thorough overview of incident reporting and safety outcomes research and incident reporting applications shows that a substantial area of the available research had been carried out in developed countries.

Consequently, little is revealed about incident reporting in developing countries. This research gap is particularly evident in Malaysia [9]. As a result, the main purpose of this research is to fill this research gap in the extant literature by conducting empirical field study on how organizations derived safety knowledge from incidents in the developing world, specifically Malaysia; and in doing that, generate rules towards incident reporting automation system. Grounded in Nonaka (SECI) model, this research advances a conceptual model by utilizing the SECI to view safety knowledge interaction in organizations, and integrate safety outcome variables derived from different extant literature.

1.4 Statement of Problem

As important as incident reports are, research on how safety knowledge transfer through incident reporting is scant. But less available are studies which build software applications to automate incident reporting based on comparing large case studies of incident reporting processes in many organizations and determining the link between the process and safety outcomes.

This study (using the rules derived from the clustering cases revealed by the best practices in the industry) designed an incident reporting system that can be used from multiple platforms including desktop and mobile devices.

1.5 Research Questions

Mixed-method research comes with challenges in writing research questions [10], this is because of the combination of two approaches namely qualitative and quantitative, and the fact that there is little literature to address this problem [10]. However, this thesis follows the Creswell Guideline [10] of writing research questions and hypotheses. Since this study starts with a qualitative approach, qualitative questions are asked first. According [10], "*inquirers state research questions not objectives (i.e., specific goals for the research) or hypotheses (i.e., predictions that involve variables and statistical tests).*" Creswell also suggests that qualitative research questions follow the structure of "what" and "how" questions instead of "why" questions which are consistent with quantitative approach because they suggest cause and effect.

This research aims to address the following five questions:

1. How is safety knowledge elicited from incident reporting process in Malaysia?
2. What are the taxons (groups) i.e. different types of incident reporting processes in Malaysia?
3. What is the incident reporting process with the most favourable safety outcome out of the possible classes yielded in the second research question?
4. How can an algorithm be designed based on the safety outcome favourable incident reporting process which the third question yielded?
5. How an application can be produced based on the results of question four to automate incident reporting process in Malaysia?

1.6 Research Objectives

Following are the objectives of the study:

1. To explore the movement of safety knowledge through incident reporting in the organizations.

2. To cluster knowledge workers and their various incident reporting processes to determine how they group together.

3. To determine the cluster that favours positive safety outcomes.

4. To design an algorithm towards the automation of some aspects of incident reporting.

5. To design an application prototype to automate the incident reporting process – while taking the literature and the findings of this study into consideration.

1.7 Scope of the Study

The focus of this study is two-pronged. First, the study endeavours to fill the gap in the literature concerning a coherent flow of safety knowledge from incident reports. These questions are asked: what do organizations do with incident reports and how does safety knowledge emanate from them? In doing this, the study is guided by the worldview (systems thinking) that serves as a conceptual perspective for thought process that searches to assimilate diverse views in scientific disciplines. This can be different from the actual conventional methodical approach to thought process, which attempts to fragment or take apart the system into categories so as to analyze the way the several components operate. [11] commonly acknowledged as the father of the General Systems Theory, describes it thus: "It is necessary to study not only part and processes in isolation, but also to solve the decisive problems found in the organization and order unifying them, resulting from dynamic interaction of parts, and making the behavior of parts different when studied in isolation or within the whole" [11] (p. 31).

Further, in answering the question how does knowledge transfer from incident reports in organizations, the study sees and operationalized knowledge transfer through Nonaka's Socialization, Externalization, Combination, Internalization (SECI) prism [12, 13].

SECI is a practicable and rigorous view to approaching the ways knowledge is created, transmitted and shared in organizations [14, 15]. The model addresses the following: two kinds of knowledge (tacit and explicit), interaction dynamic (transfer), three levels of aggregation (individual, group, context), and four knowledge-generating processes namely, socialization, externalization, combination and internalization [12, 13].

Nonaka proposes that a knowledge-creating company should actively ease the interaction of tacit and explicit types of knowledge within the organization. Organizations can achieve this via the existing organizational culture, systems and structures. These structures help the interplay of the four knowledge creating processes revolving in a spiral. The following are the four knowledge-creating processes.

Firstly, there is socialization, sharing of tacit knowledge among individuals in close physical contact via joint activities. The second process is externalization, formulation of tacit knowledge in publicly understandable forms. Next is combination, the transformation of explicit knowledge into complex forms of explicit representation. This involves communicating, disseminating, and systematizing the explicit knowledge. Finally, there is internalization, the transformation of explicit knowledge into tacit knowledge either on an individual or organizational level.

Critical in SECI model is the notion that the spiral that results from the interplay of tacit and explicit knowledge is crucial to knowledge creation and recreation. He suggests that organizations should acknowledge the significance of this dynamic interaction and institute the frameworks that will make such possible.

Accordingly, this study conceptualizes that the incident reporting process in organizations follows the four knowledge creating process of SECI model. Firstly, socialization takes place when there is an incident or a near-miss i.e. sharing of tacit knowledge among individuals in close physical contact via joint activities. The second process of externalization (formulation of tacit knowledge in publicly understandable forms) takes place when the HSE sends out alerts to the employees about the incidents and also through other textual documents and media. Combination (the transformation of explicit knowledge into complex forms of explicit representation) occurs when the organization uses the results of the incident, this involves communicating, disseminating, and systematizing the explicit knowledge resulting from the incident report. Finally, internalization occurs when employees or the organization transform the explicit knowledge into tacit knowledge.

Also taken into consideration is AR Ahlan's [16] work on the concern of organizations on the skills of information technology graduate, A. Abrizah's [17] user design advice, DRI Rambli and Suziah Sulaiman's notion of story telling [18] and

Nordin Zakaria's simplicity argument [19] so that the ensuing application from this study would not be difficult to operate.

Thus, the first focus of this study is to use the aforementioned perspectives to explore incident reporting processes among organizations in Malaysia, categorized into classes of reporting processes by utilizing the numerical taxonomy technique, and use safety outcomes to judge which class represents more safety outcome favourable practice.

The second prong of the study follows from the first, i.e. after the cluster with a more favourable safety outcome has been determined; rules are extracted from this class to create incident reporting algorithm and application.

1.8 Significance of Research and Motivation

Although the literature reports that there are some studies on the links between incident reporting/voicing out and safety outcomes [2]; the importance of effective incident reporting systems in organizations [20]; and automation of incident reporting [21-23], there is a paucity of research on how incident reports become safety knowledge and little research on the safety outcome favourable practices on incident reporting; also, applications which automate incident reporting are not developed from a large sample of case studies in organizations, like this research sets out to do. Filling these gaps in the literature is one of the motivations for conducting this study in a country such as Malaysia. It is hoped that by satisfying this research need, the researcher would have been able to push back the frontiers of knowledge for the benefit of humanity.

The outcomes of this research are also believed to be of possible interest to the following groups:

1. Government officials who monitor safety implementation in organizations. A major part of the study is directed to meet the needs of this group by identifying the incident reporting and favourable relationship with safety outcomes.

2. Health Safety and Environment (HSE) officials who are responsible for day to day safety measures and compliance in organizations.

3. Researchers in the safety knowledge, knowledge creation and transfer areas.

The outcomes of this research will highlight favourable safety outcome links of incident reporting in Malaysia and how incident reporting relates with safety outcomes. Additionally, researchers will also benefit from this study in that the research will document how incident reports become safety knowledge. Scholars may explore these outcomes in-depth and its effects on different countries or societies and use more parameters and expand the boundaries of the knowledge transfer.

1.9 Research Methodology

Broadly, a research undertaking is an "*organised, systematic, critical scientific, data-based, objective, scientific inquiry or investigation into a specific problem, undertaken with the purpose of finding answers or solutions to it*" [24]. It can be considered as an action with a purpose. This action commands the investigator to enquire about specific topics, or participants related to the research problem. A paradigm provides a basic belief system or frame that guides the investigator [25].

Although researchers can be implicit or explicit about their scientific paradigm, they are committed to its rules and standards for generating knowledge [26].

In this study, a combined approach of qualitative (case study) and quantitative strategies are used to explore the objectives of this research. The usual justification, for choosing a mixed research design approach is that it may capitalise on the strengths and resolve the weaknesses of each single method (Mingers, 2003). Examining a research problem using multiple research design provides rich insight, because a problem is approached from differing perspectives, allowing the researcher to develop more accurate explanations of a phenomenon [27], [28]. To confirm this point, [29]suggest use of triangulation of the methods used to collect data. In addition, [30] comments that triangulation is a common approach which is merely using both qualitative and quantitative methods together. Triangulation allows a better understanding regarding the research phenomenon, as multiple research methods used increase the validity of the collected data and derived findings. The following sections describe this approach in detail.

1.9.1 A Multi-stage Research Design for This Research

In order to treat a problem properly, researchers have to employ an appropriate research methodology. This section therefore addresses the methodological issues of choosing an appropriate research design to collect data to address the research problem [27, 28, 31].

A research design may be described as a series of decisions that, as a whole, form a strategy for answering the research questions and testing the hypotheses. Supporting this way of thinking, [32] view research design as a structured set of rational decision making choices, or guidelines, to assist in generating valid and reliable research results. A research design in a positivist setting covers decisions about the choice of data collection methods, and about measurement and scaling procedures, instruments, samples and data analysis [27, 32]. A good research design must make sure that the information obtained is relevant to the research problem, and that it is collected by objective procedures.

A combined approach of qualitative case study and quantitative strategies are used to explore the objectives of this research. In this research, quantitative and qualitative methods are used in a complementary manner [27]. Quantitative research will enable us to test the relationship between the research model variables, and to provide evidence to support, or work against, the research hypotheses [27, 28].

Qualitative research through a case study conducted in six sectors, namely oil and gas, education, chemical, services, construction and manufacturing in Malaysia, enable us to better understand how safety knowledge flows from incident reports. It also provides us with up-to-date information about incident report best practices in the industries. This mixed approach completes the picture of incident reporting in Malaysia. The sequence of the research process follows what [27]defines as "sequential procedures, in which the researcher seeks to elaborate on or expand the findings of one method with another method". [27]also states that "the study may begin with a quantitative method in which theories or concepts are tested, to be followed by a qualitative method involving detailed exploration of a few cases or individuals". This research starts by collecting and evaluating research literature. An initial systematic literature review is essential, because the conceptualisation of important issues related to incident reporting, safety culture; national incident reporting and safety climate require an examination of existing thinking in several research fields.

1.9.2 Clustering for Data Analysis

The mixed methods design adopted for this study is only up to a point. After the data have been collected, charted and coded, the data are classified into clusters using 2-way clustering technique. Clustering technique is like factor analysis; the main difference is, while factor analysis targets variables, the clustering analysis is concerned with cases.

1.10 Thesis Outline

This section provides an overview of the entire contents of the thesis which starts with this chapter. The structure of the thesis is pictorially represented in Figure 1.1.

The second chapter sheds light upon the environment being investigated. It begins by providing an overview of safety regulations in Malaysia. Then the chapter gives an outline on the state of safety in Malaysian organizations. This is followed by a discussion about the state of incident reporting in Malaysia. The chapter concludes by providing information about the state of incident reporting technologies and programs in Malaysia.

Chapter three reviews the roots of the research problem posed in this study. The chapter provides a critical review of the existing literature in order to present what is already known in incident reporting, and to identify any important issues related to incident reporting. The chapter is organized as follows: first, it provides a brief overview about knowledge creation and safety knowledge, its definitions and rationale. Then, it reviews the existing technology of incident reporting in Malaysia in order to identify the most appropriate theoretical background for this research. This is then followed by a critical review of the existing literature on the systems of incident reporting and the exegesis of central topics and variables in this study.

Chapter four describes and explains the issues related to the research methods and the design of this study. The details of the two phases (case study and clustering) in which the research was conducted are explained. It describes the study methodology, data collection methods, and case study process.

Chapter five presents the results of analyzing the semi-structured interviews conducted with HSE officers in Malaysia. The aim of conducting these interviews is to explore how incident reporting is practiced in Malaysia, conducting a numerical taxonomy and clustering of the processes and finding the relationship between the taxons and safety outcomes of these companies.

Chapter six discusses the results in chapter five including the rules, algorithm and coding of the prototype development of the application that will facilitate the automation of incident reporting in organizations. The rules for the application are gleaned from the analysis of case studies of incident reporting in organizations in terms of favourable safety outcomes.

Chapter seven explains and details the tools, principles and the process of the application development. The chapter shows how iterations were done and why they were guided by data and shaped by feedback from HSE personel. The chapter also explains the features and functions of the application; including which aspects of incident reporting are automated.

Chapter seven concludes this thesis by discussing the main contributions of this research. It then outlines the research outcomes and delves into their theoretical and practical implication. Finally, it highlights the limitations of this research, and then discusses and provides guidelines for further future work.

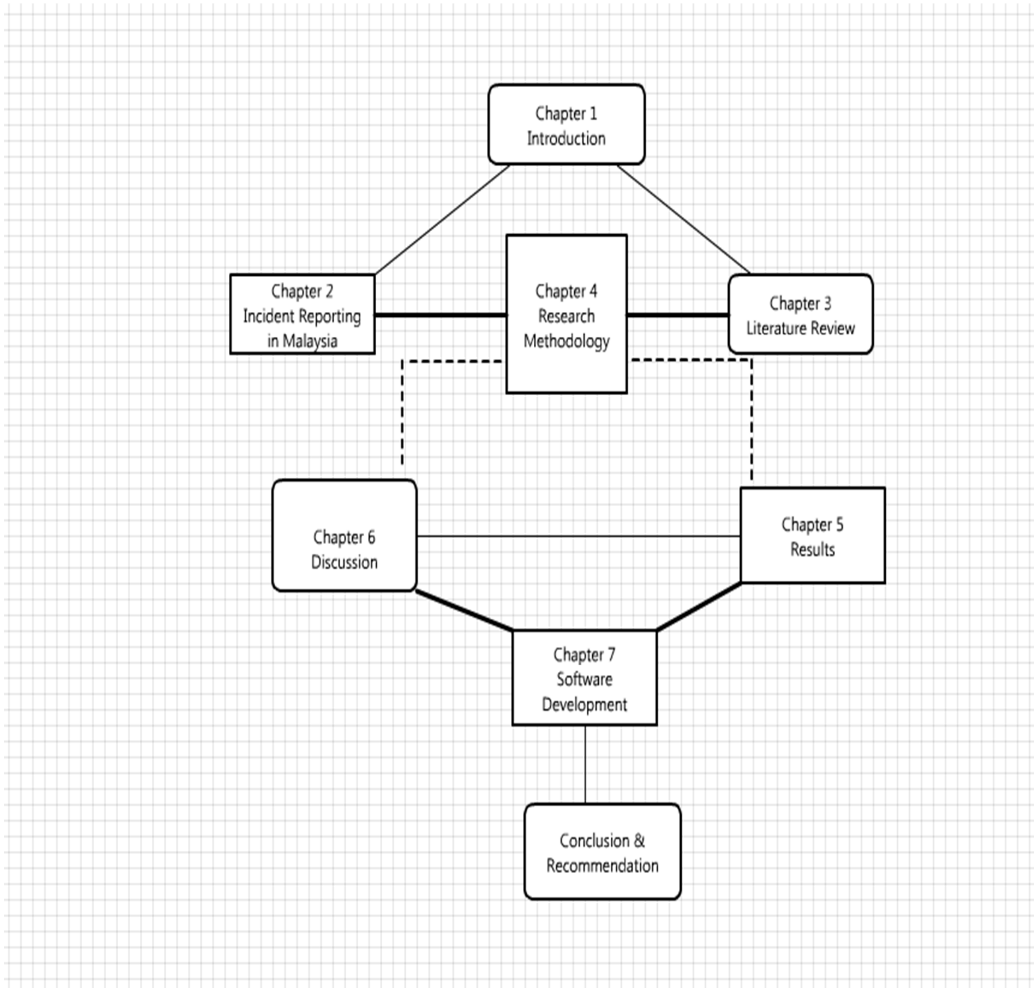

Figure 1.1: Outline of the thesis

CHAPTER 2

SAFETY AND INCIDENT REPORTING IN MALAYSIA

2.1 Chapter Overview

This chapter discusses the currency of safety studies and legal frameworks which mandate incident reporting by organizations in Malaysia. The chapter also looks at how the trends in safety issues around the world in relation with how those issues engender decisions in Malaysia. Also, the chapter discusses the organizations responsible for the sensitization and enforcement of safety regulations in Malaysia, namely, NIOSH (National Institute of Occupational Safety and Health) and DOSH (Department of Occupational Safety and Health). Also taken into consideration is AR Ahlan's work on the concern of organizations on the skills of information technology graduate and A. Abrizah's user design advice so that the ensuing application from this study would not be difficult to operate

2.2 Currency of Safety Studies

Safety studies assumed a poignant urgency since the Chernobyl nuclear disaster. This was a nuclear accident that took place on 26 April 1986 at the Chernobyl Nuclear Power Plant in Ukraine. There was an explosion and the resulting fire released huge amounts of radioactive contamination, spreading over Western USSR and Europe. This disaster was adjudged the worst nuclear accident in history [33]. A close consideration of the events which occurred in Ukraine during the disaster demonstrate that safety culture had entered into a phase of widespread cultural, social, and economic change that would define safety knowledge for decades to come. Shortly after the disaster, companies and governments started creating, prioritizing and redefining their safety regulations.

In Malaysia, precisely on December 2, 1992, the nation launched its National Institute of Occupational Safety and Health (NIOSH); an initiative that heralded a new regime in the advancement of Occupational Safety and Health in the country. NIOSH was launched after a firm commitment was extracted from the stakeholders to better safety and health of employees in the workplace[34].As the Minister of Human Resources of Malaysia, puts it, "*NIOSH would be a critical catalyst in the promotion of occupational safety and health that would also serve as the backbone to create a self-regulating occupational safety and health culture in Malaysia* [34]."

The essence of the minister's proclamation is that the establishment of NIOSH would usher in a culture of safety that would demand the participation of all and of which NIOSH will be the vanguard.

2.3 Malaysian Government's Regulation on Incident Reporting

If NIOSH is the organization that champions the safety culture in Malaysia, the organization that enforces and regulates good safety practices is Department of Occupational Safety and Health (DOSH)[35]. The Department of Occupational Safety and Health (DOSH) which is under the Ministry of Human Resources is the government organ responsible for enforcement of occupational safety and health law. Recently, the agency strengthened its structures by deepening its manpower competencies to deal with present challenges [35].

One way DOSH feels the pulse of safety and health issues in the workplace is through incident reporting. The law that regulates this is the Occupational Safety and Health (Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease) Regulations 2004[36]. Regulation 5 states:

(1) Whenever any accident arising out of or in connection with work which caused any person either—

(a) death; or (b) serious bodily injury, as specified in First Schedule, which prevents the person from following his normal occupation for more than four calendar days, or where a dangerous occurrence, as specified in Second Schedule, takes place in any place of work, the employer shall—

(a) forthwith notify the nearest Department of Occupational Safety and Health office by the quickest means available; and (b) within 7 days send a report thereof in an approved form.

(2) Whenever any accident arising out of or in connection with work which causes bodily injury to any person which prevents the person from following his normal occupation for more than four calendar days, the employer shall, within 7 days, send a report thereof in an approved form to the Department of Occupational Safety and Health office. (3) Where an employee, as a result of an accident arising out of or in connection with work, has suffered an injury or condition reportable under subregulation (1) which causes death within one year of the date of that accident, the employer shall inform the Director General in writing of the death as soon as it comes to his knowledge, whether or not the accident has been reported under subregulation (1) [36].

2.4 ISO 14000

In order to follow the global practice of environmental sustainability, Malaysia has embraced ISO 14000 [37]. Commenting on the development, Sumiati and colleagues contend that: "*With the increase in awareness of environmental issues, the level of environmental disclosure and stakeholder demands for environmental information is increasing. New developments in the ISO 14000 standards also make it more evident that a company's environmental performance as well as its environmental reporting should be considered as strategic issues in business strategy. Especially for a developing country like Malaysia, many companies are under external pressures to improve their environmental performance.*"

The essence of [37]'s argument is that following the the ISO 1400 environmental reporting guidelines has an important implication for the nation's environmental sustainability.

2.5 Health, Safety and Environment in Malaysia – A Global Perspective

Sustainable Development has become a common denominator for health, safety and environmental activities and practices. Whatever happens in one country in terms of health, safety and environmental activities can have a ripple effect on the global community. Although the development of a nation is necessary for meeting the needs of the people, this same development can easily affect the ecological balance of the global community, negatively or positively [38].

As such, there is a need for individual nations such as Malaysia to be sensitive to what is known as sustainable development. Sustainable development has been defined by the Brundtland Commission Report 1987[39] as the "the development which meets the needs of the present without compromising the ability of the future generations to meet their own needs." Sustainable development includes health, safety and environmental practices of any given nation for its people's sake and for the sake of the global community as well as the well-being of future generations. Malaysia had been engaged in multi-dimensional developmental projects. The United Nations has ranked Malaysia number 59 out of all 175 member nations of the Human Development Index (HDI) (United Nations Development Plan, 2004). The areas of health, safety and environment that have both domestic and global implications for Malaysia are depicted below:

2.5.1 Air Quality

Air Quality: The Department of Environment (DOE) is Malaysia's national agency responsible for monitoring the nation's air quality in "*residential areas, industrial areas, commercial areas, roadside areas, and reference areas*[40]." The DOE has made strides in protecting the ambient air quality by constantly monitoring and ensuring that the types of fuels that are used in the nation's industries as well as motor vehicles do not become a source of harmful particulates that constitute the main threat to air pollution. Specifically, the DOE monitors the levels of carbon monoxide, lead concentration and ground level ozone. A saturation of particulates cannot only harm the people of Malaysia but it can also negatively affect the air quality of the global community.

2.5.2 Water Quality

Safe drinking water is one of the main preventive commodities that can significantly reduce the incidence of disease, particularly water-borne diseases. In Malaysia water resources and supplies are responsibilities of individual states although the central government plays a significant role in designing policies and passing laws that protect, monitor and ensure that the water quality is safe. These policies encourage collaboration among relevant state agencies in order to prevent and control sources of contamination for raw water supplies and sources. For example, the nation's Ministry of Health established the National Drinking Water Quality Standards (NDWQS), which is responsible for setting the limits of physical microbiological and other chemical limitations for all private water supply systems. The Department of Environment is responsible for overseeing and monitoring the quality of water.

Regularly, water samples are taken by the DOE personnel from water sources for laboratory analysis as a means of monitoring and controlling levels of pollutants in the water. In 1998, the National Water Resources Council (NWRC) was established at federal level for the purpose of carrying out more stringent water management practices and for ensuring a sustainable water supply system. A polluted water system can be hazardous for the nation as well as the global community since the pollutants can find their way to larger water bodies such as seas and oceans where they can cause large-scale global problems.

2.5.3 Ozone Depletion

Although Malaysia consumes a considerable amount of ozone-depleting substances imported from Europe and the United States, it does not manufacture them. Malaysia has been involved in various international activities that are aimed at reducing ozone depletion. For example, in honor of the Montreal Protocol of 1987, Malaysia attended a conference that focused on the emission of Chlorofluorocarbons (CFCs) at the Vienna Convention. This conference was focused on protecting the ozone layer. Malaysia further responded by stipulating its own plans as a nation aimed at reducing ozone depletion.

The country subsequently ratified the Vienna Convention as well as the Montreal Protocol in 1989. In honor of its commitment, Malaysia has reduced its consumption of CFCs [41]. Malaysia has also established an agency called the Ozone Protection Section which operates under the auspices of the DOE. By taking these measures, Malaysia is taking a global responsibility to safeguard the stratosphere of this planet for the sake of its people and the global community at large. The ozone layer is what protects life on earth from the deadly effects of ultraviolet rays emanating from the sun. Depletion of the ozone layer can be catastrophic [41].

2.5.4 Solid Waste

In order to address the issue of solid waste, Malaysia has formulated a number of policies and strategies. The increase in the population of Malaysia has led to an inevitable increase in the production of its solid waste. Because of the influx of individuals to urban and peri urban, underdeveloped settlements, Malaysia has experienced notable environmental problems in the form of solid waste management. The Malaysian federal government has embarked on a mammoth project of resettling informal urban squatters to better low-cost residences to minimize the problem of solid waste management and to improve the general health of the populace. Although about 76% of the nation's solid waste is being disposed of properly there is still the 24% that is being dumped in illegal dumpsters, rivers and drains and canals [41]. The government has also established the National Strategic Plan for Solid Waste Management that is focused on upgrading improving existing landfills and constructing new ones. The government has established the Department of National Solid Waste Management, which operates under the auspices of the Ministry of Housing and Local Government; all for the purposes of crafting a comprehensive solution to solid waste management. Careless management of solid waste cannot only lead to local epidemics of infectious diseases but it can be a source of contamination for water bodies and marine life on a large scale resulting in endangering the health of the international community.

Toxic, Chemical, and Hazardous Waste: All wastes should be disposed of responsibly and safely so that it does not pose as a health hazard. But disposal of hazardous material must be especially carefully done because of the potential of catastrophic health problems. Malaysia disposes of its toxic and hazardous waste using incinerators. Some of its toxic waste is recycled and re-used after it has been certified as safe for use. Another portion is exported for recycling.

The Malaysia DOE established a collaboration of agencies called the Technical Committee on Banned and Severely Restricted Chemicals to oversee and monitor adherence to the national policies on the disposal of toxic, chemical and hazardous waste. A federal law known as the Environmental Quality Act of 1974, which was amended in 2001 was passed as a strategy to consolidate all existing rules and regulations related to handling, transportation, storage, recycling and treatment of toxic, chemical and hazardous material [41]. A consolidation of the laws covering these activities makes it easy for respective agencies to monitor and enforce adherence. All the aforementioned are taking into consideration as nations, including Malaysia, formulate policies on health and safety. The next section discusses the significance of incident reporting to the environment, workplace and stakeholders

2.6 Importance of Incident Reports

Given that an accident and the resulting incident report have the capacity to immediately call attention of stakeholders, including regulating agencies to safety issues, the significance of the report cannot be overstressed. However, there is scant research attention focusing on the nature of the knowledge extracted from such reports and how it is transferred within the organization and among the stakeholders.

To increase competitive advantage, employees are required to work with increasingly complex machines and within the confines of equally complex structures [42]. In such environments, accidents happen; and because human lives are involved in such incidents, their occurrences are taken seriously by employers, supervising agencies, manufacturers and professional associations [20]. To underscore such importance (and as mentioned in sections above) legislations exist in many countries requiring organizations to record and report incidents. The mechanism by which that requirement is fulfilled is by filing incident reports [20]. Incident here means an accident or a near-miss.

Every incident associated with any kind of personal injury is required to be documented. Based on the kind of injury, its seriousness as well as implications, accidents may also be required to be reported to the associated regulating agencies, like Malaysia's Department of Occupational Safety and Health (DOSH). However, some accidents which do not cause any specific personal injury will likewise have to be reported. Due to the importance of such reports, organizations are usually careful in ensuring that various requirements of reporting are fully understood and complied with. It can also be crucial to preserve significant evidence on many grounds; as it may be needed for an organisation's investigation of an incident in a bid to avoid its reoccurrence [20]. Incident reports are used to fulfill many purposes such as feedback for safety programmes in organizations, data for insurance claims, yardstick to assess old safety rules by government agencies, and grounds for creating new ones.

The extant literature tends to focus on research findings as transferable safety knowledge. Even experts that are affiliated with safety research institutes operationalized safety knowledge as research findings. For example, among the objectives of the Robert Sauvé Research Institute on Workplace Health and Safety (IRSST) based in Canada, are to: "To add new, interdisciplinary research and KT [Knowledge Transfer] capacity related to workplace injury and permanent structures for ongoing capacity enhancement linking the participating organizations and to build a network of research and community WHS collaborators in Atlantic Canada linked to the three Québec research organizations with their established social capital of community and institutional connections, thus creating a truly Eastern Canadian regional organization [43]" But they define "knowledge [as] research findings"[43]; p. 159. It is the intent of this study to explore how safety knowledge transfers through incident reports by examining how organizations use incident reports. Further, the study intended to fashion out the right way to automate the incident reporting process after extracting the best practices from the many groupings that resulted from our data. Previous attempts at automating incident reporting did not derive their algorithm after careful analyses of large sample data and how incident reports relate to safety outcome. Chapter Three delves into the critical analysis of existing systems of incident reporting, their deficiencies and the limited research on how incident reporting relates to safety outcome.

2.7 Chapter Summary

This chapter firstly took a bird's-eye view of the global perpective of safety studies around the world before narrowing down to the safety issues, the legal framework for incident reporting and the regulation of safety and health in Malaysia by NIOSH (National Institute of Occupational Safety and Health) and DOSH (Department of Occupational Safety and Health). The next reviews the literature on incident reporting and discusses the gap in the literature and why this study is worth pursuing.

CHAPTER 3

LITERATURE REVIEW

3.1 Chapter Overview

In order to help academic writers out of the difficulty of writing and organizing a literature review, Creswell [7] offers a simple model. Creswell's model is the guideline followed in this chapter. In a qualitative study, he says, the literature should be written to explore the topics around central phenomenon being addressed. However, for quantitative and mixed methods study, "*write a review of the literature that contains sections about the literature related to major independent variables, major dependent variables and studies that relate the independent and dependent variables*"[7].

Therefore, since this study adopts the sequential type of mixed-methods approach of research design (i.e. qualitative phase comes before and informed the parameters of the quantitative phase), this chapter first addresses topics around the central phenomenon – safety knowledge creation from incident reports – as though the study were purely a qualitative research. Therefore, the chapter looks at Nonaka's model of knowledge creation [9], then unnatural incidents and their costs, delving deeply into the system of incident reporting worldwide; also safety incident reporting technologies and advantages and disadvantages of manual and electronic incident reporting were analyzed. Later, how incident reporting procedure (independent variable) correlates with safety outcome (dependent variable) was delved into.

Finally, the chapter establishes a gap of why this research is necessary and how this chapter logically leads to the methodology chapter.

3.2 A Critical Analysis of Nonaka's Model of Knowledge Creation

Ikujiro Nonaka [9] and his co-workers created a consistent body of theory concerning knowledge creation in organizations based on four main ideas: a) knowledge creation at individual level is a direct result of the continuous dialogue between tacit and explicit knowledge; b) there are four basic knowledge conversion processes: socialization, externalization, combination and internalization; c) knowledge creation at the organizational level is based on these four conversion processes and a spiral driving force; d) there is a shared space Bafor knowledge creation.

The novelty of these ideas, and the correlation between them and Japanese companies' success on the global market made Nonaka one of the most prominent thinkers in knowledge management, and his model of knowledge creation became a new paradigm for organizational knowledge dynamics.

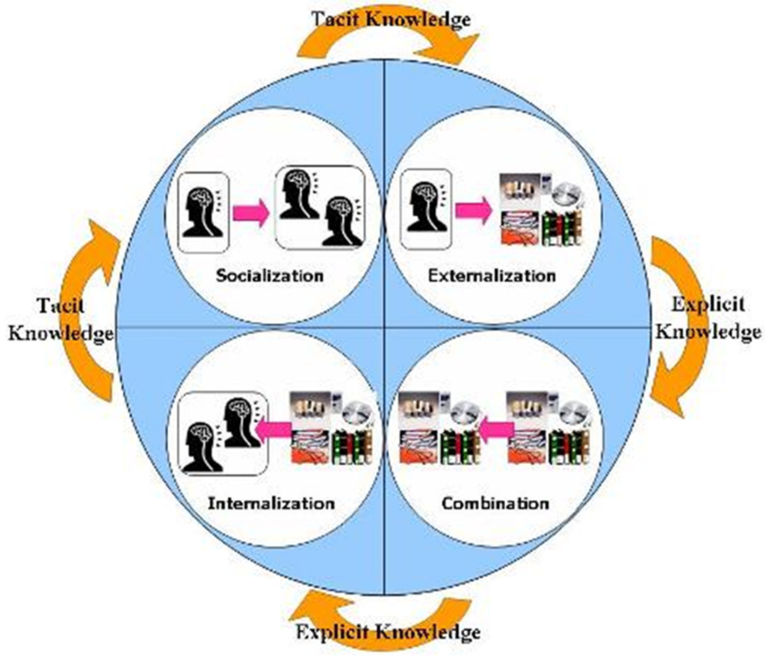

Figure 3.1: Nonaka's SECI Model

3.3 Functionality of the Nonaka's Model and its Limits

The main assumptions of this model constitute in the same time the degree of freedom and the limits of its functionality [9, 10, 39-43]. One such assumption is the relative consistency of knowledge as a justified true belief. That means that knowledge creation can be described with respect to a given cultural framework, which is at a microscale the cultural horizon of individual, and at macroscale the cultural horizon of a country. The Nonaka's model of knowledge dynamics in organizations can be very well understood and used in the context of Japanese culture, but it is unlikely to produce successful results in other cultures. The basic cornerstone is the concept of

Ba which hardly can be understood in a culture where the Cartesian dualism produced such a gap between rational and non-rational worlds. Also, this concept is related to the Japanese specific interpretation of no-thing-ness: "*No-thing-ness is not to be understood as a thing, because it then would be based on a conception of something, which would be no-thing*"… If you understand what exists then you can understand that which does not exists. This means that although it is impossible to know that which does not exists, it is possible to know that if "*anything is anything, then everything is everything*…"*The spirit of no-thing-ness means that there is no such thing as relying upon anything at all outside of your individual mind*".

Postulating the four basic processes of knowledge dynamics, i.e. socialization, externalization, combination and internalization, and integrating them into a pattern of knowledge conversion, Nonaka is blurring the lines between individuals and groups. Knowledge conversion from tacit to explicit and from explicit to tacit, according to the epistemological dimension, is clearly a process developed at the individual level. There is no meaning for such a process to be developed between the tacit knowledge of a given person and the explicit knowledge of another person. However, the knowledge conversion from tacit to explicit, and from explicit to tacit develops between different individuals. If the whole spiral of knowledge creation would be considered for only two individuals, at the limit, it could be understood. But, if we would consider a group of people, it is hardly difficult to explain and demonstrate how the knowledge conversion works because of the sequential interplay between strictly individual processes and group processes. As a metaphor, the spiral of knowledge creation is an excellent solution. However, for any attempt of practical analysis and evaluation this spiral knowledge creation represents an almost impossible task. Although Nonaka and his co-workers consider all four basic processes to be designed for knowledge conversion, actually only two of them satisfy the condition of transforming one form of knowledge into another form of knowledge. They are: externalization and internalization. Externalization means to get some explicit knowledge out of the own experience, in a form that can be transferred through the process of combination. Internalization is the reverse process by which some valuable knowledge got through combination can be stored in a specific way as experience, and used accordingly in the decision making. However, there is a difference between the capacity of a given individual to perform externalization and internalization, and his or her motivation. Also, it is important to note the fact that these two processes are not done in an automatic way, but with some cognitive efforts. Socialization and combination are processes designed for exchange of knowledge from one person to another, and not for knowledge transformation. Thus, Nonaka's model is not actually a cycle of knowledge conversion processes, as claimed by authors.

The epistemological dimension of the Nonaka's model is based on transforming tacit knowledge into explicit knowledge and vice versa. However, these transformations raise some questions concerning knowledge dimensions. Explicit knowledge has only one dimension, which the extensive dimension. Knowledge obtained, for instance, in mathematics like 2+2=4 cannot have intensity. It has only the extensive dimension, which is a quantitative one. However, the tacit knowledge contains emotions. Any emotion is characterized by extensive and intensive dimensions. The level of intensity is similar to temperature in characterizing the heat. Thus, an emotion may have a higher temperature than another emotion for the same person, or an emotion may have a higher temperature than the same emotion generated in another person. Now, the question is: how can we consider transforming emotions as tacit knowledge (i.e. knowledge with two dimensions) into explicit knowledge (i.e. knowledge with only one dimension). The spiral of organizational knowledge creation considered with respect to the ontological dimension originates in the middle management and evolves upward and downward. This might be the specific of Japanese management, but it is hardly efficiently in the Western management, where the decision making process is always a top-down process. The Nonaka‟s model for organizational dynamics is based on creation and flow of knowledge. The analogy is made with the flow of water, but we know from fluid dynamics that any flow is generated by a pressure difference. Looking into this knowledge dynamics model, we see no such thing as a pressure field and no pressure difference is able to generate the flow of knowledge. Once again, the metaphor is beautiful but the practical application is rather difficult.

In conclusion, with all their limitations, Nonaka and his co-workers developed the dyad of tacit knowledge – explicit knowledge, and all their effort is to describe the dynamics between these two forms of knowledge. However, considering knowledge as a field of meanings and feelings already we may promote a new dyad: cognitive knowledge – emotional knowledge. Emotional knowledge is generated by emotions, which may be considered as states of our body and mind. Emotions are characterized by the following generic constituents:

- A feeling component – physical sensations, including chemical changes in the brain.

- A thinking component – conscious or intuitive thought appraisal.
- An action component – expressive reactions (like smiles), as well as coping behaviours (think fight or flight).
- A sensory component – sights, sounds, etc., which intrude and serve to trigger the emotional response.

3.4 INCIDENT REPORTING AND SAFETY IN THE WORKPLACE

In recent discussions of safety within the workplace, a contentious issue has been the place of incident reporting in engendering safety knowledge and its subsequent contribution to the safety outcomes. Writing in his handbook of incident reporting, Johnson [44] complains that:

"Every day we place our trust in a myriad of complex, heterogeneous systems. For the most part, we do this without ever explicitly considering that these systems might fail. This trust is largely based upon pragmatics. No individual is able to personally check that their food and drink is free from contamination, that their train is adequately maintained and protected by appropriate signaling equipment, that their domestic appliances continue to conform to the growing array of international safety regulations. As a result we must place a degree of trust in the organisations who provide the services that we use and the products that we consume. We must also, indirectly, trust the regulatory framework that guides these organisations in their commercial practices. The behaviour of phobics provides us with a glimpse of what it might be like if we did not possess this trust. For instance, a fear of flying places us

in a nineteenth century world in which it takes several days rather than a few hours to cross the Atlantic. The SS United States' record crossing took 3 days, 10 hours and 40 minutes in July 1952. Today, the scheduled crossings by Cunard's QEII now take approximately 6 days. In some senses, therefore, trust and profit are the primary lubricants of the modern world economy. Of course, this trust is implicit and may in some cases be viewed as a form of complicit ignorance. We do not usually pause to consider the regulatory processes that ensure our evening meal is free of contamination or that our destination airport is adequately equipped".

The essence of Johnson's argument is that individuals are forced to trust machines and regulatory frameworks, however, these systems eventually and inevitably fail; and judging the by efforts and significant research that has gone into finding a coherent solution to adverse incident in organizations, it is important to delve more deeply into the surrounding variables essential to its understanding.

Most studies in the field of health, safety and environment (HSE) have only focused on national incident reporting systems when it pertains incident reporting. Further, most systems of incident reporting technologies have only been created using generic algorithms by their designers without recourse to what obtains in the industry. Therefore, the generalizability of much published research on incident reporting technologies is problematic. The design of the systems are rather controversial, and there is no general agreement about what should go into the system and of what parts to be automated.

3.5 INCIDENT REPORTING

In recent years, researchers and practitioners have struggled with adverse incidents in organizations; it is becoming increasingly difficult to ignore the increasing fatal incidents recorded daily [44-47]. From a critical opinion of the attempts and substantial research that has been conducted into finding a lucid solution to fatal incidents, it is essential to venture more deeply into the surrounding variables necessary to its understanding. One variable, critical to the understanding of better safety outcome is incident reporting [2, 48-50]. A considerable amount of literature has been published on incident reporting. The large volume of published studies describes the role of incident reports in near misses and accidents.

The first serious discussions and analyses of incident reporting emerged during the last three decades with majority of them favouring laws mandating organizations to report adverse workplace incidents to the national regulators. Such cerebral works include [17, 44]. During the past decade much more information has become available on the role of incident reports in safety outcomes [17, 50].

In response, educators and others have advanced educational arguments supporting incident reports. Johnson, Tyler and Adler-Milstein all argued that reporting incidents is correlated with favourable safety outcomes. Thus, in keeping with such reasoning, they maintained that incident reporting should be an integral part of the safety systems in national HSE systems. However, many of the previous research findings into incident reporting have not been explicit on how incident reports lead to favourable safety outcomes. While a section of the researchers contend that incident reporting leads to positive safety outcomes, others argued that its contribution is not readily evident.

Those who hold the position that incident reports leads to favourable outcomes have many supporters. For instance, this view is supported by [50] who writes that effective incident reporting in work places go together with safer organizations. Adler-Milstein discusses the challenges and strategies for facilitating safer workplaces; while [2] argues that her data support the correlation of incident reports-safer workplaces position. As [48] reminds us, that incidents resulting in legal and financial consequences do motivate organizations to take action. Elsewhere, Adler-Milstein has argued that frontline workers undertake problem solving activities after major or catastrophic incidents. At the end of her thesis [2] states: "*We hypothesize that problem solving activities are especially likely to follow reported operational failures that provoke financial and legal liability risks. We also hypothesize that management commitment to problem solving, enacted through managers' communication and engagement practices, can encourage frontline workers to conduct problem solving. We test our hypotheses in the health care context, in which the use of incident reporting systems to highlight operational failures is widespread. Using data on nearly 7,500 reported incidents from a single hospital, we find support for our hypotheses. Our findings suggest that frontline workers' participation in problem solving is motivated by some inherent characteristics of the problems as well as by particular management practices.*"

The essence of [2] argument is that incidents with legal and financial ramifications lead to actions and actions –which are likely to correct weaknesses in safety systems -

lead to safer workplaces. In the next few paragraphs other researchers' criticism of the usefulness of incident reporting systems will be discussed.

For example, [51] points out that incident reporting systems undervalue the numerator and usually, the denominator stays unidentified. Further, many analysts now argue that the strategy of incident reporting systems in some sectors has not been successful. Wald and colleagues [51], for example, argue that incident reporting systems can not allow precise epidemiologic information. All in all, the view that incident reporting systems work in all industries has been challenged by a number of writers. The most important of these criticisms is that those who recommend the blanket usage incident reporting systems failed to note that while incident reporting systems may work in aviation and other industries, its viability in other sectors such as health is doubt. However, better information through recent studies has come to light and highlighted the effectiveness of incident reporting systems in other industries including healthcare [50].

The forgoing paragraphs report the views of authors who have done previous work on incident reporting systems; however, subsequent paragraphs in this section will argue, in this author's own voice, and interrogate the pertinent questions which remained to be asked or answered in the previous studies. The researcher will also put forward his disagreements - with reasons – and agreements – with a difference.

One question that needs to be asked is the recency of those who implied minimal effectiveness of incident reporting systems. The main weakness of the previous studies was that their analysis were based on the data available to them at the time the failure to address what we do know about incident reporting systems. Another problem with this approach is that, while acknowledging the effectiveness of incident reporting systems in industries such as aviation, it simply discounted the viability of the systems in other industries simply because there were no studies to cite its efficacy in healthcare sector. Yet, perhaps the most serious disadvantage of this view is that the authors focused on the different error collecting data systems and ignored the benefit of the practice itself.

Since most studies on the topic of incident reporting systems have only focused on the techniques, and most studies on incident reporting systems have only been carried out in a small number of areas such as in either aviation or healthcare sectors, the generalizability of much published research on this issue is problematic. The experimental data are rather controversial, and there is no general agreement about the effectiveness of incident reporting systems. Previous studies would have been more convincing if they had included many sectors in their research to evaluate the usefulness of incident reporting systems; and the conclusions might have been more interesting. In order to address that gap, the current study focused on the practice of incident reporting in six different sectors.

3.6 NATIONAL INCIDENT REPORTING

Central to the entire discipline of health, safety and environment is the concept of national incident reporting. Thus in addition to incident reporting systems, this author would like to critically review the literature concerning this topic especially as it relates to safety outcomes. National incident reporting is defined here as the framework a country has put in place to receive reports of incidents and resulting fatalities from workplaces.

Again, one variable, critical to the understanding of safer workplaces and safety outcomes is the national incident reporting and various legislations and systems that come with it. Therefore, a considerable amount of literature has been published on national safety incident reporting. The large volume of published studies describes the role of national incident reporting in safety outcomes [17, 44-47].

The first serious discussions and analyses of national incident reporting emerged after the Chernobyl nuclear disaster [52] with majority of them favouring the necessity and urgency required of nations to undertake comprehensive incident reporting systems. Such intellectual works include Francis Row's work on the Malaysia's national regulatory frameworks on SOCSO [47]. Through the past decades, much more information has become available on the role of national incident reporting in relation with workplace incidents e.g. [17, 44].

Further, educators and others have advanced educational arguments supporting legislation for incident reporting on a nationwide scale. [17, 44, 47] all argued that effective national incident reporting should be a requirement for all nations which safe workplaces. Thus, in keeping with such reasoning, they maintained that regulation should accompany legislation. However, many of the previous research findings into national incident reporting have *been* inconsistent and contradictory [53-56]. While a section of the researchers contend implied that national incident reporting is of itself a magic pill that can reduce workplace accidents, others argued that national incident reporting systems cannot and have not of themselves been solving the problems of workplace fatalities.

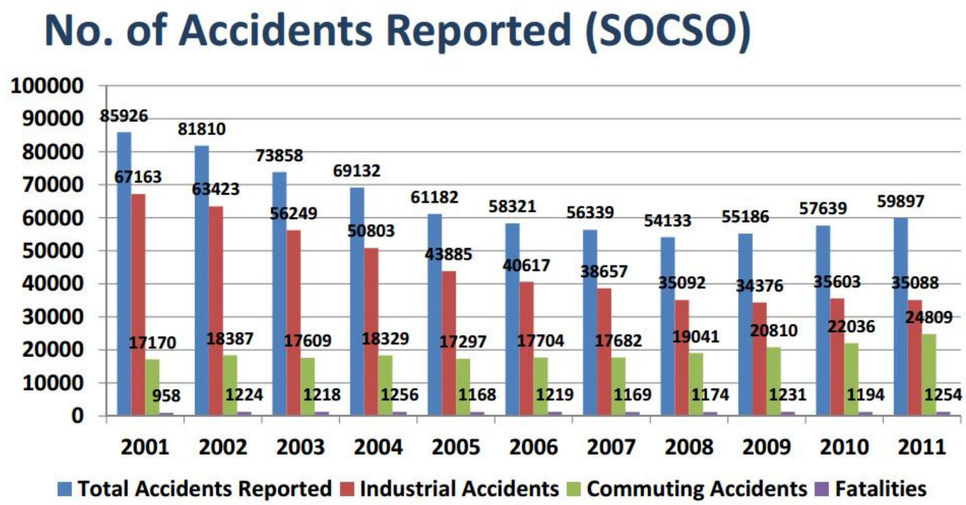

Figure 3.2: Increasing rates of fatalities in Malaysia. Source, SOCSO

In Malaysia for example, as shown in figure 3.1, although number of industrial accidents are reducing, the fatalities due to those incidents are increasing. However, there those who even hold the view that workplace incidents in Malaysia are actually increasing [57]; and this view has many supporters. For instance, this position is supported by Malaysian Trades Union Congress vice-president A. Balasubramaniam who told New Straits Times newspaper that "the present safety and health laws were self-regulated and, as such, many employers gave less priority to the safe workplace concept." While in 2012, [58] argue that their data support the notion that workplace incidents are increasing despite the efforts of NIOSH and DOSH. As [58] reminds us, "Malaysian government has made efforts on executing safety and health policies through the enforcement of guidelines as well as conducting site safety seminars and certifications. Yet, existing record indicated that the present Occupational Safety and Health (OSH) situation in the workplace is still very much adverse and below expectation." The essence of [58]'s argument is that although the roles been played by the regulators and national incident reporting systems are commendable, is still much to be desired.

The previous sections report the insights of authors who have done previous work on national incident reporting systems; however, subsequent paragraphs in this section will argue, in this author's own voice, the pertinent questions which remained to be asked or answered in the previous studies.

One question that needs to be asked is whether organizations do submit reports as regularly as they should to the regulators – the custodians of the national incident reporting systems. The main weakness of the focus on the national incident reporting system is the failure to address under-reporting, especially in developing countries like Malaysia. For example, in 2005, according to International Labour Organization's report of that year, India reported 220 fatalities nationwide while Czech Republic with 1% of India's work force reported 231. ILO estimated that the realistic figure for India should be 40,000 fatalities. Another problem with this approach is that it fails to take organizational learning into account. Because the focus is not on organizational incident reporting system, by the time the lessons learnt from the national system trickles down to the organizational level, it may be too little too late.

Yet, perhaps the most serious disadvantage of this focus is that although the regulators may use the data yielded from the national reporting system to focus on advocacy and sensitization, and even if the sensitizations result in reduction of incidents, there is no guarantee that it would lead to reduction in fatalities as figure 3.1 and 3.2 show.

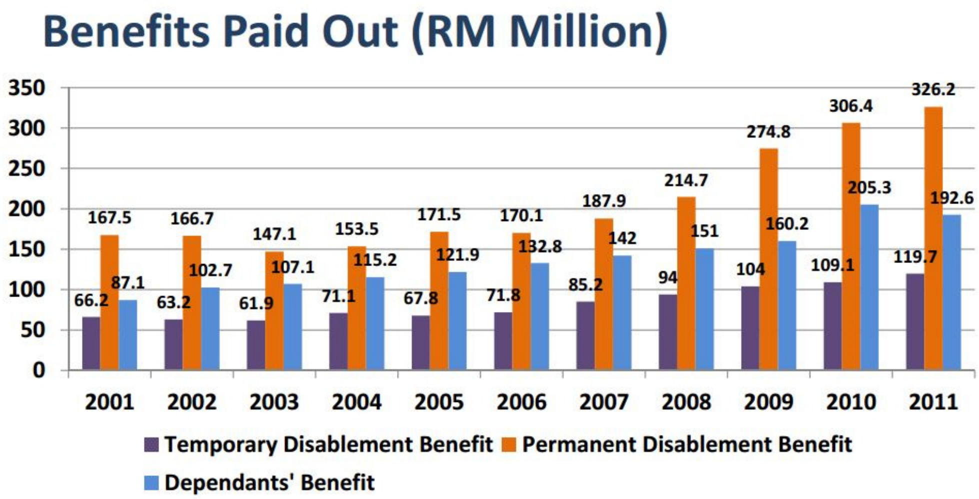

Figure 3.3: Increasing cost of incidents in Malaysia. Source, SOCSO

Since most approaches in the area of national incident reporting systems have only focused on the national systems - usually instituted by regulators – to exclusion of organizational incident reporting systems, the efficacy of these systems is problematic.

National incident reporting systems would have been more advantageous if they had included robust organizational systems in the equation and the results might have yielded better workplaces. To avoid that weakness, this study focused on the organizational incident reporting systems.

3.7 ORGANIZATIONAL INCIDENT REPORTING

The previous section discussed the weaknesses inherent in national incident reporting systems. This section will discuss why organizational incident reporting systems should be favoured over national incident reporting systems. This is because organizational incident reporting systems are at the heart of our understanding of safer workplaces. So it is one variable critical to the understanding of organizational safety culture and the flow of safety knowledge from incidents and the resulting reports. A considerable amount of literature has been published on organizational incident reporting systems. The large volume of published studies describes the role of the reporting systems in reducing unfavorable safety outcomes.

The first serious discussions and analyses of organizational incident reporting emerged in 1957 when Flanagan described critical incident technique to report incident in military aircraft training. Critical incident reporting involves reporting and documenting preventable incidents that could lead to adverse effects. The goal then was to gather qualitative data for future planning and prevention [51].

In consolidation, researchers and practitioners have introduced techniques supporting incident reporting systems within the organization. Like national incident reporting systems, organizational incident reporting focused on adverse events, near-misses and no-harm events. The inclusion of no harm events and near-misses offers several advantages. One, these types of events occur three to 300 times more than fatalities resulting from adverse events. Two it removes the psychological barrier associated non-reporting. Further, they do not attract much medical or legal consequence.

Barach [59] described organizational incident reporting as sharing the following features:

- *"they focus on near misses*
- *they provide incentives for voluntary reporting;*
- *they ensure confidentiality; and*
- *they emphasize systems approaches to error analysis."*

In some cases, reporting was promoted by some incentives including the following:

- "*immunity;*
- *confidentiality;*
- *outsourcing of report collation;*
- *rapid feedback to all involved and interested parties; and*
- *sustained leadership support.* [51]"

However, many authors contend that organizational incident reporting as presently constituted has not been without faults [28, 39, 60-72]. For example, Blake [73] points out that there are still barriers to incident reporting in organizations. Such barriers include, lack of anonymity, lack of feedback, the presence of fear and blame. Additionally, many analysts now argue that the practice of organizational incident reporting has not been successful. For example, argue that many incidents go unreported because some forms are too long, junior being afraid of reporting incidents involving their bosses, staff too busy to report incidents and so forth. On the whole, the organizational incident reporting practice has been strongly challenged in recent years by a number of writers due too many barriers it attracts. The most important of these criticisms is that of the lack of clarity of what to report.

The forgoing paragraphs discuss the views of authors who have done previous work on organizational incident reporting; however, in the following paragraphs this researcher will lend his voice to interrogate the pertinent questions which remain to be asked or answered in the previous studies. The researcher will also put forth his disagreements and agreements and the reasons why he holds such views.

A significant question that needs to be asked is what the previous studies have already interrogated and that is the question of barriers; which this researcher has collapsed into essentially a problem of anonymity and the complexity of the organizational incident reporting systems. For example, if a system insures anonymity, other problems such as the fear of bosses would be taken care of. Further, if the systems are simplified, the problems of staff being too busy and long forms would be solved.

As most studies in the domain of organizational incident reporting have pointed out barriers to incident reporting, it shows that these problems persistently recur and therefore have not been solved; although the automation application that will emerge from this research will be due to the best practice in the industry, solutions to the general barriers identified in the literature will be incorporated into the system.

3.8 INCIDENT REPORTING TECHNOLOGIES

Since the introduction of the critical incident technique by Flanagan [74] in 1954, recent developments in organizational safety have heightened the need for the understanding of evolution of incident reporting technologies [75]. Thus, another variable, critical to the understanding of safe workplaces is the technology which warehouses and handles the inflow and outflow of incident reports. A considerable amount of literature has been published on incident reporting technologies [51, 59, 74, 75]. The large volume of published studies describes the role of the technology in the effectiveness of incident reports.

As stated earlier the first serious discussions and analyses of technology emerged during the 1950s with majority of them favouring institutions of critical incident reporting systems in importing sectors. Such cerebral works include [74]. During the past decades much more information has become available on the role of incident reporting technologies in organizational safety [51, 73, 75].

In response, researchers and others have advanced trenchant arguments supporting the deployment of technologies in reporting incidents. Adler-Milstein, Walker, Beckmann and so forth all argued for the introduction of incident reporting technologies at workplaces. Thus, in keeping with such reasoning, they maintained that seem to correlate with better safety outcomes. However, many of the previous research findings into organizational incident reporting have *been* inconsistent and contradictory [51, 76, 77]. While a section of the researchers contend that the technologies are fast, efficient and accessible [2, 48-50], others argued that even organizational incident reporting, under-reporting is rampant: "these systems more often focus on incident outcomes, not categories. Few data describe the operation of these institution-specific systems, but underreporting appears endemic" [51].

Those who hold the position that incident reporting technologies are significant parts of safety conscious organization have many supporters. For instance, this view is supported by [50] who writes that technology driven reporting system should not only be used in the safety domain but would also be the wave of the future and it is the reason why United States Congress approved $30 billion for the purpose. In this light, [77] *discusses* the challenges and strategies for facilitating the creation good incident reporting technology within the organization. Mahajan [77] reminds us that the system must be anonymous, target different levels of analyses (i.e. high level information on the types of incidents and results of analysis of latent factors) and provide feedback to keep knowledge workers in the loop. Elsewhere, [51] writes that "incident reporting systems remain an important and relatively inexpensive means of capturing data on errors and adverse events."

3.9 Advantages and Disadvantages of Safety Incident Reporting Technologies

There are a myriad occurrences and adverse incidents which safety agencies encounter and deal with on everyday basis. These occurrences are often a very important source of information or data. These data indicate the time when a particular incident occurred, the location or place where the incident took place, the type of response carried out by a relevant agency to address the incident, and the report or information recorded by that agency via a manual or computer-based system during the emergency call that reported the incident [2, 78][2, 78][2, 78][2, 77][2, 64][2, 59][2, 59]. Naturally, the assortment of information collected needs to be processed and organized by relevant management personnel and systems in order for it to be of use. In the absence of a proper incident reporting system the safety agencies can be incapacitated and fail to effectively fulfill their responsibilities.

They might be able to collect the information but cannot be able to use it if it is not properly deciphered. The result could be an operational dysfunction; making it difficult for effective prophylactic strategies to be implemented so that a recurrence of similar incidents could be averted [79]. A comprehensive safety incident reporting system allows first responders and their respective agencies to use the available historical data to make informed strategies and decisions regarding future operations.

There is a variety of safety incident reporting software available out there which is replete with tools to help in making incident analysis. No two computer safety incident reporting technologies are the same. They are all as unique and designed to suit the organizations they serve. Usually an organization uses a computerized incident reporting system equipped with security codes and requirements, and only those who know them can be allowed to access its database [80].

The database may contain individual incident reports, property damage and injuries sustained, and evaluation of the total cost incurred as a result of the incident reported. Such databases are updated periodically although new incident reports are allowed to be submitted any time. The incident reports are often made on pre-formatted, standardized documents to provide uniform terminology in reporting, which ensures that appropriate entries are made. Some companies allow safety incident reports to be completed both manually and electronically. The person doing the reporting can make the choice.

3.9.1 Advantages and Disadvantages of Manual and Electronic Incident Reporting

Advantages of paper-based or manually compiled incident reports include a low clerical cost and increased validity in case of litigation. It is easy to trace who actually compiled and signed the manual report. Handwritten reports can also be a safeguard against forgery. It is not easy for a forger to accurately reproduce an individual's unique handwriting. However, these reports can also have disadvantages. Handwritten incident reports can be tedious and laborious. Besides not representing the agency or organization that generates them as being technologically advanced, these paper reports increase the workload of records departments [70]. Most narratives are handwritten after the incident has already taken place and are then attached to the manual face-sheet as an attempt to reinforce the authenticity of the report. These handwritten reports also have to be manually shuffled from one authorizing official or supervisor to another; increasing their chances of getting misplaced or lost in the process.

Other times the corrections that are supposed to be made are forgotten in the lengthy process and the data or information remains distorted. Paper-based incident reports processes are much slower than computer-generated reports. This means that information dissemination can be delayed and so can the design and implementation of appropriate strategies. There are also times when paper-based reports require re-typing to make them more legible. Another disadvantage of handwritten incident reports is that errors are generally more frequent than on computer-generated documents. Handwritten incident reports can also be illegible, which can result in distortion of the information being compiled; derailing strategic planning [81].

Advantages of electronic incident reports include the fact that they are immediately generated by the computer and are ready to be transmitted after completion. Using computer-generated reports improves the overall turnaround time. The time gaps between the creation of a particular report to its approval or rejection is significantly reduced in electronic reporting. The data on the report is available whenever it is needed. As soon as the report is saved on the computer that report can be made available immediately to whoever might request it. Reports can easily be transmitted to supervising officials and decisions are made instantly. Supervisors can have access to the reports wherever they are and authorize them. The auto-populate feature common to most of these reports reduces the possibility of duplicating data entry and almost entirely eliminates mistakes.

If a computer-generated report is rejected, it can easily be sent back to the office who initiated it and be corrected almost instantly. However, problems can also arise when using computer-generated incident reports. For example, the nature of incidents that require being reported may change over time and the technology or software required for reporting may need updating; which can be quite a costly endeavor for the organization. The newly updated technology might also create other problems such as establishing new ways of making incident reports without compromising standards. For instance, instead of using generic categories when making a safety incident report, the new software might require more specific categories and sub-categories. This also can increase the possibility of entry errors and low incident reporting precision. It is also possible that new software or hardware might be complicated and this could raise the potential for errors when entering the data. Another concern is the issue of hackers who can easily access computer information and steal it.

3.10 How Does Incident Reporting Correlate with Safety Outcomes?

Each nation or company has its own incident reporting system tailored according to the needs of its industries and people. Any benefits resulting from any incident reporting system are very much dependent upon its robustness, unambiguousness, and user-friendliness. Incident reporting helps organizations to effectively deal with occupational injury, illness as well as death. In other words, incident reporting can be perceived as a means of ensuring sustained quality improvement in any given organization. Nowhere is incident reporting more critical than in the healthcare industry in which the numbers of adverse incidents that need reporting are believed to occur at a higher rate than in any other sector. For example in the United Kingdom it was reported that approximately 850,000 adverse incidents reports are made each year; costing the National Health Services (NHS) over £2 billion each year [82]. To determine whether incident reporting correlates with safety outcomes, the Health and Safety Executive (HSE) conducted a study among five organizations namely, "a creamery, a construction site, a North Sea oil platform, a transport company and a National Health Service hospital" [83, 84].

The results of the study demonstrated that the organization which had one of the highest incident reporting rates; in this case, the National Health Service Hospital incurred significantly lower incident-related costs. This indicates that there is a correlation between incident reporting and overall safety outcomes. This, ultimately, lowers costs since unsafe places are always subject to high litigation and compensation costs. Enforcement of stringent incident reporting measures can help improve overall organizational safety. However, this is very much dependent on the commitment and leadership styles of middle and frontline managers and supervisors responsible for incident reporting in a given industry or organization.

In the United States, like the DOSH in Malaysia, the Occupational Safety and Health Administration (OSHA), a federal organization, was established in 1971 to work in partnership with individual states to assist employers and employees in reducing occupational injuries and deaths, and to maximize the safety of employees through incident reporting mechanisms. OSHA also conducts on-site inspections to determine the quality of work environments in different industries. Adverse incidents that occur in workplaces as a result of negligence are subject to employer penalty.

Since the establishment of OSHA in 1971 work-related death and injuries have been reduced by 60% across the nation. Certainly this attests to the fact that incident reporting is correlated with safety outcomes [85]. The Malaysian Incident Reporting and Learning System manual makes the insightful observation that incident reporting is "one of the accepted best practices for patient safety"[86]. Most adverse incidents do not occur randomly but are a result of dysfunctional organizational systems which can be rectified if they are reported and analyzed appropriately. The issues that need to be taken into account regarding incident reporting in order to maximize their effectiveness include sustained validation of information submitted in the reports. Through innovative and empowerment strategies these weaknesses can be reduced and safety can be further enhanced due to incident reporting systems.

3.11 Conclusion and Identification of the Gaps in the Literature

This chapter has given an account of and the reasons for a further study on organizational incident reporting. The chapter sets out to highlight major contributions to the study of the way incident reports yield safety knowledge and lead to reduction in adverse occurences; and the synthesis necessary to situate what has come before and what needs to be done in order to push back the frontiers of knowledge in this incident reporting domain.

The strengths and weaknesses of the previous studies have been reasoned out and the findings and syntheses in this chapter suggest that, in general, previous studies have deeply rooted the foundation in incident reporting but have not entirely answered the question of safety knowledge emanate from incident reports and how incident reporting systems are built based on organizational practices. Furthermore, the methods of some of those studies are flawed and the subsequent conclusions untenable.

Previous papers on incident reporting would have been more useful if they had included an explanation of how safety knowledge flows from incident reports. Also their conclusions might have been more interesting if the authors had factored in the taxonomy of incident reporting. The evidence from this review of literature suggests that the field would benefit if these gaps are filled.

This review contributes to existing knowledge of incident reporting and safety in workplaces by providing evidence that a focus on national incident reporting while excluding organizational systems have not always worked and that many incident reporting systems in organizations do not stem from the best safety practices in organizations. Although the current review is based on a small number of topics, they are the main topics essential to the understanding of incident reporting in organizations and the findings suggest that more research work is necessary. Notwithstanding these limitations, the study suggests that a gap in incident reporting technologies exists to be filled to further a more robust understanding of the relationship between incident reporting and safety at workplaces.

This review has thrown up many questions in need of further investigation; and in keeping with this finding, this researcher focused on three main objectives to answer these questions, namely, the interrogation of how safety knowledge flows from incident reports, the grouping of incident reporting processes and the development of an automation system. The table below provides a summary of the contributions, limitations and gaps of the previous studies. The next chapter will provide more details of steps taken and methods used to resolve the issue of the relationship between incident reporting and safety outcomes.

3.12 Chapter Summary

Throughout this chapter, we have gone through a summary of many of the reasons for the establishment and implementation of incident reporting systems within the government and commercial organizations including such areas as transportation, the military, health care, power generation operations, etc. The justification for these systems has arisen from the fact that it provides an opportunity for learning which can potentially assist organizations to become aware of the potential for accidents before they occur.

Additionally we have gone over many of the problems that arise with systems for reporting incidents. One of the main problems and we see is the trouble that arises in getting a wide range of individuals or agencies to cooperate and contribute into the system. The rest of this thesis is going to continue addressing all the problems that we identified within this chapter. What we hope to achieve by this is to make techniques available that will help companies and organizations fully come to realize the benefits which proponents of incident reporting systems claim. Other factors that are critical to take into consideration include those of system failure, weakness in management, and human error since they all have the capability of contributing some aspect to reported incidents. Chapter four delves into how this study was researched; the methods used to collect data, the data analysis techniques used and the rationale for choosing such techniques.

Table 3.1: Summary of Review of Literature

Author	Contribution	Limitations/gaps
(Flanagan, 1954)	Critical Incident Technique (CIT)	Not technology focused.
(Cullen et al., 1995)	Pointed out weaknesses in incident reporting systems	Did not provide and alternative
(Barach & Small, 2000)	Benefits of incident reporting	Did not show how safety knowledge flows from incident reporting
(Johnson, 2003; Tyler, 2007)	National/Regulatory Incident Reporting Systems	Did not dwell on the benefits of organizational incident reporting
(Adler-Milstein & Jha, 2012)	Benefits of organizational incident reporting technologies	Did not give methods of creating the incident reporting technology in organizations
(Mahajan, 2010)	Provides what the features of the incident reporting system	Stopped short of creating the system.

(Benn et al., 2009)	Created feedback based incident reporting system	Too limited and focused only on UK.

CHAPTER 4

METHODOLOGY

4.1 Chapter Overview

This chapter explains that this study, used a combined approach of qualitative and quantitative strategies were used to explore the research questions of this research. It also explains the rationale for choosing mixed method out of the three main approaches namely, qualitative, quantitative and mixed-methods. It also explains why the qualitative phase of the research used the case study tradition out the five main traditions of qualitative inquiry, grounded theory, phenomenology, ethnography, case and biography.

Qualitative research through data collected in six sectors, namely oil and gas, education, chemical, services, construction and manufacturing in Malaysia, enabled us to better understand how safety knowledge flows from incident reports. This research started by collecting and evaluating research literature. The study used a cluster sampling technique in the quantitative phase.

A semi-structured interview was used fusing grammar-target technique, content-unpacking technique, and storytelling to elicit data. Two-step clustering was used to make the large data tractable.

4.2 Research Approach: Mixed-Method

Broadly, a research undertaking is an "organized, systematic, critical scientific, data-based, objective, scientific inquiry or investigation into a specific problem, undertaken with the purpose of finding answers or solutions to it" [24, 25, 32]. It can be considered as an action with a purpose. This action commands the investigator to enquire about specific topics, or participants related to the research problem. A paradigm provides a basic belief system or frame that guides the investigator [25]. Although researchers can be implicit or explicit about their scientific paradigm, they are committed to its rules and standards for generating knowledge [32].

In this study, a combined approach of qualitative and quantitative strategies were used to explore the objectives of this research. The usual justification, for choosing a mixed research design approach is that it may capitalise on the strengths and resolve the weaknesses of each single method. Examining a research problem using multiple research design provides rich insight, because a problem is approached from differing perspectives, allowing the researcher to develop more accurate explanations of a phenomenon [27], [28]. To confirm this point, [29] suggest use of triangulation of the methods used to collect data. In addition, [30]comments that triangulation is a common approach which is merely using both qualitative and quantitative methods together. Triangulation allows a better understanding regarding the research phenomenon, as multiple research methods used increase the validity of the collected data and derived findings. The following sections describe this approach in detail.

4.3 A Multi-stage Research Design for this Research

In order to treat a problem properly, researchers have to employ an appropriate research methodology. This section therefore addresses the methodological issues of choosing an appropriate research design to collect data to address the research problem [27, 28].

A research design may be described as a series of decisions that, as a whole, form a strategy for answering the research questions and testing the hypotheses. Supporting this way of thinking, [25]view research design as a structured set of rational decision making choices, or guidelines, to assist in generating valid and reliable research results. A research design in a positivist setting covers decisions about the choice of data collection methods, and about measurement and scaling procedures, instruments, samples and data analysis [25]. A good research design must make sure that the information obtained is relevant to the research problem, and that it was collected by objective procedures.

A combined approach of qualitative case study and quantitative strategies were used to explore the objectives of this research. In this research, quantitative and qualitative methods were used in a complementary manner [27]. Quantitative research will enable us to test the relationship between the research model variables, and to provide evidence to support, or work against, the research hypotheses [27, 28, 89].

Qualitative research through a case study conducted in six sectors, namely oil and gas, education, chemical, services, construction and manufacturing in Malaysia, enabled us to better understand how safety knowledge flows from incident reports. It also provided us with up-to-date information about incident report best practices in the industries. This mixed approach completed the picture of incident reporting in

Malaysia. The sequence of the research process follows what [27] defines as "sequential procedures, in which the researcher seeks to elaborate on or expand the findings of one method with another method".[27] also states that "the study may begin with a quantitative method in which theories or concepts are tested, to be followed by a qualitative method involving detailed exploration of a few cases or individuals".

4.4 Mixed-method Approach: Purpose

The purpose of this sequential mixed methods study was to first explore and generate themes about organizations' use of and process of incident reporting in Malaysia using face-to-face interviews; then based on these themes, the second phase was to develop variables for quantitative data analysis together with the survey data collected.

4.4.1 Mixed-method Approach: Rationale

The rationale for using both qualitative and quantitative data was that useful quantitative dimensions of incident report process could best be developed only after a preliminary exploration of case studies of incident reporting processes in organizations.

4.5 Clustering for Data Analysis

The mixed methods design adopted for this study is only up to a point. After the data have been collected, charted and coded, the data were classified into clusters using 2-way clustering technique. Clustering technique is like factor analysis; the main difference is, while factor analysis targets variables, the clustering analysis is concerned with cases.

4.6 Characteristics of the Sample

The initial sample consisted of 300 companies - randomly taken from different professional or government directories - of whom 51 did not respond; of 249 that responded, 45 did not complete all of the interviews, leaving 204 cases for the final analysis. All the interviewees were HSE personnel in the respective firms. All of the participants had been in the HSE department one year or more. The study used a cluster sampling technique.

4.7 Cluster Sampling

To date, various methods have been developed and introduced to obtain samples from a population such as stratified sampling, random sampling, haphazard sampling, convenient sampling, and so forth. Each has its advantages and weaknesses. Since data were gathered from multiple sources at various time points during the 2011–2012 academic session, it was decided to use cluster sampling, since unlike stratified sampling technique, the cases do not need to be homogenous [90]. In cluster sampling technique the population that is to be sampled is subdivided into clusters.

A cluster can be as heterogeneous as possible to the corresponding the population. Thereafter, a random sample is then taken from one or more of the clusters. In this research, companies in Malaysia were the members of the population. The population was then clustered into six subgroups namely, manufacturing companies, chemical companies, construction firms, academic institutions, oil and gas and information technology/services.

For each cluster, an appropriate directory which features phone numbers and email addresses of the companies was located. From these directories, random numbers were generated using the Excel function:

=RAND()

The formula was then modified to obtain the range of cases that was desired from the cluster, for example if random numbers from one to 50 was desired from the construction cluster, the following formula was used:

=INT(50*RAND())+1

All the sectors went through this random sampling until 300 cases taken from different sectors was attained.

4.8 Interview Method

Semi structured interviews were conducted with the HSE officers. The protocols for the interviews adopted for this study, are due to [62] and [91]

In the field of information systems there is often a dichotomy between content unpacking questions and process unpacking questions. 'What' and 'why' are said to unpack content while 'how' elicit the tacit process as explained further in the sections below.

4.8.1 'Why': Unpacking Content

The use of why? Why? prompts technique to press the line of enquiry to several stages removed from the immediate causal factor was identified in the air accident investigation literature [92]as a useful field aid, which were trialed during pilot studies at UTP and other identified sites. [92] suggests that the WHY question should be posed at least five times for each line of enquiry in aviation, but even three repetitions have proven to be adequate; as used in [62] with owner-operator farms in New Zealand. The pilot study of this research also revealed that three repetitions were adequate.

4.8.2 'How': The Grammar Targeted Interview

The grammar-targeted interview method acknowledges the dynamic relationship between what people say and how they say it. Research in linguistics suggests that we are not typically conscious of how we use grammar to construe meaning, even though we use language to make complex meanings. Most interview methods within Information Systems and particularly within the area of Knowledge Elicitation apply content-targeted strategies. The focus of the grammar-targeted method is, however, on process.

If we map the notions of content and process to SFL, content refers to semantics and process to lexico-grammar and phonology.

Table 4.1: Question type differs when addressing content and process **[91].**

Content	what we say	hidden knowledge	question unpacking content - 'what'/'why'

Process	how we say it	tacit knowledge	question unpacking grammar - 'how'

The aim of the grammar-targeted interview method is to achieve a more elaborated description of a person's knowledge than can be achieved by a content-targeted strategy [91].

Bearing in mind the advantages of both content unpacking questions and process unpacking questions, it is decided that both will be used in this study; for, the aims of the research emcompass both content and process. A modification of the Why? Why? prompts and grammar targeted strategy were used at the interview sites. It is hoped that the investigation method will provide a workable systematic framework for discussing, analysing and recording events and the factors behind them. It is also hoped that the participative re-examination of the process will allow pre-existing causal schema [91] to be reviewed and confirmation bias reduced. The structured approach will also draw out important information that was so obvious to the respondent that they may well have omitted to mention it.

4.9 Story Telling

The final step in the interview process is story telling about at least one incident that has happened before in the organization; how the case was reported, what process it went through, the resolution and so forth. In telling the story, other salient points that might been otherwise forgotten could come to fore.

Experts are increasingly using story-telling techniques in communicating about business [93]. It is easy to illustrate how people warm up to stories by observing speakers who alternate between prepared speeches and story-telling. Whenever a speaker finishes a story and goes back to prepared speech, the audience usually returns to fidgeting [94]. A story could have many propositions and still be shorter, simpler, and easier to understand and remember compared to non narrative techniques. “Because stories draw their effectiveness from an ancient resource - the power of social dynamics - they are deeper, and more compelling compared to non narrative text. When we read the story, we create an image in our minds that is whole and internally consistent, and we can use that image as a setting for any points that are made”[94].

Social communities and organizations still use the tradition of oral narration to pass down wisdom, learning or insight and big corporations around the world are using it effectively to change their business mindset in their effort to improve their knowledge mobility and practice. Aiming to improve access to knowledge globally within its organization, Shell International Exploration and Production's Organizational Performance and Learning (OPAL) team argues that “the power of a good story well told can inspire innovation, personal challenge and professional breakthrough. Stories can encourage us to change, to think `out of our boxes', to seek the aid of others in leveraging our own efforts. For these reasons we have embraced story-telling within Shell Exploration and Production as a means of helping shape our knowledge-sharing culture” [93].

4.9.1 Charting

All the information from the interview was charted using a systematic charting technique due to [95]. The resulting flow charts are easier to interpret than the notes taken from the interview. It is also easier to see how the incident report and its carriers move within the organization. See section of results chapter for more information of the charting.

4.9.2 Transforming the Charts into Quantifiable Variables

Subsequently, the charts were coded into numerical variables. However, in order to remove bias, a group of postgraduate students of UniversitiTeknologi PETRONAS were given the charts and the coding protocol to carry out the coding.

From the literature e.g. [96] and from the nature of the incident reporting in Malaysia, five variables were identified; these variables are entities or persons who partake in the safety knowledge dynamics of the incident reporting in a firm. The variables are victim involvement, management involvement, HSE involvement, HR involvement and regulators involvement.

The numerical values came about from how involved the entities were in the incident reporting in the organization. Therefore, if the researcher needed to know how involved HSE department was in the incident reporting in Company X, the incident reporting chart for that company was consulted and the steps of the movement of HSE in the chart counted. For example, if from start to finish, the HSE participated only three times (e.g. by interviewing the victim, by filing the case and by reporting to management), numerical value 3, would be assigned to the variable HSE involvement for Company X. See section …of the results chapter for more discussion on transcoding.

4.9.3 Safety Outcome

To measure the safety outcome, each company that was interviewed started with a safety outcome score of 100. Afterwards, three marks were removed for every unfavourable safety outcome. Unfavourable safety outcomes were operationalized as a. near misses, b. accidents and c. number of work days missed as a result of unfavourable safety outcomes. Only unfavourable safety outcomes for the year 2011 were considered. Therefore, if a company had had three accidents and four near-misses, the safety outcome of that company was calculated as:

Safety Outcome = 100 - (3 x 3) + (4 x 3)

= 100 – 21

= 79

4.10 Classification and Clustering Technique for Data Analysis

Keying out groups of individuals or objects that are similar to each other but different from individuals in other groups can be intellectually satisfying, profitable, or sometimes both. Clustering analysis is used in different field to show similarities between groups. In busisness it is used “to target offers to subgroups that are most likely to be receptive to them. Based on scores on psychological inventories, you can cluster patients into subgroups that have similar response patterns” [97]. In cluster analysis, the researcher does not know beforehand which case belongs in which group. Also, the number of groups is not known.

Different authors have undertaken clustering analysis in a variety of ways; however, clustering analysis is conducted in three main ways: hierarchical clustering, k-means clustering and two-step clustering. Each has its advantages and drawbacks [97].

4.10.1 Hierarchical Clustering

For hierarchical clustering, you choose a statistic that quantifies how far apart (or similar) two cases are. Then you select a method for forming the groups. Because you can have as many clusters as you do cases (not a useful solution!), your last step is to determine how many clusters you need to represent your data. You do this by looking at how similar clusters are when you create additional clusters or collapse existing ones.

4.10.2 K-means Clustering

In k-means clustering, you select the number of clusters you want. The algorithm iteratively estimates the cluster means and assigns each case to the cluster for which its distance to the cluster mean is the smallest.

4.10.3 Two-step Clustering

In two-step clustering, to make large problems tractable, in the first step, cases are assigned to "preclusters." In the second step, the preclusters are clustered using the hierarchical clustering algorithm. You can specify the number of clusters you want or let the algorithm decide based on preselected criteria.

The term cluster analysis does not identify a particular statistical method or model, as do discriminant analysis, factor analysis, and regression. You often don't have to make any assumptions about the underlying distribution of the data. Using cluster analysis, you can also form groups of related variables, similar to what you do in factor analysis. There are numerous ways you can sort cases into groups. The choice of a method depends on, among other things, the size of the data file. Methods commonly used for small data sets are impractical for data files with thousands of cases.

For this study, two-step technique was used to analyze the data because due to the nature of the data, it was the most suitable: one, the data set is relatively large, two, it makes large problems tractable and it accommodates both categorical and continuous data [97].

4.11 Chapter Summary

This chapter explains that this study used a combined approach of qualitative case study and quantitative strategies were used to explore the objectives of this research. Triangulation allows a better understanding regarding the research phenomenon, as multiple research methods used increase the validity of the collected data and derived findings. This section therefore addresses the methodological issues of choosing an appropriate research design to collect data to address the research problem.

Qualitative research through a case study conducted in six sectors, namely oil and gas, education, chemical, services, construction and manufacturing in Malaysia, enabled us to better understand how safety knowledge flows from incident reports. This research started by collecting and evaluating research literature. The study used a cluster sampling technique. A semi-structured interview was used fusing grammar target technique, content unpacking technique, and storytelling to elicit data. Two-step clustering was used to make the large data tractable. The next chapter discusses the results of the methods used in this chapter.

The chapter elaborates on the research methods used for this research. It explained that mixed-method approach was used as the overarching research strategy and the rationale for choosing the approach. It also explained that case study method was used for the first phase of the research. The fusion of “why why” technique, grammar targeted interview and story techniques was used for data collection. Finally it told of how the interview data collected from the companies were charted and later clustered using the two-step clustering technique. Figure 4.1 shows the flow of the research. The next chapter discusses the results obtained from the implementation of methods used in this chapter.

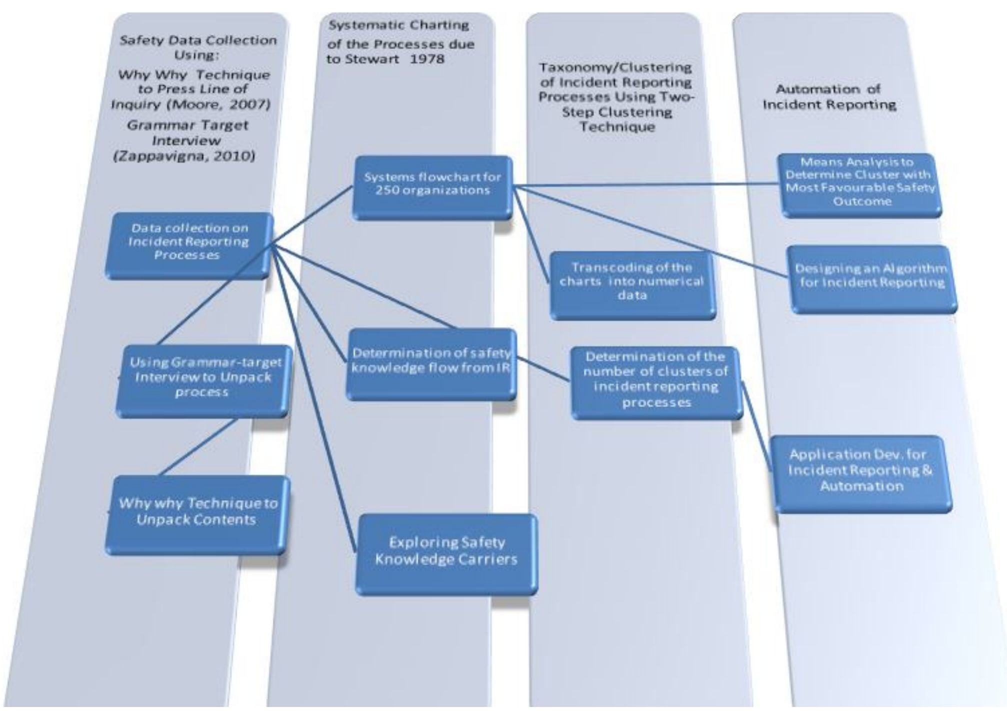

Figure 4.1: Research Framework

CHAPTER 5

RESULTS

5.1 Chapter Overview

This research sets out to answer five central research questions. The first one was to explore how safety knowledge flows from incident reporting process in Malaysia. The second was to produce a taxonomy i.e. to discover the classification of incident reporting processes in Malaysia. The third was to determine the more favourable incident reporting process out of the possible classes yielded in the second research question. The fourth was to design an algorithm based on the more favourable incident reporting process which the third question yielded. The fifth was to produce an application based on the results of question four to automate incident reporting process in Malaysia.

This chapter reports the result of all the five research questions explored and determined in this research.

5.2 Charting: Extraction of Safety Knowledge from Incident Reporting Process

On the question of how safety knowledge is extracted from incident reporting process in Malaysia, all the information from the interview was charted using a systematic charting technique due to [92]. The resulting flow charts are easier to interpret than the notes taken from the interview. It is also easier to see how the incident report and its carriers move within the organization. As explained in section 4.9.1of the methodology chapter, figure 5.1 shows a chart obtained from one of the interviews.

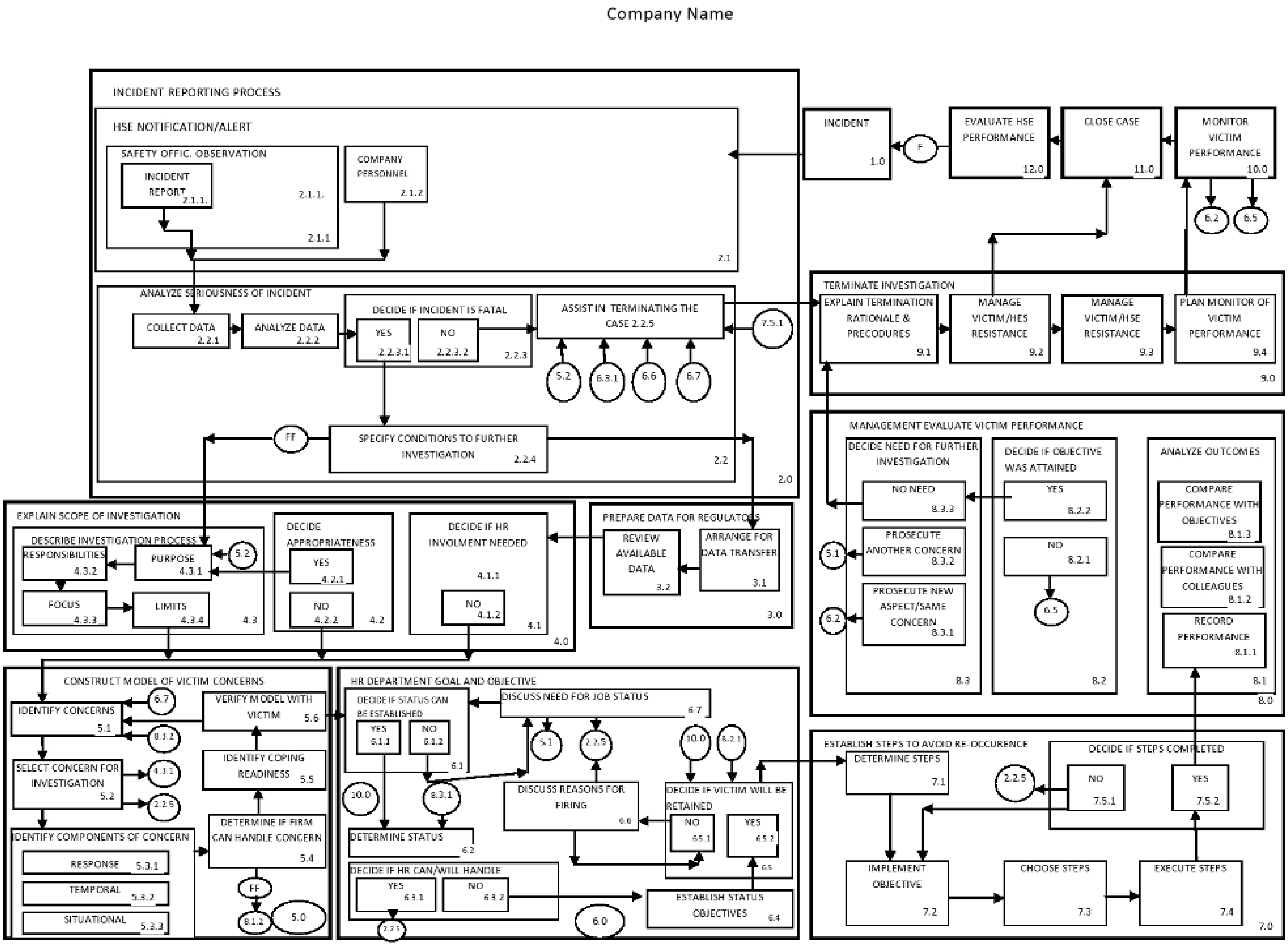

Figure 5.1: A flow chart of incident reporting process in Malaysia.

5.3 Movement of safety knowledge through incident reporting process

An analysis of the charts produced from several case studies of incident reporting process in Malaysian organizations produced four basic components and five knowledge carriers necessary for safety knowledge extraction from incident reports. Figure 5.2 shows the basic components necessary for safety knowledge extraction.

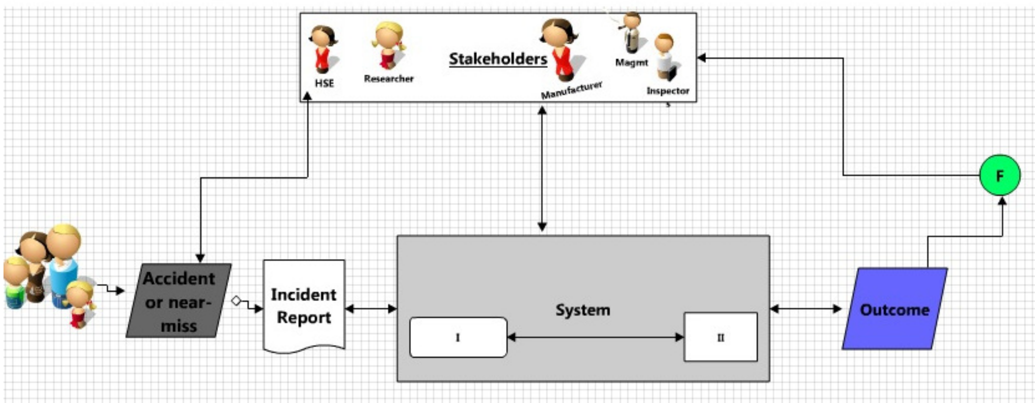

Figure 5.2: Basic components and carriers necessary for safety knowledge extraction

Basic Components of the incident report knowledge transfer process

The extraction process has four basic components. They consist of:

1. The incident report
2. The stakeholders (researchers, safety inspectors, machine manufacturers, government agencies, professional bodies, and so forth.)
3. The safety knowledge transfer system
4. The outcomes of the safety transfer system

   All above components – whether they are people or artifacts - make their inputs in the extraction of safety knowledge. Below is an explanation of each component.

5.3.1 Incident Report Input

The incident report input brings into the system not only the nature of the accident or near-miss but also problems and concerns about machines, structures and operations; including how prone some locations, certain researchers and materials are to incidents. These provide a lot of background and direction towards safety culture in the organization. The particular way these materials and persons are integrated gives the incident or set of incidents a pattern. Thus, the stakeholders must be prepared to respond to the patterns of the incidents.

5.3.2 Stakeholders' Input

Besides the incident reports, the stakeholders too, input certain skills, knowledge, and attitudes into the system. For example, the Health Safety and Environment (HSE) manager must institute an effective procedure on passing the information about the incident to other stakeholders and to develop a sound human relationship with the victim that is based on trust, understanding, and respect. A professional relationship must be established with the victim regardless of the victim's behaviour, attitudes, creeds, race, sex, or socioeconomic status so that further details about the incident could come to light. Further, safety inspectors must monitor the trend of incidents in organizations and classify type, nature, severity and other information into categories to help them modify or enforce the existing rules. Researchers in the institution have the responsibility for being competent in the use of those tools, techniques, and strategies demanded by the safety culture. These include such skills as observation, testing, operation and the use of a variety of other safety techniques.

5.3.3 The Safety System

The inputs made by the stakeholders and incident reports interact within the safety system. The type of interaction that takes place depends upon the nature of the safety system used by the institution and the calibre of inputs made into this system by the stakeholders and incident reports.

For example, a particular safety system may not be appropriate for an incident of a certain department or from a particular service. For other incidents, the system may be adequate but the stakeholders may not be able to control or efficiently input their own input sufficiently to enable safety knowledge move from one stage of the transfer to another. The stakeholders may be "turned off" by the frequency or natures of the incidents experienced by an individual or department and thus lose sight of professional responsibilities. A stakeholder may fail to make the type of inputs into the system that would make safety knowledge transfer a facilitative process.

The type of interaction that takes place within a safety knowledge transfer system also depends upon the input into the system made by the incident reports. The report may not be sufficiently detailed enough to facilitate the extraction of safety knowledge into the system. Or, the victim may be deceptive or dishonest in communications with an HSE department. Inputs can be used to the advantage of the organization if the stakeholders utilize a safety knowledge transfer system that has the capability of providing guidelines for working with a wide range of materials and persons, and if the HSE department has the appropriate skills, knowledge, and attitudes to input into the safety knowledge transfer system. It is the primary responsibility of the HSE and not the victim to provide the necessary conditions for effective human interaction.

5.3.4 Safety Knowledge Outcomes

The last basic component of the safety knowledge transfer from incident report is the output or outcomes of the interaction between the stakeholders and incidents that have taken place within the safety knowledge transfer system used by the organization. Any time incidents happen and the HSE and incident reports engage in the knowledge transfer process there is some kind of outcome as a product of their interaction. This is the "payoff'" of the safety process and the HSE "moment of truth".

The outcomes of safety system can be positive or negative for the research institution. For the institution which attains the goals established in the system design, the outcomes represent a rewarding experience. Perhaps the organization has made a decision that will change some machines or structures in the organization. The organization may have obtained information that will help in getting a certain job done safely. Or, perhaps the organization has learned how employees can handle certain procedural situations. Whatever outcome emanates from the safety system, the stakeholders receive it as a feedback; this is shown by the letter F in figure 5.3. The feedback informs the stakeholders whether to modify the system, leave it as it is or change the system. The stakeholders also use the feedback to fashion products and services towards an optimum safety system.

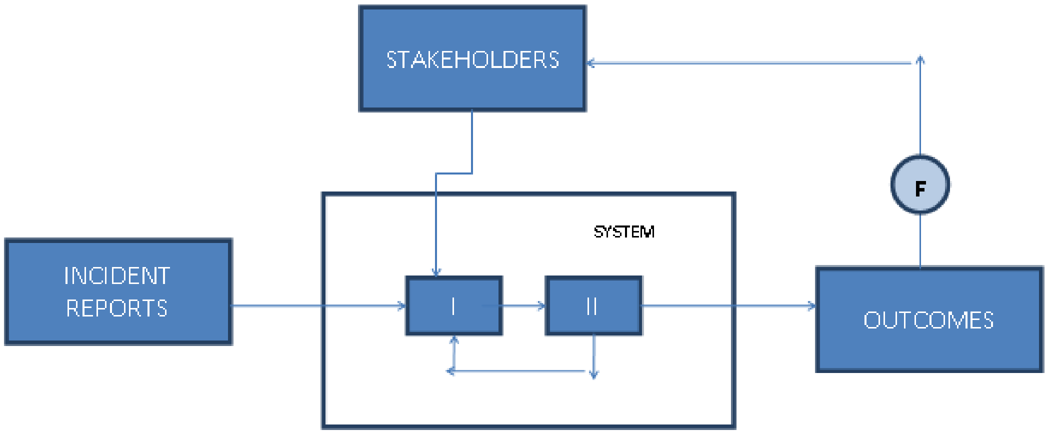

Figure 5.3: How safety knowledge moves within organizations

Figure 5.3 shows a clearer picture of figure 5.2 and it can be easily turned into a model. Following are the explanations of the different labels.

The schema shown in figure 5.3 shows that employees error is recognized as a constant condition that will be demonstrated to some degree by all employees. That is, the schema accepts that employees will make mistakes and will have to encounter accidents or near-misses. Thus, the Health, Safety and Environment (HSE) officer/manager who may have more knowledge on safety issues among the stakeholders and who is the first person to be notified when and incident occurs, must be ready to use the safety system to handle the error.

Note that the safety system contains two smaller boxes. They represent the stages incident reports pass through; the relationship between the stages are indicated by the arrows. The initial interaction among the incident reports and stakeholders (among who are, HSE officer, medical personel, regulating agenciesand the victim) take place within Stage I as each make an input input into the system. In the event that investigations progresses beyond the first stage, interactions of a different kind are invoked in Stage II. In the event that an error is recognized in Stage II, the HSE officer can recycle to Stage I and correct the error. The arrows from Stage II back to stage I symbolize this concept. For instance if the HSE officer noticed that an injury was not properly reflected in the incident report when it reached Stage I, it will be necessary to recycle back to Stage I to correct the mistakes.

The interaction in the system leads to safety outcomes (favourable or unfavourable); these outcomes are used as feedback (letter F in figure 5.3) by the stakeholders, so that with this new knowledge, they can impact on the safety system whenever any new incident report comes in.

5.4 Clustering of Incident Reporting

To answer the second research question of how many clusters are formed by the various incident reporting processes, SPSS Two-Step Cluster solution was undertaken. Primarily, we are interested in knowing the number of clusters at which Schwarz Bayesian Criterion (BIC) becomes small and the change in BIC between adjacent number of clusters is small. In this analysis, three clusters were yielded. The final cluster solution is shown in Table 5.1. The table shows that the largest cluster has 44.1% of the clustered cases and the other remaining two have almost equiv

Cluster Distribution

		N	% of Combined	% of Total
Cluster	1	90	44.1%	44.1%
	2	58	28.4%	28.4%
	3	56	27.5%	27.5%
	Combined	204	100.0%	100.0%

Figure 5.4: Three types of incident reporting processes

5.5 Examining the Composition of the Clusters

In order to determine how the clusters differ, a cross-tabulations and bar charts of the distribution of the categorical variables within each cluster were plotted. Figure 5.2 shows the percentage of regions in each of the clusters. It can be seen that region distribution in all the clusters is dissimilar to the overall distribution. Therefore, region is an important variable in forming the clusters. North Malaysia features prominently in cluster 3 but did not feature at all in cluster 1. While East Malaysia has the highest percentage in cluster 1, it virtually disappeared in cluster 3. Sabah and Sarawak have less than 10 percent in cluster 2 and 3 but features highly in cluster 1. Furtl while South Malaysia

feature:

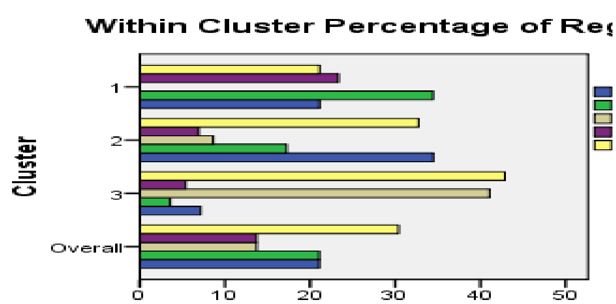

Figure 5.5: Distribution of regions within clusters

Also, it can be seen that sector distribution in all the clusters is dissimilar to the overall distribution. Therefore, sector seems to be an important variable in forming the clusters. Manufacturing features prominently in cluster 3 but did not feature at all in cluster 2. While Information technology and services sector has the highest percentage in cluster 1 and 2, it is not prominent in cluster 3. The chemical sector has less than 10 percent in cluster 2 and 3 but features moderately in cluster 1. Further, the percentage of oil and gas sector ranges from moderate to high in all the three clusters.

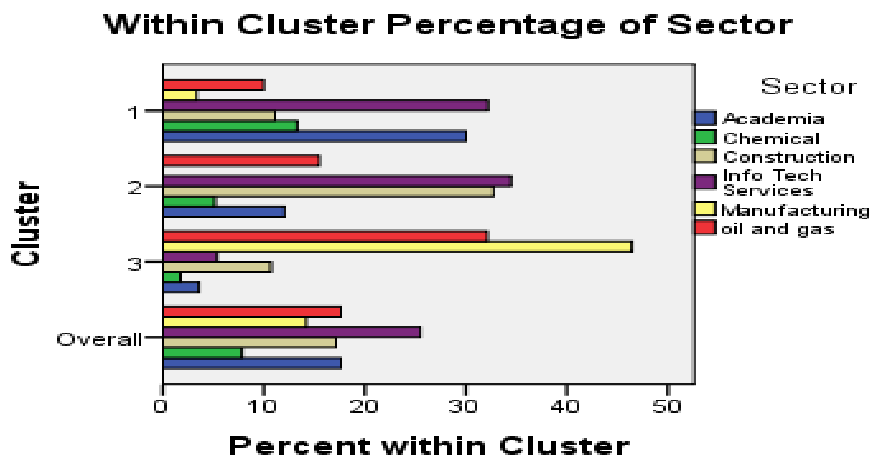

Figure 5.8: Distribution of sectors within clusters

Also, it can be seen that size distribution in all the clusters is dissimilar to the overall distribution. Therefore, **Figure 5.9** shows that size is probably an important variable in forming the clusters. Cluster 1 has only size red companies which are defined as large. Large companies also feature prominently in cluster 3 but have the lowest percentage in cluster 2. The most prominent size in cluster 2 is blue (medium size companies); while the most prominent in cluster 3 is green i.e. the small sized companies.

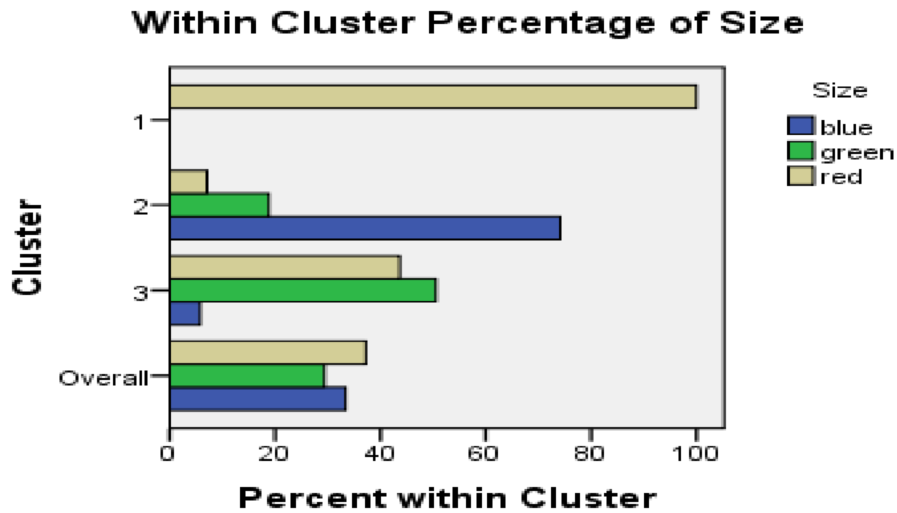

Figure 5.9: Distribution of organizational sizes within the three clusters

To determine the composition of the clusters using the continuous variables i.e. HSE involvement, management involvement, victim involvement, HR involvement, and regulator involvement, a plot of the means for each group was plotted. Figures 5.11 to 5.15 show within-cluster percentage of the company's five variables.

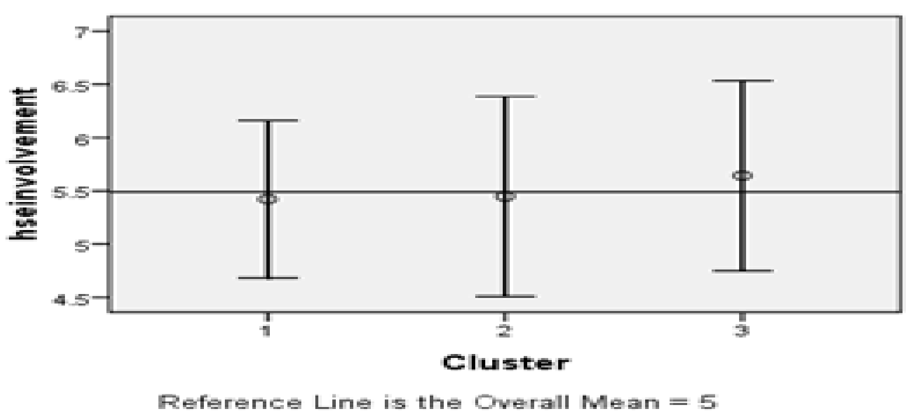

Figure 5.10: Within cluster percentage of HSE involvement

Figure 5.11: Within cluster percentage of HR involvement

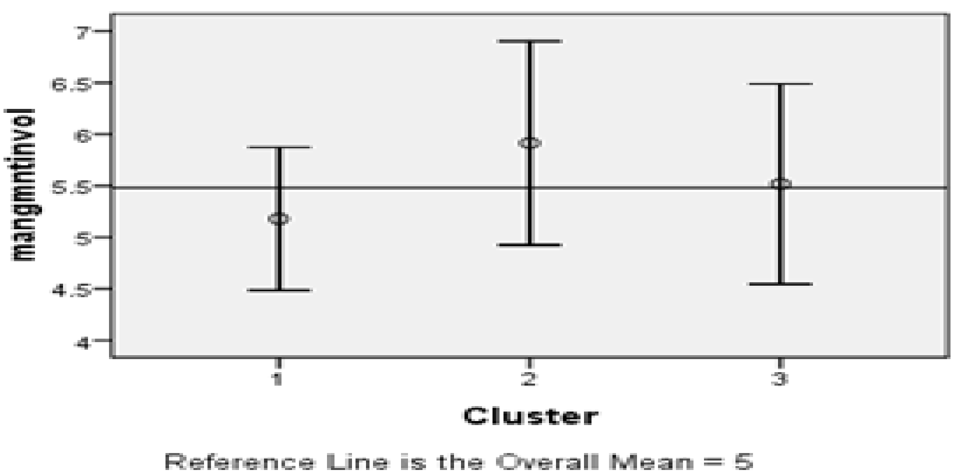

Figure 5.12: Within cluster percentage of management involvement

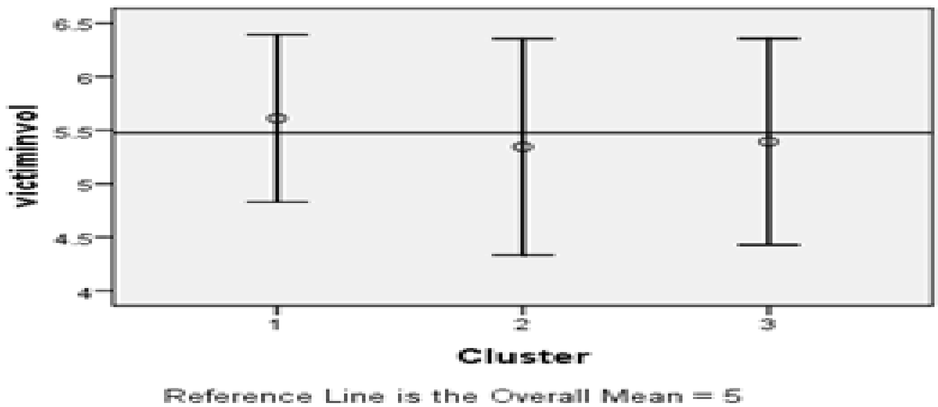

Figure 5.13: Within cluster percentage of victim involvement

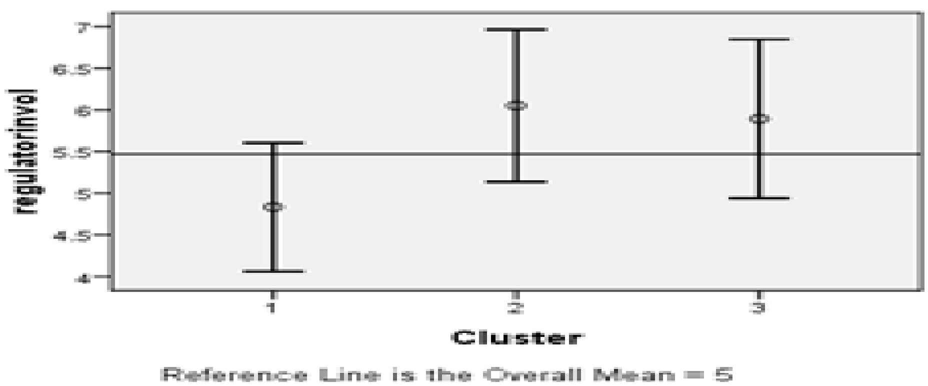

Figure 5.14: Within cluster percentage of regulator involvement

Figure 5.11 to 5.15 show that for the regulator and management involvement, the average mean is higher for second cluster. For HSE involvement, the average mean is higher for cluster 3. There are almost no differences in average means of the clusters in the victim involvement variable. Similarly, for the HR involvement, clusters two and 3 have similar means. This shows that HSE involvement, management involvement, and regulator involvement are important variables in forming the clusters.

5.6 Examining the Importance of Individual Variables

When clustering cases, it is important to know how significant specific variables are for the formation of the clusters. In the case of categorical variables, SPSS computes a chi-square value which compares the actual observed values for a variable within a cluster and the overall distribution of values. Figures 5.16-5.18 are plots of the chi-square statistics for size, sector and region.

5.6.1 Importance of Region

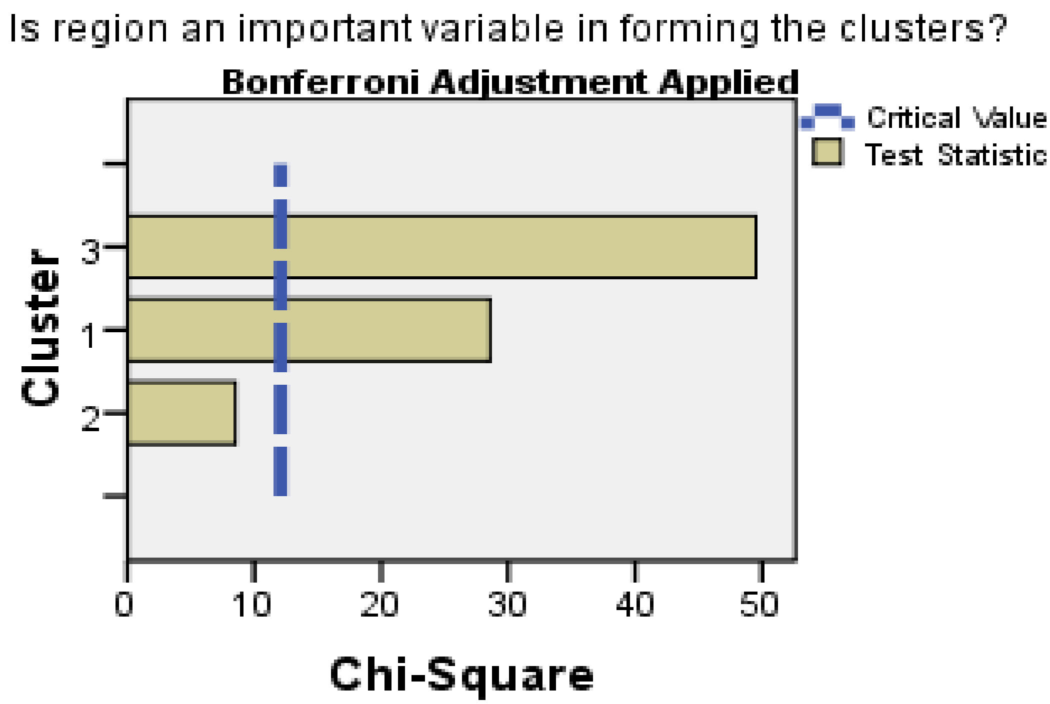

Figure 5.15: Importance of region to cluster formation

5.6.2 Importance of Sector

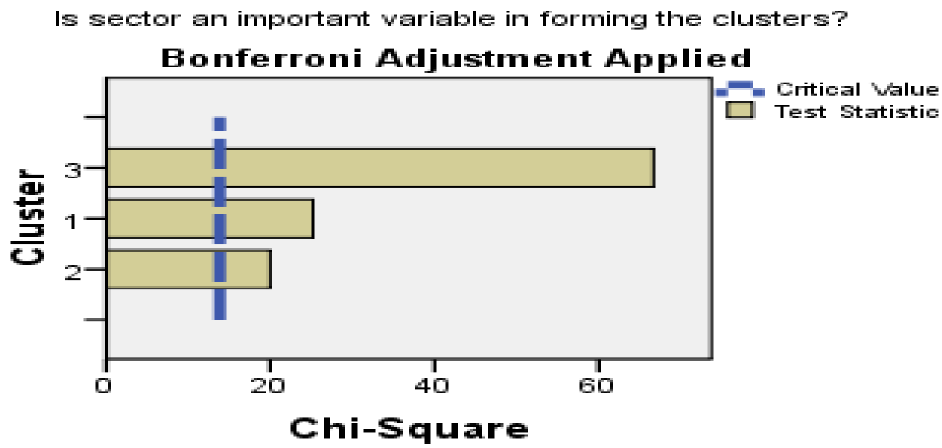

Figure 5.16: Importance of sector to cluster formation

5.6.3 Importance of Size

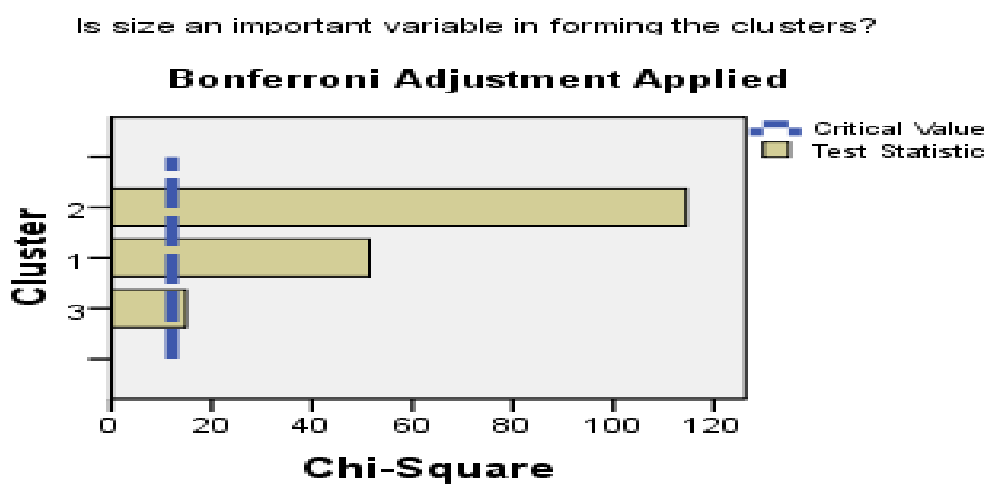

Figure 5.17: Importance of company size to cluster formation

Within each cluster, the observed distribution is compared to an expected distribution based on all cases. Large values of the statistic for a cluster indicate that the distribution of the variable in the cluster differs from the overall distribution. The critical value line that is drawn provides some notion of how dissimilar each cluster is from the average. Whereas a greater absolute value of the statistic for a cluster and a less critical value indicates that the variable is probably of importance in distinguishing that cluster from the others, Figures 5.16-5.18 show that the absolute value is greater than the critical value for all the variables (size, sector and region) and for the clusters 1 and 2. It is only the test statistic of cluster 2 that is less than the critical value in the region variable. This seems to show that region is not as important in forming the clusters as sector and size are in cluster formation.

5.6.4 Importance of HSE

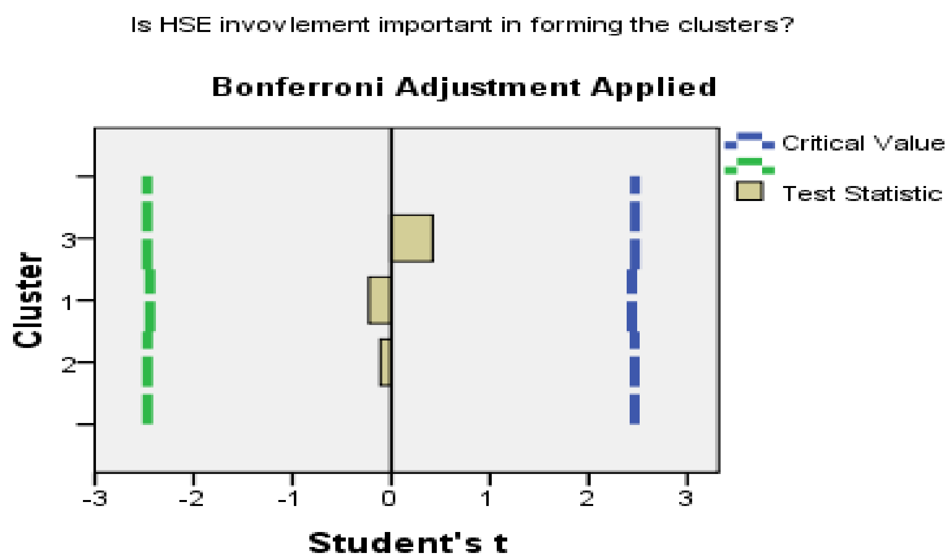

Figure 5.18: Importance of HSE involvement to cluster formation

5.6.5 Importance of HR

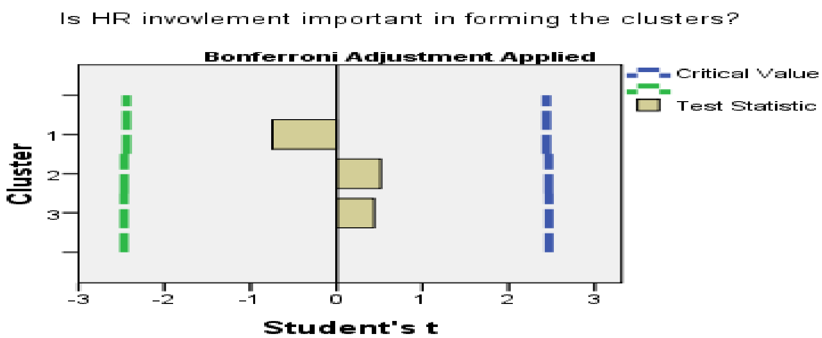

Figure 5.19: Importance of HR involvement to cluster formation

5.6.6 Importance of Regulator

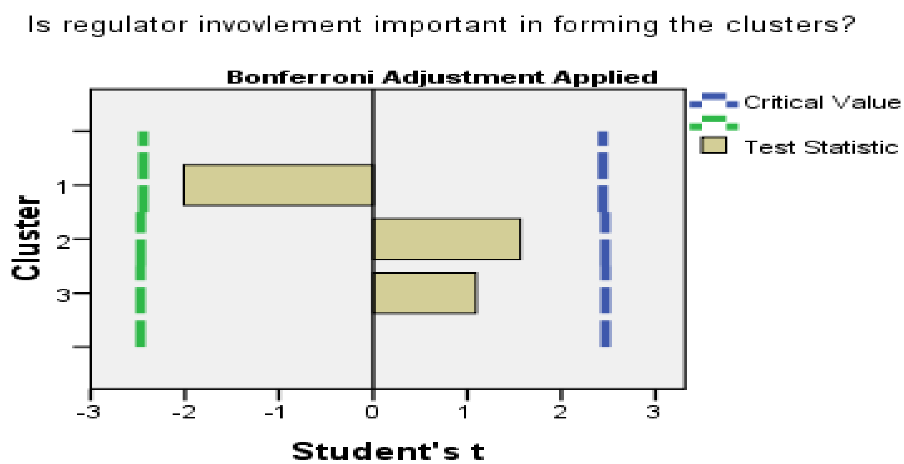

Figure 5.20: Importance of regulator involvement to cluster formation

5.6.7 Importance of Victim

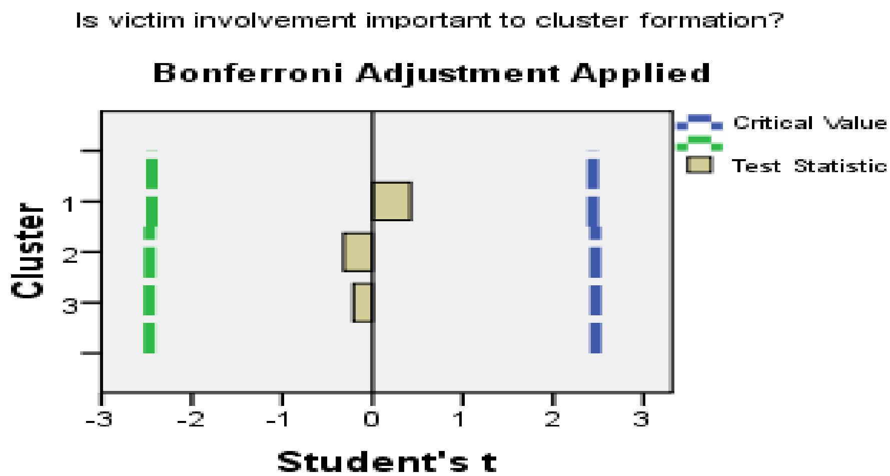

Figure 5.21: Importance of victim involvement to cluster formation

5.6.8 Importance of Management

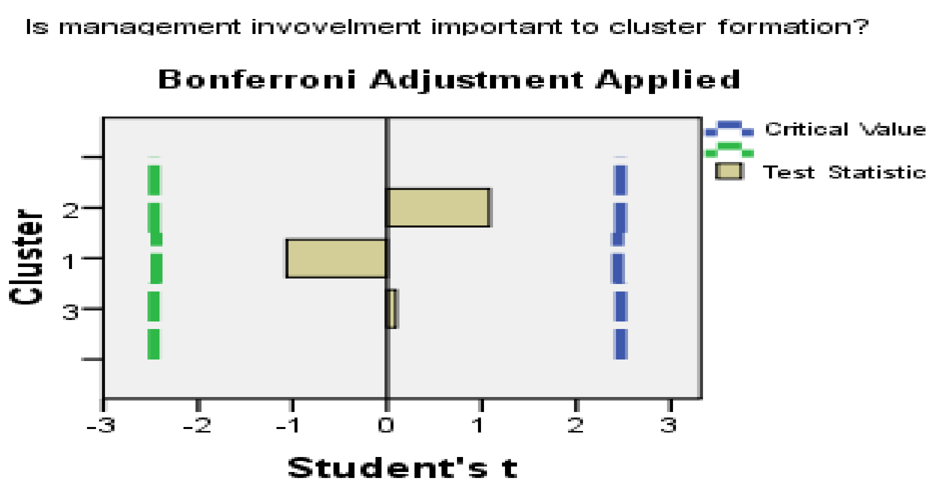

Figure 5.22: Importance of management involvement to cluster formation

However, in the case of continuous variables, rather than plots of chi-square values, one gets plots oft statistics which compare the mean of the variable in the cluster to the overall mean. Figures5.19 – 5.23 show the average score of victims, management, HSE, HR and regulators' involvement for the three clusters. It can be seen that the averages of those five variables are not statistically different for the three clusters, since the values of the test statistics are less than the critical value for each of the clusters. This seems to show that all these five continuous variables are not important in cluster formation.

5.7 Examining All Categorical and Continuous Variables within a Cluster

After presenting summaries and bird-eye views of all variables in all the three clusters combined, this section looks at individual clusters and the variables which characterize them.

5.7.1 Categorical Variables

Rather than tailing every single variable across all clusters, the researcher looked at the composition of each cluster. Figures 5.24 – 5.26 show the categorical variables that make up clusters 1, 2 and 3. But first, **Figure 5.23: 3D Histogram of the distribution of cases** shows distribution of cases across variables. It can be seen that the distributions of sector, region and the size of a company are different for all the clusters. It appears that all the clusters are statistically different as far as these variables are concerned.

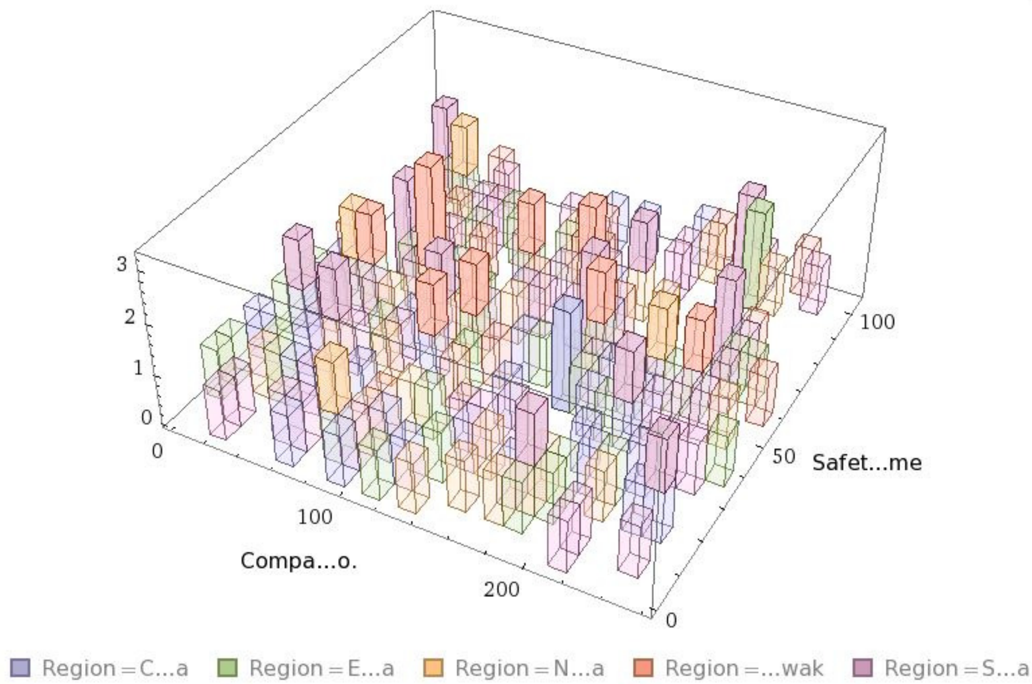

Figure 5.23: 3D Histogram of the distribution of cases

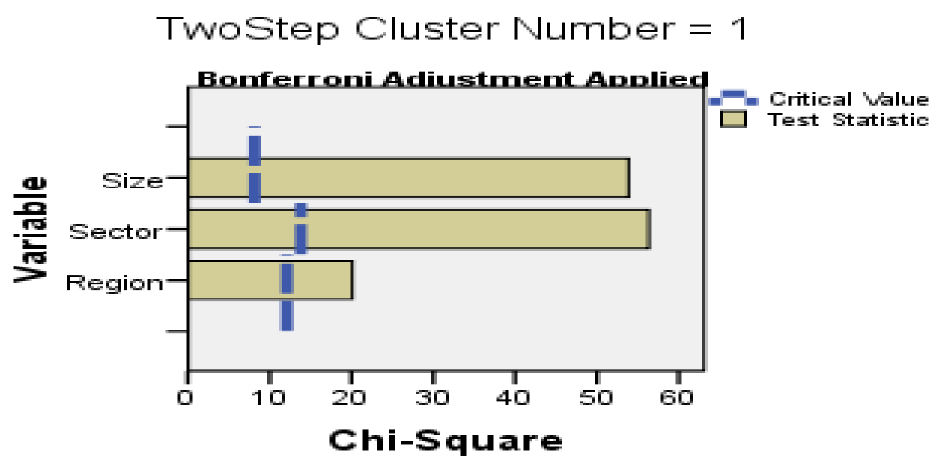

Figure 5.24: Categorical variables within cluster 1

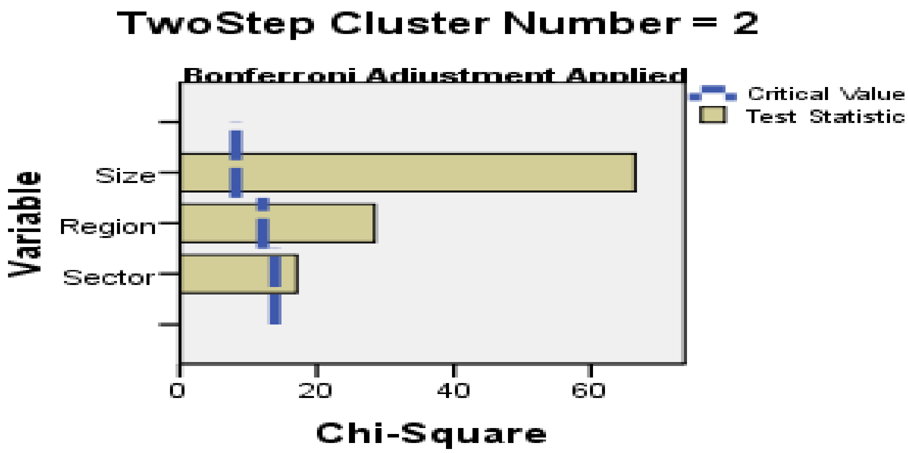

Figure 5.25: Categorical variables within cluster 2

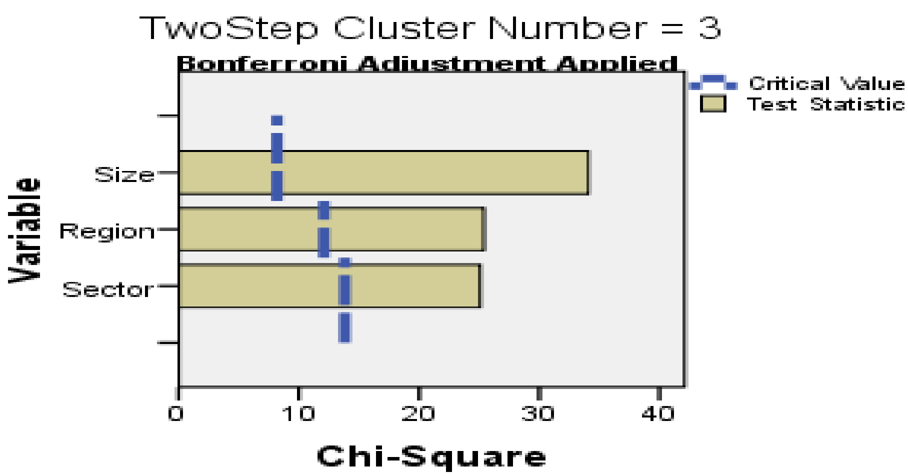

Figure 5.26: Categorical variables within cluster 3

5.7.2 Continuous Variables

Contrary to what obtains with the categorical variables, continuous variables Figures 5.24 – 5.26 show the categorical variables that make up clusters 1, 2 and 3. It can be seen that the distributions of HSE, victim, HR, regulator and management involvement are not different for all the clusters. Considering these variables alone, it appears that not all the clusters are statistically different.

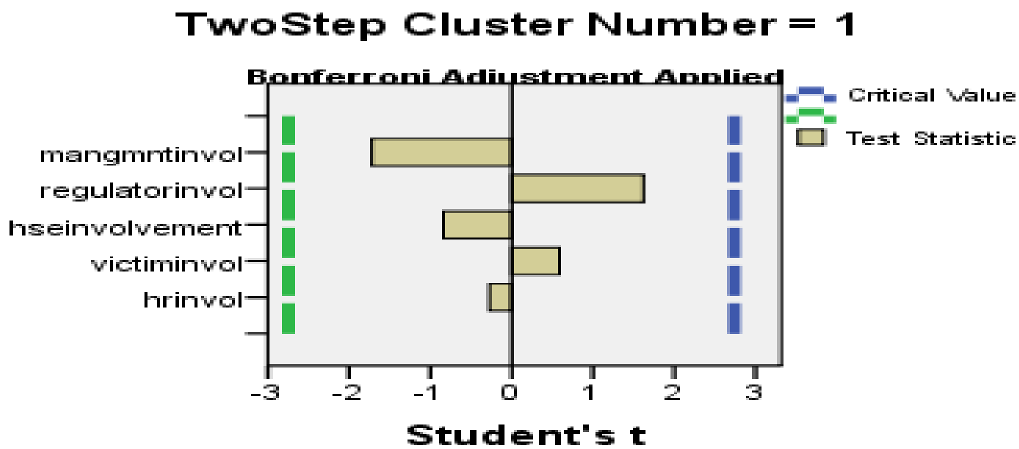

Figure 5.27: Continuous variables within cluster 1

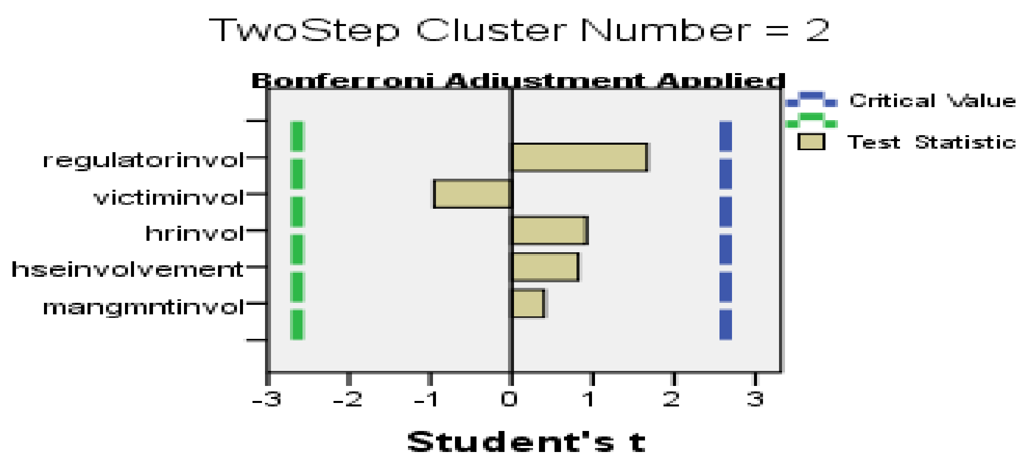

Figure 5.28: Continuous variables within cluster 2

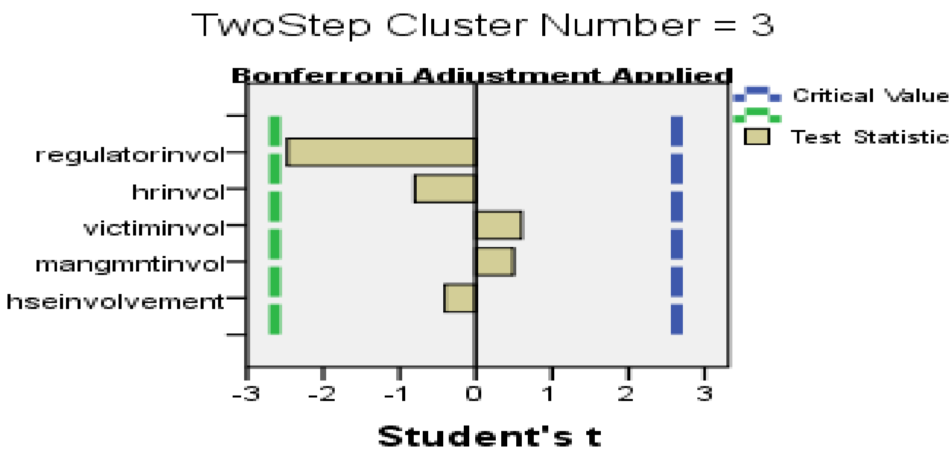

Figure 5.29: Continuous variables within cluster 3

5.8 The Best Incident Reporting Process (class) Using Safety Outcome as a Measure

To answer the third research question of how the different clusters performed on the safety outcome, i.e. which class of incident reporting is the best, cluster membership was used as independent variable and safety outcome as dependent variable and

Table 5.1: Performance of individual clusters on safety outcome

Two-step Cluster Number	Mean	N	Std. Deviation
1	46.29	90	27.514
2	50.98	58	28.205
3	53.70	56	29.231

Two-step Cluster Number	Mean	N	Std. Deviation
1	46.29	90	27.514
2	50.98	58	28.205
3	53.70	56	29.231
Total	49.66	204	28.228

means analysis was undertaken. Table 5.1 shows the means for each cluster. Cluster 3 seems to be the group of companies that have the more favourable safety outcome.

5.9 Characteristics of the Clusters

Finally, this section presents a textual explanation of the unique clusters one at a time.

Table 5.2: Performance of each cluster: finding the favourable safety

	Variables					
Clusters	Percentage of sample	Region	Sector	Size	Involvement	Safety outcome
Cluster 1	44.1%	East M'sia/S&S	Infotech/services and academia	Big firms	victim	Least favourable
Cluster 2	28.4%	South and Central M'sia	Infotech/services and construction	Medium size firms	Regulator and management	Second most favourable

Cluster 3	27.5%	South and North M'sia	Manufacturing and Oil and Gas	Small and large	HSE, HR, Regulator	The most favourable

5.9.1 Cluster One

Cluster 1 consists of 90 cases which made up of 44.1% of the sampled cases. Cluster one is dominated by companies from East Malaysia and Sabah and Sarawak. Sector wise, information technology/services and the academia populate cluster 1. In terms of size, cluster is almost exclusively big companies with staff strength of 100 and more. Cluster one has the lowest HSE, HR, management and regulator involvement of all the clusters but has the highest percentage of victim involvement. Cluster 1 performed the lowest in safety outcome.

5.9.2 Cluster Two

Cluster 2 consists of 58 cases which totalled 28.4 % of the sampled cases. Cluster two is dominated by companies from South Malaysia and Central Malaysia. Cluster 2 is populated by information technology/services and construction. As regards size, cluster 2 has mainly medium size companies with staff strength of between 11 and 100. Cluster 2 has the highest percentage of regulator involvement, its HSE involvement is second only to cluster 3 and has the same level of victim involvement with cluster 3. Cluster also has the highest management involvement. Finally, cluster 2 was the second most favourable in safety outcomes.

5.9.3 Cluster Three

Cluster 3 consist of 56 cases which totalled 27.5% of the sampled cases. Cluster 3 is dominated by South Malaysia and North Malaysia. Cluster 3 is populated by manufacturing and oil and gas. In terms of size, cluster 3 is populated by small companies with staff numbering between one and ten and large companies with staff strenght of 100 and above. The HSE department is very involved in incident reporting the companies within cluster 3. HR department is also very involved in the incident cases within this cluster. Regulators and victims are also very involved in this cluster; and finally, management involvement is more than average - second only to cluster 2.Finally, cluster 3 performed better than all the clusters in safety outcome.

5.9.4 Algorithm

To answer the research question of how the cluster with the most favourable safety outcome would yield an algorithm, the characteristics and charts developed for cluster 3 organizations were used to form an algorithm. Figure shows the flowchart of the algorithm. The algorithm starts with an incident which calls for a decision to be made. In making this decision, the program would help the user to choose available options, namely, first aid, ambulance, fire service, police or self-help. The application then sends an alert to Twitter to inform employees of the incident. After that, the system calls for another decision where the incident was fatal or not. If yes, it prompts for a report to be sent to the Malaysian Deparment of Occupational Saftety and Health (DOSH).

If the an employee was at fault or negligent, the system also sends an email to HR department. Also if the employee wants to claim, a report is prepared for SOCSO; if the employee does not want to claim, the system keeps the decision in case the employee changes his mind and want to claim later.

If it was a machine failure, the system checks if it is still under warrantee, if it is, the system facilitates contact with the manufacturer through the inbuild email function.

Also the application keeps reminding the HR department concerning the settlement or the penality of the employee involved. The application facilitates the likelihood of recurrence. The system also asks if the on site investigation has been completed. If no, it reminds the HSE department every 24 hours. If yes, it prompts for the file (investigation document) to be uploaded and stored in the database and closes the case, which ends the algorithm.

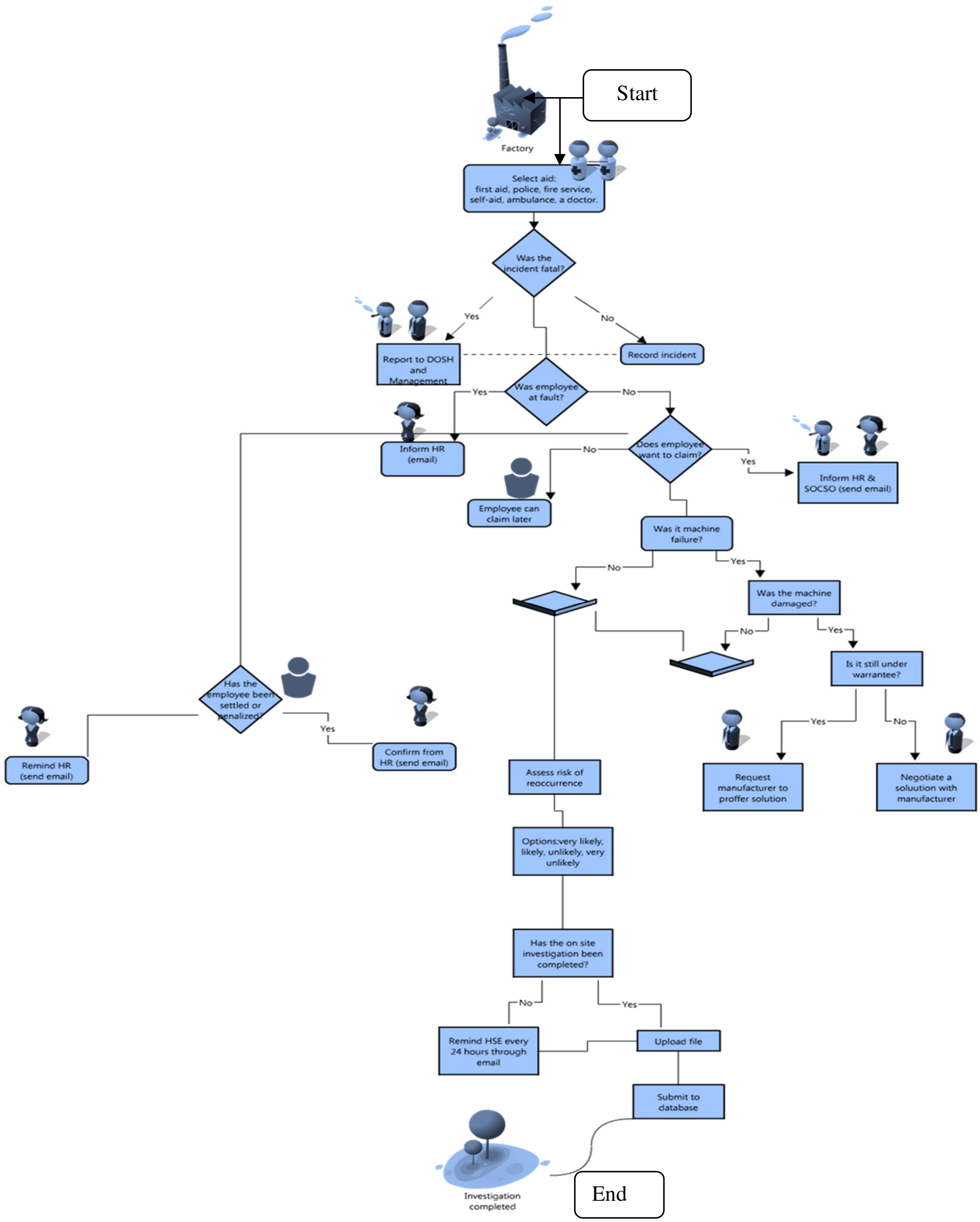

Figure 5.30: Flowchart for the algorithm of incident reporting

The algorithm shows how involved the five knowledge carriers and stakeholders are within incident reporting process.

5.10 Incident Reporting Automation

The algorithm produced in answer to research question four was used to create a computer program than can automate incident reporting. Appendix A shows the complete program code.The last research question has to do with the automation of incident reporting. For this to happen, an application to facilitate needed to be created; and the algorithm developed for research question four was used to create such an application. To be able to access the incident reporting system by the HSE on any platform (tablet, desktop and mobile devices), the system was built using web technologies. It was also made responsive so that it can sense which platform is accessing it; and immediately it senses this, it gives the appropriate format to that device. For example, if the HSE officer is accessing the system using a tablet such as iPad or a phone, the system will respond by the giving the user appropriate navigation consistent with the mobile device, so that there is no need to install other software such as flash to power the application. **Figure 5.31** shows the screenshot of the application; Chapter 7: SOFTWARE DEVELOPMENT, explains the features, functions and aspects of the process that the system automates.

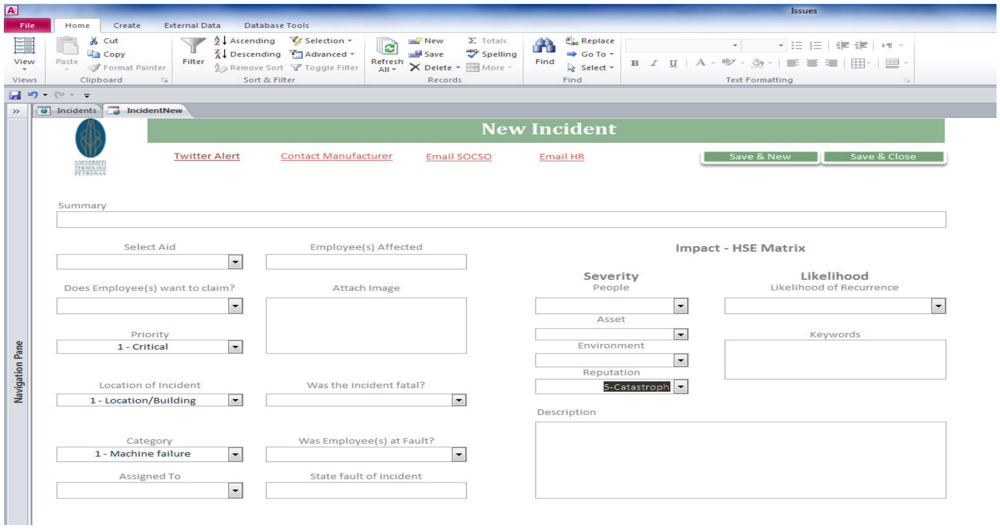

Figure 5.31: The Incident Reporter

5.11 Chapter Summary

This presents the results of the five central research questions of this study. The first one was to explore how safety knowledge is extracted from incident reporting process in Malaysia. The second was to produce a taxonomy i.e. to discover the classification of incident reporting processes in Malaysia. The third was to determine the incident reporting process with the most favourable safety outcome out of the possible classes yielded in the second research question. The fourth was to design an algorithm based on the most favourable safety outcome of incident reporting which the third question yielded. The fifth was to produce an application based on the results of question four to automate incident reporting process in Malaysia.

Therefore, the chapter shows that that safety knowledge flows through four basic components and five knowledge carriers within the organization. It identified three classes of incident reporting processes and the determined the most favourable among the three in terms of higher performance on safety outcome. Finally, the chapter shows the algorithm derived from the cluster 3 the “All Inclusive” class of incident reporting process. The next chapter discusses the results found in this chapter and how they relate to the literature.

CHAPTER 6

DISCUSSION

6.1 Chapter Overview

In a thesis, the discussion chapter discusses the results of the study and relates them to what came before from the body of literature. This chapter also discusses and juxtaposes what the current research has found and what the body of knowledge i.e. the literature says concerning safety knowledge extraction, types of incident reporting procedure, best practices in incident reporting and automation of incident report.

6.2 The Flow of Safety Knowledge from Incident Reports

On the question of, how does safety information flow from incident reports in Malaysia, this study found that such knowledge flows from the individuals in the organization as well as the artifacts. Safety knowledge begins to form from the occurence to recording, to HSE involvement, HR involvement, and so forth until the case is closed.

The most interesting finding was that although the results agree with the literature on the role of stakeholders in transforming and transferring safety knowledge in organizations such as [99], it clearly traces safety knowledge flow through five significant knowledge carriers. The test was successful as it was able to identify five knowledge carriers within the organization through their involvement in incident reporting namely, victim, HSE, regulators, management and HR involvements.

The present results are significant in at least two major respects. One, these five knowledge carriers within the organization could be used for further analysis to differentiate on the basis of how more involved each knowledge carrier is and the relation of such involvement with the safety outcome within the organization. Two, instead of wading through obtuse and the nebulous and confusing behind-the-scenes on-goings through which safety knowledge flow from incident reports, this finding has charted a straight way to view the transfer of safety knowledge within the organization. It has morphed such transfer from an opaque black-box to a transparent aquarium.

Prior studies have noted the importance of incident reporting and safety knowledge in organizations [2, 99]. A strong relationship between incident reporting and safety issues resolution has been reported in the literature [2]. However, in reviewing the literature, no data was found on the association between incident reporting and specific knowledge carriers.

Yet, the findings of the current study are consistent with those of [99] who found that it is the integral members of an organization including their associates outside the organization, especially the regulators embody safety knowledge.

This result when viewed with system thinking lenses could also yield a clearer picture. In recent decades, the concept *''systems''* continues to be used by practically all scientific disciplines and systems thinking seems to have appeared to refer to the excogitation of problems in their entirety. A systemcan be described as mental model or even combination of pieces that work together along with one another inside the *system's* limits *(*form, framework, organization*)* to operate. People view their environment more or less as structured into or by systems.

The devices that are around us, the agencies that create them, the vegetation that sprout inside the backyard, the trees and shrubs in the woods, political *elections,* the households, the communities as well as ourselves- all could be perceived as systems and *sub-systems.* In systems thinking, the term system is employed to describe an element as well as the relationships between and amongst its components and also the whole. The systems perspective of the universe holds that the world is all about a systemichierarchy of integrated sophistication-a sequence of *wholes* inside wholes, just about allofwhich are interconnected as well as interdependent.

From this standpoint, a specific system can not be correctly grasped without having also understand its connection to the world of which it is a component. Systems thinking *is a* subjective approach of engaging with the world through comprehending the interactions between the numerous systems in the environment. In the manner a mechanistic perspective breaks components down to know the operation of a device, the systems thinking perspective endeavors to know the environment by way of regrouping the interactions which can be found between systems. Most people venture onto the world with our individual models for arranging knowledge, and we present these styles to the people around us. When we study these models attentively we may observe that, similar to every language, these are made of components, processes, principles as well as boundaries. The technology of these relationships is systems thinking. According to [100], ‘‘problem-solving in this way involves pattern finding to enhance understanding of, and responsiveness to, the problem’’.

In 1972, Ackoff and Emery [101], two renowned systems thinkers, suggested the idea of purposeful systems to strengthen the concept that systems arise within the context of particular goals. Holland [102] had formalized the notion of adaptive systems which represent the basic need for systems to adjust as well as conform to alterations in the system's context to better attain their goals. Shakun [103] after that suggested the concept of responsive systems to permit the manner systems learn from previous operation to enhance functioning and proficiency.

Lastly, Rubenstein-Montano et al. [100], indicated that: *"Results from systems thinking rely greatly on precisely how a system is defined due to the fact that systems thinking looks at associations between the several components associated with the system. Limitations ought to be established to differentiate what parts of the world are actually covered within the system and also what components are regarded as the environment of the system"* (p. 6). The actual environment of the system may impact problem solving due to the fact that it influences the system, however it is not part of the system. Consequently, knowledge transfer inside as well as in between systems should start with a solid definition of the system being referenced, together with its limitations [7]; moreover, it will be beneficial to view organizations with a potpoouri of sub systems usually housed at one location, using the systems approach. Utilizing this perspective will also make it easier to appreciate the flow of safety knowledge translation from incident reports.

However, this result has not previously been described using the type of data used in the current study. Surprisingly, no differences were found in the sizes of the organizations - at least on the question of how safety knowledge flows through incident reports within Malaysian organizations. This result may be explained by the fact that within each industry, where a firm is big or small they share some safety mechanisms and platforms. For example, they go to the same safety workshops, they are likely to be regulated by the same bodies and they belong to the same safety associations. Data from six sectors were utilized, namely, construction, academia, chemical, oil and gas, information technology and services, and manufacturing.

Therefore, when data are collected from other sectors such as medical institutions and transportation sectors, the analysis may yield different results.

This finding has important implications for developing research tools such has a questionnaire on how involved each five knowledge carriers identified in this study are to incident reporting. Such data could then be used for a quantitative analysis. Some of the issues emerging from this finding relate specifically to who will do the work where incident reporting is concerned. The literature places an importance [2] on who does the reporting. This combination of findings provides some support for the conceptual premise that Incident reporting contributes how safety knowledge is carried within the organization. The value of on the contribution of the size of the organizations suggests that a weak link may exist between incident reporting process and whether the firm is big, medium or small. However, with a specific sample, caution must be applied, as the findings might not be transferable to other sectors such as medical field and transportation sector. These results therefore need to be interpreted with caution.

However, more research on this topic needs to be undertaken before the association between safety knowledge transfer and incident reporting is more clearly understood. Further research should be done to investigate the specific form of safety knowledge each level or what each of the five knowledge carriers embody.

Research questions that could be asked include “what is the specific contribution of the health and safety department or the management cadre in the transfer of safety knowledge through incident reporting?”

6.3 Clustering of Incident Reporting Procedures

On the question of how many clusters or types of incident reporting procedures are inherent in Malaysian companies, two-way cluster analyses yielded three types. The most interesting finding was that cluster 3 which contains only 27 per cent of sampled cases is the most favourable class as far as safety outcomes are concerned. The test was successful as it was able to identify the characteristics of this most successful cluster. That is, the incident reporting procedure with the most favourable safety outcome has HSE and the HR departments as the most involved in the process of incident reporting. The cluster is also dominated by oil and gas and manufacturing - two sectors that have long histories of safety systems.

The present results are significant in at least two major respects. One, it is easy to tell what the cluster with the most favourable incident reporting is doing right to earn it better performance in the safety outcome, such as running an all inclusive procedure as well as including the management in the process of incident reporting. This will enable other organizations to copy the template of this cluster.

Prior studies have noted the importance of an embracing safety systems (to tranforms). The more people that engaged in or inform concerning incidents, the more safety concious the organization would. According to [99], safety knowledge could be learned or transfered from anybody or artifact and at any point within the organization.

A strong relationship between overall participation and safety knowledge has been reported in the literature. However, in reviewing the literature, no data was found on the unique charasteristics displayed in these clusters. Yet, the findings of the current study are consistent with those of [99] who found that safety knowledge is embed in various departments and activities in organizations. However, this result has not previously been described using the type of data used in the current study.

Surprisingly, no differences were found between big companies and small ones. In terms of size, cluster 3 is populated by small companies defined as firms with staff strenght between one and 10 and large companies with staff strength of 100 and above. This result may be explained by the fact that small companies are easier to manage; and it is easy to get everyone involved or toe the line of safety consciousness. Further, big companies already have the maturity and sometimes enduring safety systems; so they are expected to do better.

This finding has important implications for developing frameworks for incident reporting. The findings also show a path for an algorithm for building systems that can automate incident reporting, which is the next logical step in this research.

6.4 The Relationship between Safety Outcome and Incident Reporting: Choosing the Cluster with the most favourable Safety Outcome

On the question of if incident reporting is related to safety outcomes, this study found that the companies with the more defined incident reporting process also had the most favourable safety outcome. The most interesting finding was that although the results agree with the literature on the relationship between the incident reporting and safety outcome, this result clearly shows the relationship which was hitherto sketchy.

The test was successful as it was able to identify and confirm the little research done on the relationship between incident reporting and safety outcome. The present results are significant in at least two major respects. One, this correlation could be used for further analysis to determine how the two variables compare in an organization. Further, incident reporting could be used to predict safety outcome and vice versa in within the organization. Two, this study provides a more coherent narrative concerning the relationship between incident reporting and safety outcome and also offers a simpler and more straight forward method of determining such relationship.

Prior studies have noted the importance of incident reporting and safety outcomes.

A relationship between incident reporting and safety outcome has been reported in the literature [2]. However, in reviewing the literature, no data was found on the association between incident reporting and safety outcomes using a large sample such as this - especially utilizing Malaysia sample. Further, most of such studies were done using samples from patients care institutions. In this study, the construction industry, manufacturing, oil and gas, information technology and services, chemical and the academia were sampled. Yet, the findings of the current study are consistent with those of [99] who found that incident reporting is positively correlated with safety outcome.

However, this result has not previously been described using the type of data used in the current study. Surprisingly, the standard deviation of the incident reporting score among the companies was too high. This result may be explained by the fact that the range of scores was equally high [104]. This is because some companies, for example, could score 10 out of a 100 while others score 80 out of 100 – this resulted in a very high range and subsequently high standard deviation.

As noted before, only data from six sectors were used, namely, construction, academia, chemical, oil and gas, information technology and services, and manufacturing. Therefore, when data are collected from other sectors such as medical institutions and transportation sectors, the analysis may yield different results. This finding has important implications for developing or determining the relationship between safety outcomes and incident reporting, since it affords itself as a tool or instrument to be used for a quantitative analysis on determining the relationship between the two variables.
This combination of findings provides some support for the conceptual premise that in organizations, incident reporting when done correctly saves lives and contributes to favourable safety outcomes. The value of the result suggests that a strong link seems to exist between safety outcome and incident reporting.

However, with a unique sample such as this, caution must be applied, as the findings might not be transferable to other sectors such as medical field and transportation.

These results therefore need to be interpreted with caution. Additionally, more research on this topic needs to be undertaken before the association between safety outcome and incident reporting is more clearly understood. Further research should be done to investigate the specific degree of strength in the relationship between the two variables. Research questions that could be asked include: does incident reporting predict safety outcome.

6.5 Algorithm of Incident Reporting

On the fourth research question of creating an algorithm for incident reporting in Malaysia, three clusters were considered and the one which had more favourable outlook on safety outcomes was chosen as a blueprint for the algorithm. The structure of the algorithm is presented in chapter five. This algorithm is significant because, whereas other automation processes of incident reporting did not derive their algorithm from several case studies, this research presented and algorithm gleaned from the synthesis of several cases of incident reporting processes in organizations.

6.6 Automating the Incident Reporting Process

The last research question has to do with the automation of incident reporting. For this to happen, an application to facilitate needed to be created; and the algorithm developed for research question four was used to create such an application. To be able to access the incident reporting system by the HSE on any platform (tablet, desktop and mobile devices), the system was built using web technologies. It was also made responsive so that it can sense which platform is accessing it; and immediately it senses this, it gives the appropriate format to that device. For example, if the HSE officer is accessing the system using a tablet such as iPad or a phone, the system will respond by the giving the user appropriate navigation consistent with the mobile device, so that there is no need to install other software such as flash to power the application.

6.7 Chapter Summary

This chapter relates the study with what came before i.e. related studies in the literature. It also discusses the significance and implications of the findings. Results show four basic components and five safety knowledge carriers necessary for safety knowledge to be extracted from incident reports. Also, three classes of incident reporting procedures were generated and results show that cluster 3 named "Type Inclusive" by this study, performed better than others on safety outcome. An algorithm based on Type Inclusive was generated and an application to automate the incident reporting procedure was designed. These results have tremendous implications for both research and practice. For research, we now have taxonomy of incident reporting procedure, which future studies could refer to as Dooba, Kamil and Jaafar's taxonomy of incident reporting. This research has additionally shown the path of how safety knowledge is extracted from incident reports: this affords the literature and researchers the opportunity to interrogate the depth of involvement of five safety knowledge carriers or the interconnectedness of the four basic components necessary for safety knowledge extraction. To practice, safety workers, regulators and the HSE departments now know which procedure of incident reporting yields the most favourable safety outcome; and organizations now have a template and a program to automate their incident reporting.

CHAPTER 7

SOFTWARE DEVELOPMENT

7.1 Chapter Overview

The incident reporting automation software developed in this study is a multi-platform application that can be used on tablets, desktops, mobile phones and the internet. This chapter shows the application development process used in this research. It elaborated on the application development principles, tools and techniques used for the development of the software – the Incident Reporter. Further, the chapter discusses the features and functions of the developed application and discusses which aspect of the incident reporting process is automated. Also reported are the process of iteration, version control and the milestones. The primary tools of developing this software were SQL, Access and Visual Basic for Application (VBA).

Also taken into consideration is AR Ahlan's [13] work on the concern of organizations on the skills of information technology graduate, A. Abrizah's [14] user design advice, DRI Rambli and Suziah Sulaiman's notion of story telling [15] and Nordin Zakaria's simplicity argument [16] so that the ensuing application from this study would not be difficult to operate. Yet, the overarching framework follows Pilone [101]. However, this chapter is an abridged version of the application documentation; please find a detailed documentation in Appendix E and the pseudo code written in Pascal is in Appendix A.

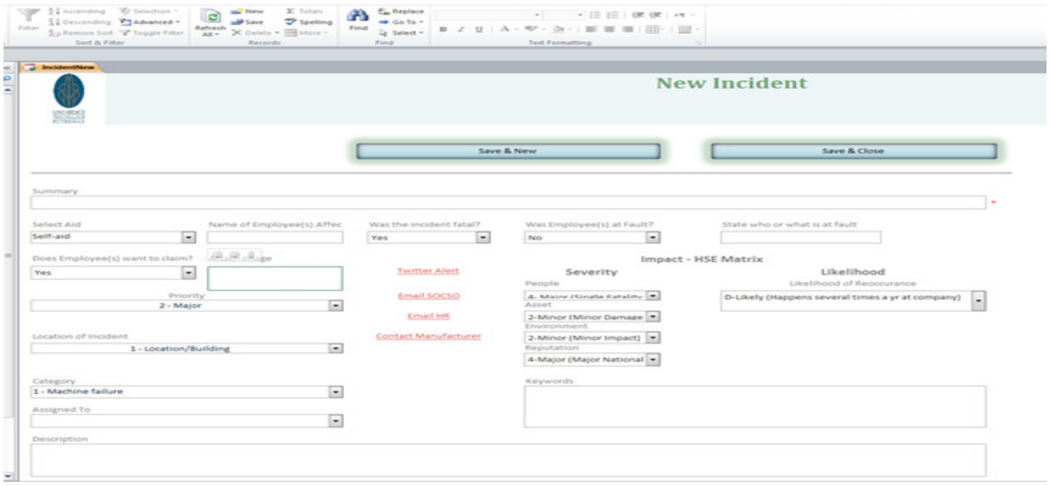

Figure 7.1: Sample of the Result of an Iteration

7.2 Iteration Techniques

To stay on course, the study used software iteration technique to streamline the process and keep focus. When change occurred iterations were also planned out and balanced. To ensure bit sized deliverables, every iteration was a working software or a part that was working so that the client, in this case, the data and the HSE personel of some sampled organizations, from whom feedback was gathered at every step of the way could be au courant of the progress [101].

Software pipelining, a technique used in optimizing loops, and role plays were utilized in figuring how the application should behave. Then user narratives were utilized to keep the software functional. Planning poker [102], an alternative to Wideband Delphi, was also used for estimation to ensure a consensus based user stories.

The researcher also did not use more than one calendar months for iteration – i.e. 20 days were set aside per iteration. Velocity was then used to give the researcher confidence in keeping in line with the algorithm and expectations of HSE officers. The HSE buy-in was sought when choosing the user stories to use for milestone 1.0 to 3.0 and in what iteration the story will be built in. Figures 7.1 and 7.2 show the screenshots of versions 1.0 and 2.0.

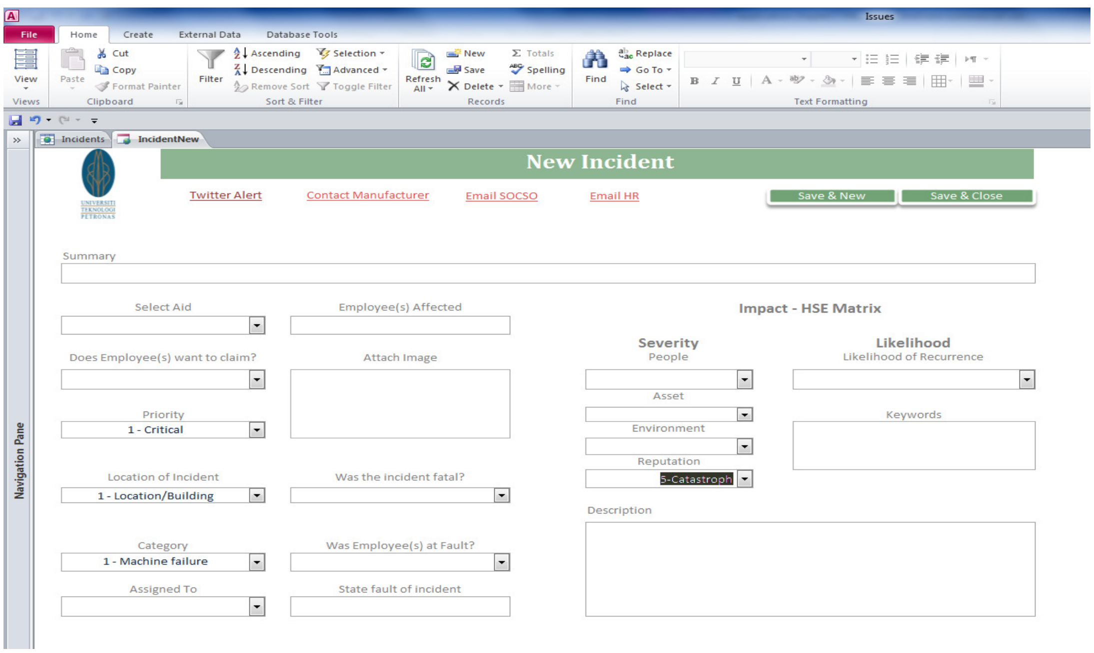

Figure 7.2: Result of the Iteration after figure 7.1.

A version control tool [101, 103, 104] was used to track changes to the software. Tags such as bug fixes, releases, and end of iteration were used to track major milestones in the project.

A build tool was utilized for scripting, testing deploying, and for version control. Many IDEs already come with these tools; in this study, Visual Studio was used. Build scripts were also treated like code and also subjected to version control [105].

Taking into consideration that there are different views to the software, we tried to test the application from different perspective. Failures were also accounted for as well as successes; whereever possible, testing was automated and a continuous integration tool was used for building and testing for each commit [101].

Test were written first before building code to pass the tests; when tests fail initially, they were then used in refactoring [106] after passing [101] without changing the external behavior of code. Also, mock objects were used to provide variation for objects needed for testing, after that, the needed objects were hidden or deleted.

7.3 Development principles

This study followed three basic development principles: develop software that is needed, on time, on budget [102, 103, 107-109]. First, the results of the foregoing research questions showed that the application is highly needed by the HSE personnel; therefore there is no question about its need in the industry. Second, the application, among other things, was developed within the time frame of this Ph.D. study, so it was delivered on time. Lastly, the tools for development were chosen carefully so that there was no special fund, outside the graduate assistantship offered to the researcher by UTP, requested for this application; therefore it was developed on budget.

Further, although the customer knows what he wants, as shown by the data and feedback from HSE personnel, the researcher did not lose track of the fact that his help was needed to nail down the requirement, thus, adjustments were made with that realization in mind; however, the requirements remained customer oriented. Yet the customer (in this case the data and feedback from HSE) decided what was in our or out so much so that when the strengths and weaknesses of this application are evaluated, they would be faithful to the data and HSE requirements. Still it was the developer's responsibility to know where changes (code) should go or should not go.

For example, when the feedback from HSE indicated that report of the database should be converted to Excel files, the researcher determined that would not be the optimum way to go about it, but figured out an alternative of converting the queries and tables into Microsoft Excel files in five easy steps for the user. See figures 7.3 to 7.6.

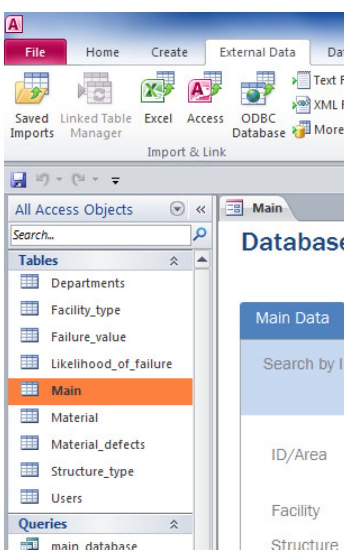

Figure 7.3: The user clicks on the table or the query he desires to convert

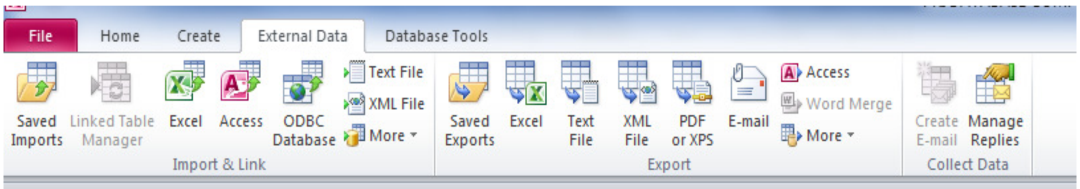

Figure 7.4: He clicks on External Data on the top menu

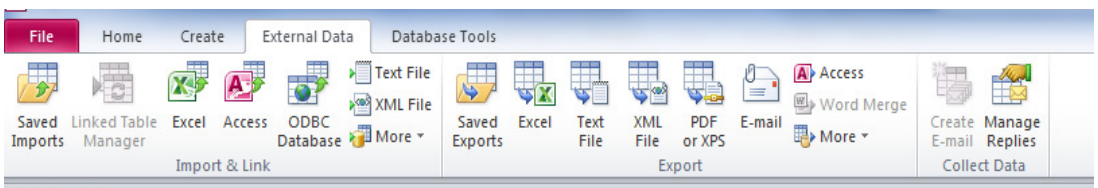

Figure 7.5: Click on Export to Excel icon

Further, the user checks “export data with formatting and layout” if that is what is preferred; see figure 7.6. The user also checks “Open the destination file after the export operation is complete” if the user wants to immediately go to the Excel file.

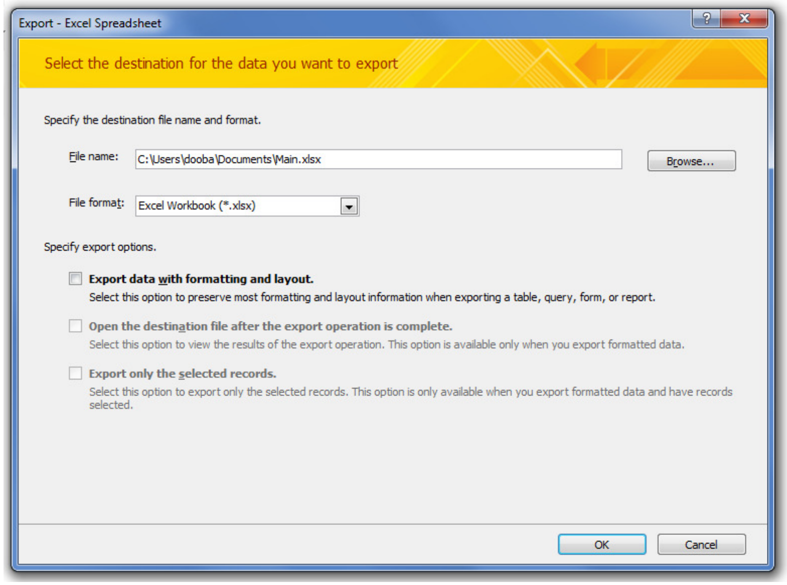

Figure 7.6: Exporting to Excel formatting options

Now the data is in the spreadsheet and can be used for further decision making analysis. Although Microsoft ensured compatibility between the two programs, in the case of this application, VBA (Visual Basics for Applications) was used to design the bespoke features that the data and HSE needed. Therefore, some of the basic compatibility features between the two programs have been squared up.

TDD (test driven development) was also used to focus on functionality and make refactoring safer [106]; when something is broken it will be apparent immediately. Good code coverage (and coverage is more important than code counts) has greater effeciency using TDD approach. Also, as pointed out earlier, iterations were used to force intermediate deadlines and sticking to them. These iterations sometimes included external testing of the application at an HSE office or sent online for them to download test and send feedback.

7.4 Application Features and Functions

Following are the functions of the application prototype. This section also illustrates and explains the aspects of incident reporting process that the application automates.

7.4.1 Add a New Incident

Adding a new incident immediately after an adverse occurrence or a near-miss is easy with this application. And because the user signed into the application with his credentials, the aspect of assigning ownership of a case or incident is automated. The case is automatically assigned to the user. Following are the steps necessary in opening a new incident record.

- The user clicks the Open Incident tab.
- The user clicks New Incident
- In the Incident Details form, the user fills in the information on the incident.
- If the user wants to add another contact, they would click Save & New, and repeat step 3. Otherwise, they click Save & Close. These steps are shown in **Figure 7.7: Adding New Incident** and **Figure 7.8: The New Incident Form**

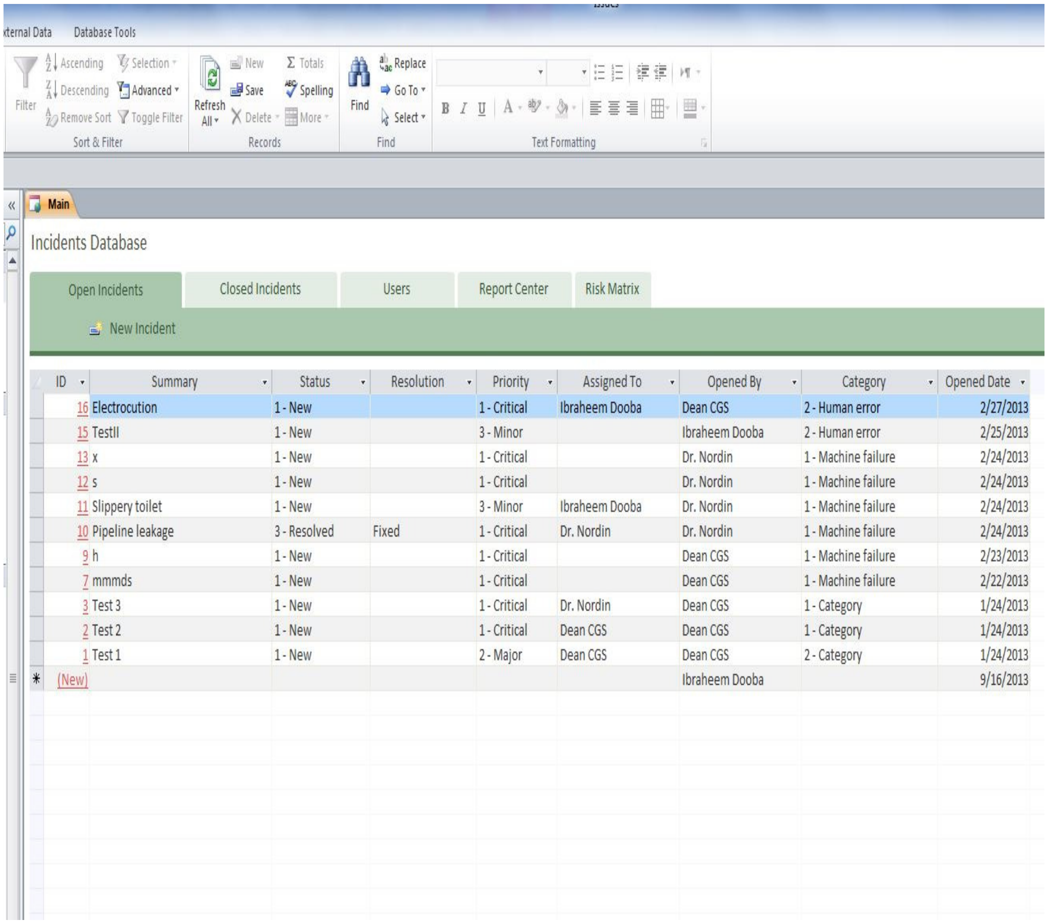

Figure 7.7: Adding New Incident

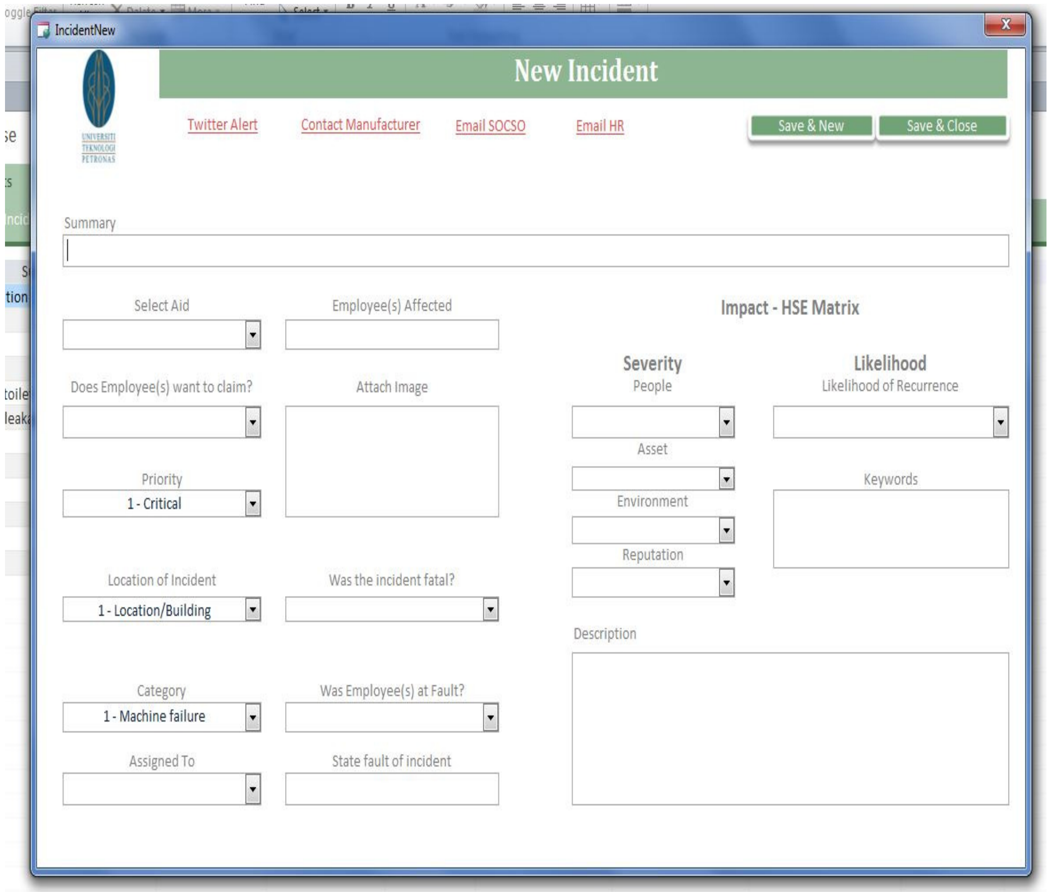

Figure 7.8: The New Incident Form

7.4.2 Viewing and editing incident

Incidents can be edited. The edited incidents automatically update across the application saving the time of trying to edit components one after the other. The following steps show how the record of an incident can be edited.

- The user clicks the Open Incident tab.
- In the Summary column of the datasheet, the user double-clicks the incident that they want to view or edit.

- Then edits the information as needed, and then click Save or Save & Close. This is shown in **Figure 7.9: Editing Incidents**.

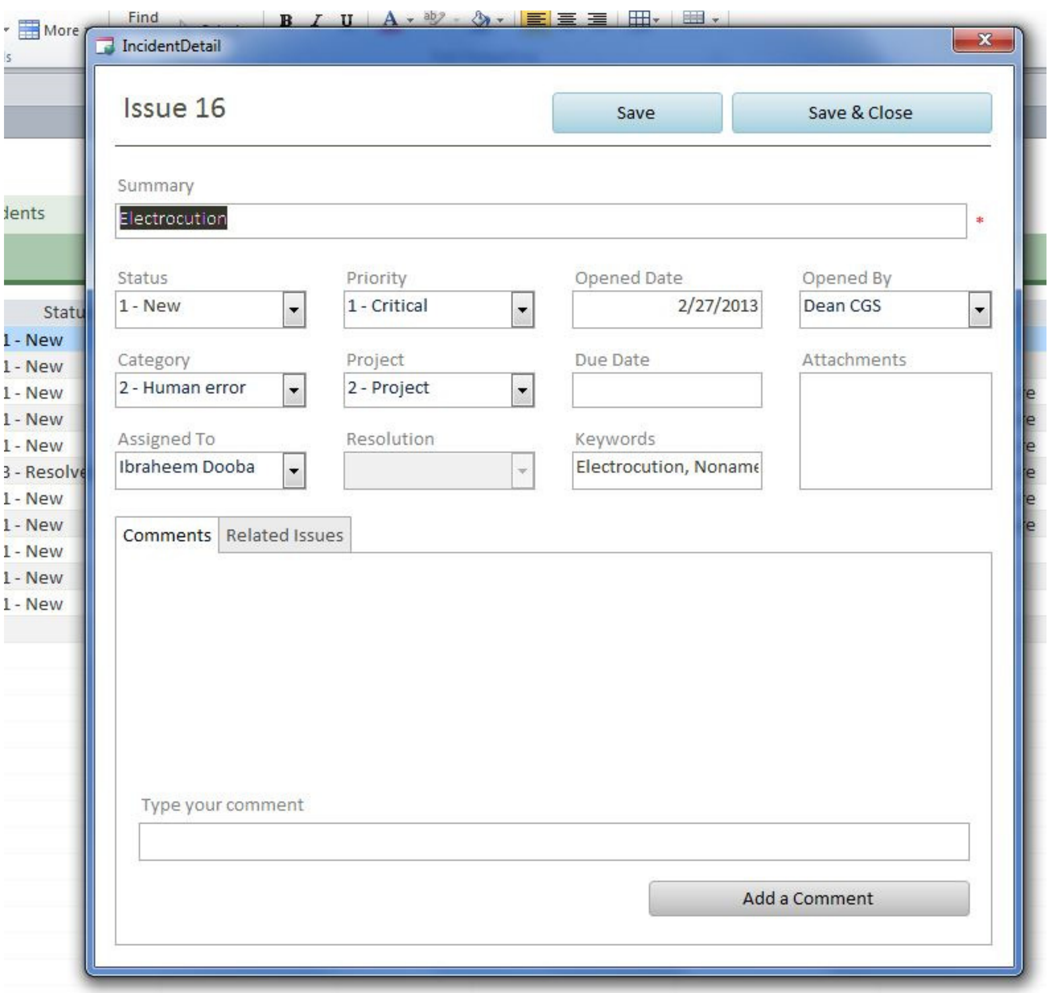

Figure 7.9: Editing Incidents

7.4.3 Editing the items in a drop-down list

Many of the drop-down lists in the Incidents Reporter Desktop & Web Application can be edited to suit the user's needs by using the following procedure:

- The user clicks the down-arrow to display the list.
- If the list is editable, the Edit List Items button will appear just below the list.
- Then the user would click the Edit List Items button.
- If the Edit List Items dialog box appears:
- The user then types the list items you want, one on each line.
- Alternatively, the user can select a default value from the Default Value list.
- Then the user clicks OK.
- If a Details form appears:
- The user would click the New (blank) record button at the bottom of the form.
- Then types the information in the form, and then click Save and Close.

These steps are shown in **Figure 7.10: Editing and Adding Items to the Drop-down Lists** and **Figure 7.11: Editing and Adding Items to the Drop-down Lists II**.

It can also be seen that this aspect of incident reporting process is automated because once a list is entered and edited, the application automatically makes judgement for the user on the options available without the user thinking of them himself.

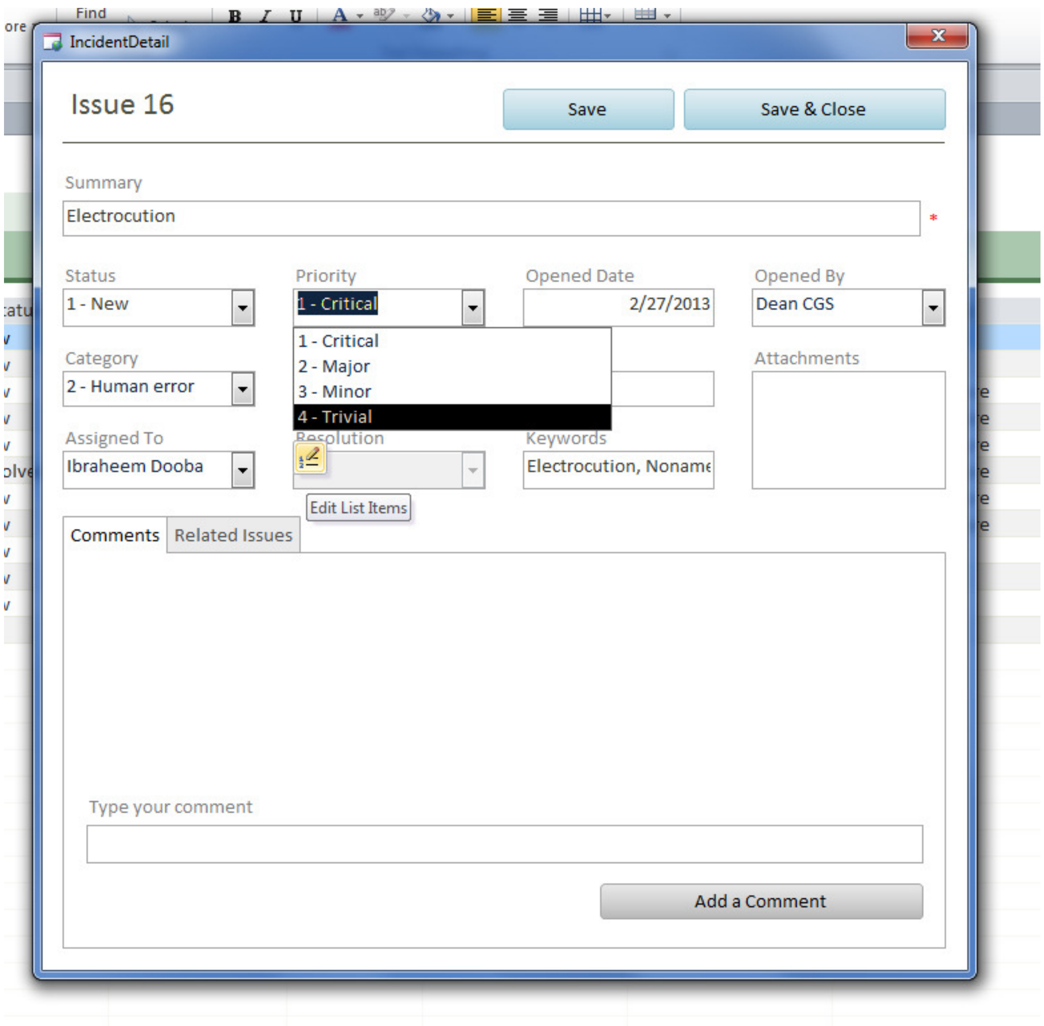

Figure 7.10: Editing and Adding Items to the Drop-down Lists

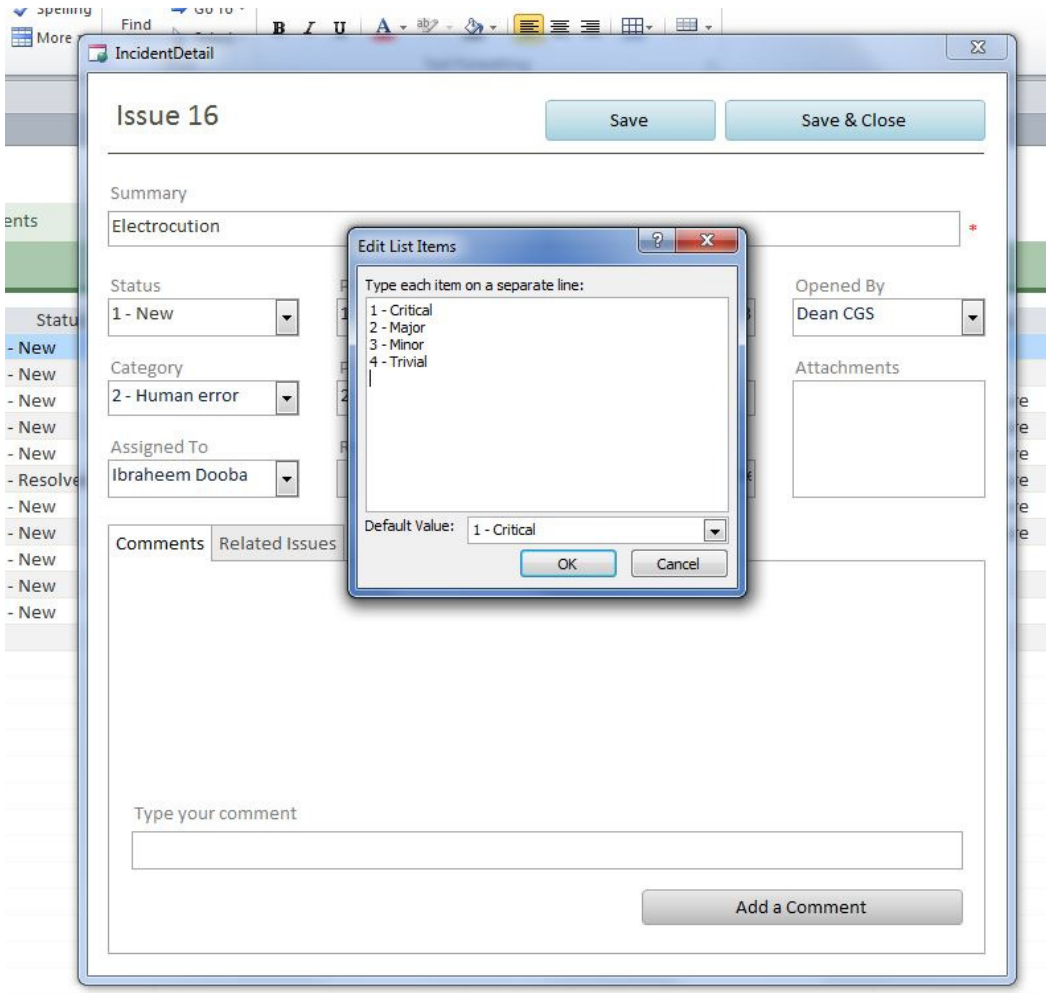

Figure 7.11: Editing and Adding Items to the Drop-down Lists II

7.4.4 Attach Files to a Record of an Incident

If a form or datasheet contains an Attachments field, the user can use that field to attach pictures, documents, or other files to the record by using the following procedure:

- The user Double-clicks the Attachments field.

- In the Attachments dialog box, the user clicks Add.
- They the user browses to the file they want to attach, and then clicks Open.
- In the Attachments dialog box, the user then clicks OK.

This saves the time of manually filing all related documents to an incident. This way, police report, SOCSO documents, hospital bills, reports from HR and so forth can all be attached to the incident for future reference.

The steps are shown in **Figure 7.12: Attaching Images and Documents** below.

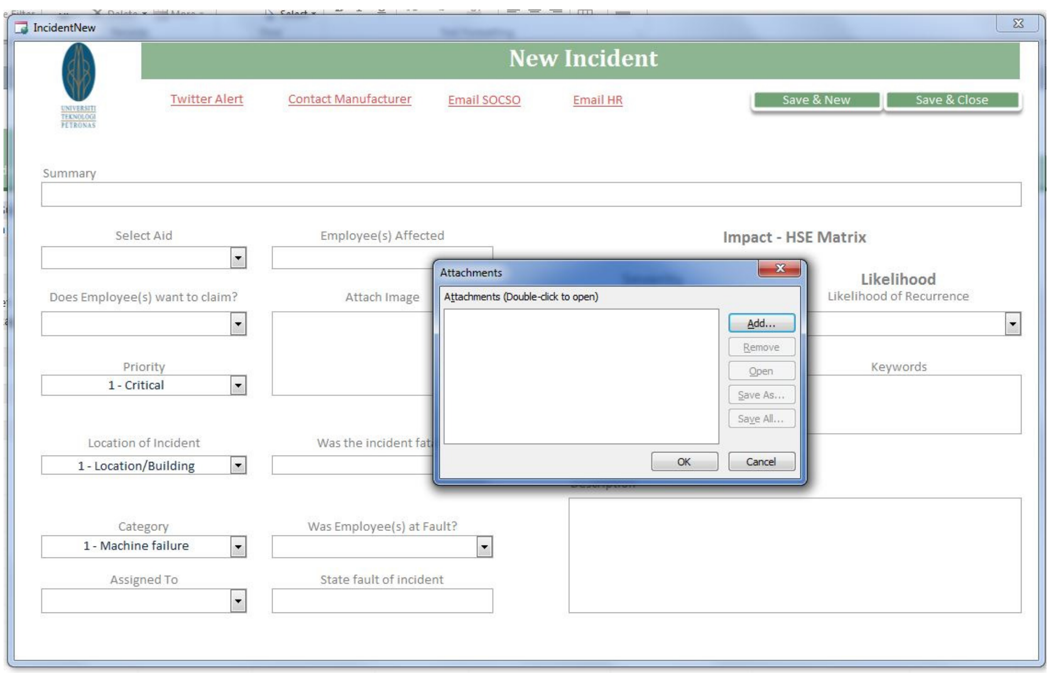

Figure 7.12: Attaching Images and Documents

7.4.5 Previewing and printing a report

The Incident Reporter allows four reports. To preview a report:

- The user clicks the Report Center tab, and then under Select a Report, click the report they want to view.

- Incident Reporter displays the report in the preview pane. To print the report:

- The user clicks Open in New Tab, and then on the File tab, clicks Print, and selects the print option that they want. This is shown in **Figure 7.13: The Report Center**

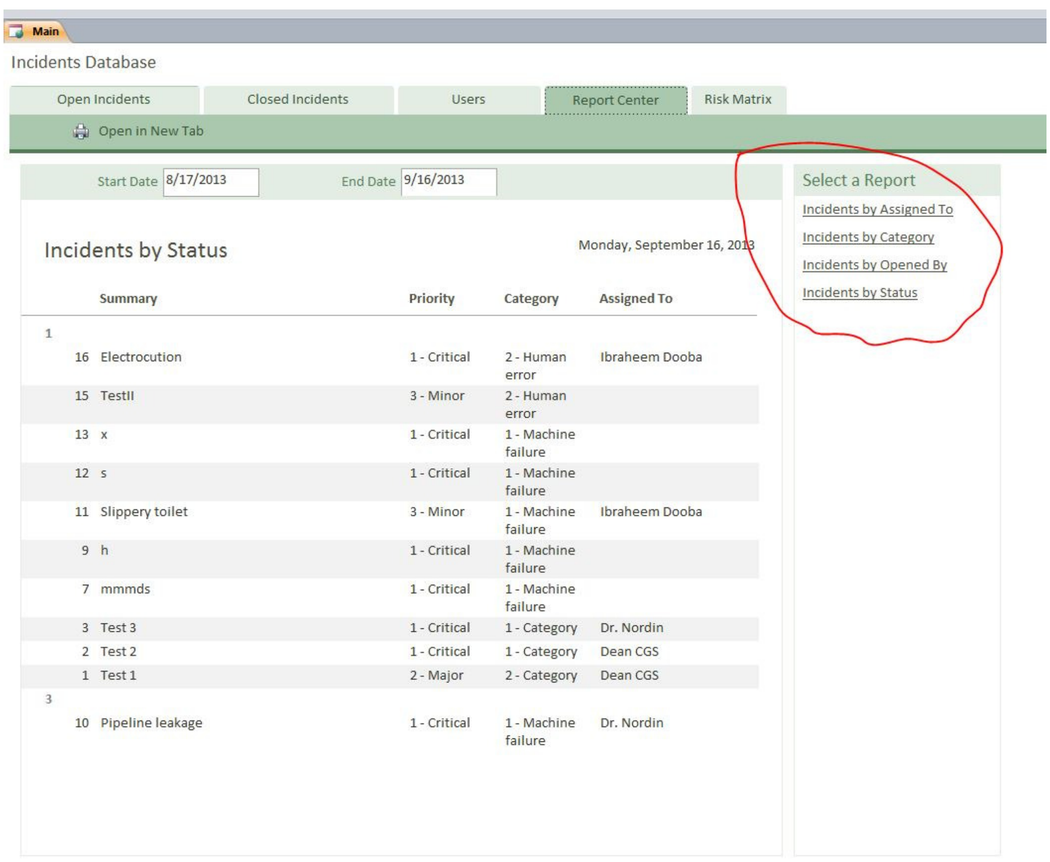

Figure 7.13: The Report Center

7.4.6 Publish the Incident Reporter to Web

If the user has access to a Microsoft SharePoint server that is running Access Services, the user can publish the Incident Reporter to the server and share it with a team or for organization-wide deployment by using the following procedure:

- The user clicks the File tab, and then clicks Publish to Access Services.
- In the Server URL box, the user types the URL of the SharePoint server that they want to use.
- In the Site Name box, the user types the name you want for the Incident Reporter or will just leave as "Incident Reporter." This will become part of the URL.
- Then the user clicks Publish to Access Services.

- Access publishes the Incident Reporter to the server. If all goes well, Access displays a success message which contains a link to the new Web database. The procedure is shown in **Figure 7.14: Publishing to the Web** below.

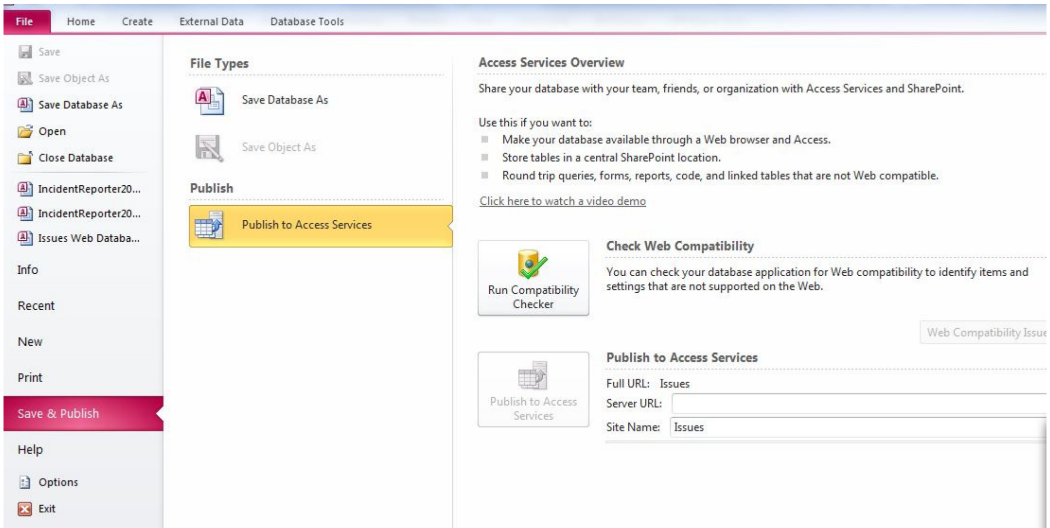

Figure 7.14: Publishing to the Web

7.4.7 Social Media and Emailing Capabilities

The Incident Reporter includes functions to communicate directly with users on social media such as Twitter.com. The application can also send emails directly to HR and even manufacturers as shown in **Figure 7.15: Interracting with Social Media and Emailing Features**.

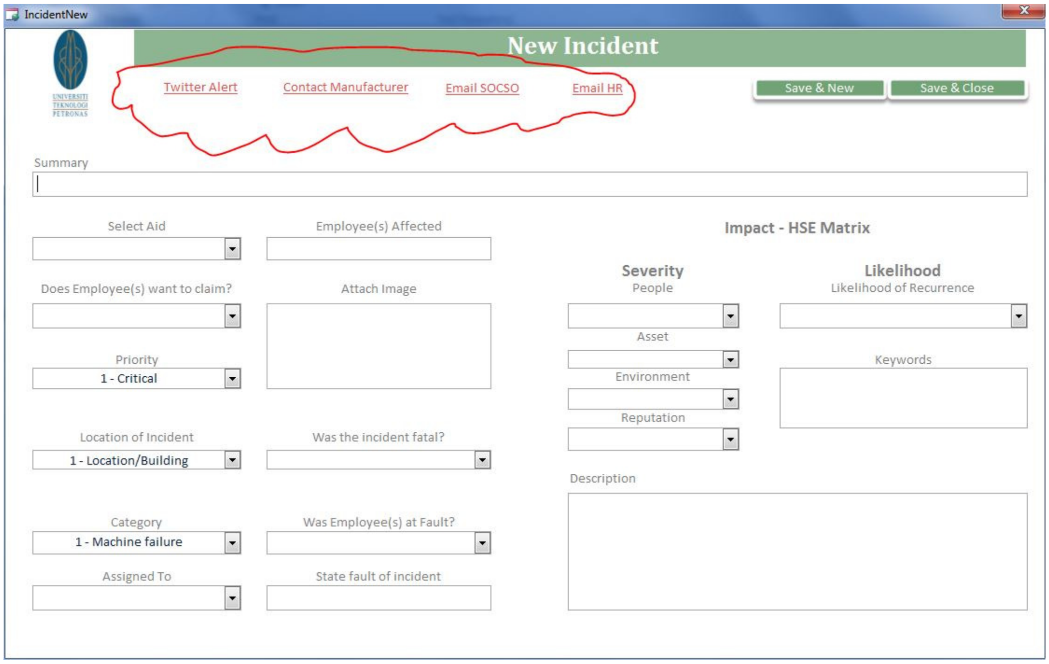

Figure 7.15: Interracting with Social Media and Emailing Features

7.5 Conclusion

The algorithm for this software was realized from the case studies, a detailed description of how this was achieved is in chapter four. Iterations and changes during the development process was shaped by the researcher's interaction with and subsequent feedback from the HSE officers. The resulting application is multi-platform compatible; this means that it can be used as a desktop application, a mobile application and a web application. An algorithm based on Type Inclusive was generated and an application to automate the incident reporting procedure was designed.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

8.1 Chapter Overview

This chapter provides the take home message and recommendations for further studies on safety knowledge extraction, incident reporting taxonomies and the automation of the procedure. The chapter gives concluding remarks on the study. It summarizes other chapters in the process developing a model for safety knowledge extration, incident reporting taxonomy and the application for automating incident reporting. This study was based on sequential mixed study approach that adopted both quantitative and qualitative approaches of inquiry. About 200 organizations from six sectors were choosen in Malaysia as case studies to understand how safety knowledge emanates from incident reports. Following the results of this study, the contribution to theory, methods and practice are proffered to the field of health and safety. The chapter begins with the summary of findings by addressing the research questions of the study. Next, it evaluates the contributions and implications as regards how the study enriches the body of knowledge in the field and pushes back the frontiers of knowledge. Finally, it describes the limitations of the study and gives recommendation for future research.

8.2 Addressing the Research Questions

This section discusses the research findings by addressing the research questions.

8.2.1 The Flow of Safety Knowledge from Incident Reports

The extraction of safety knowledge from incident reporting processes in organizations is a complex phenomenon. It is considered as an iterative social process, which involves a series of social actions that develop through social interaction of multiple actors within a related environment rather than just a technical process [53]. In response to this study, the use of a process-based approach has provided a deep understanding of the interaction between factors and processes. The approach allowed the researcher to explore and highlight components and knowledge carriers through which safety knowledge is created, and demonstrate the dynamics of its nature by interpreting the relevant meaning of it.

Indeed, the HSE and organizations unique approaches to incident reporting are real in the study of safety knowledge extraction. Therefore, the case studies are essential to the study of such a complex process. In fact, the application of case studies to an exploratory inquiry of this research has been successfully adapted as a suitable research methodological approach to study the phenomenon.

The approach has provided a flexible research process and design to understand and interpret the meaning of the real context in the setting. The contextual conditions that are believed to be significant and relevant to the phenomenon in question are discovered. The theoretical model emerged as a major finding, providing a holistic and comprehensive understanding of the nature of the incident reporting process. Therefore, the following research question has been answered.

How does safety knowledge flow from incident reporting process in organizations?

The results and discussions, which answer this research question, are presented in Chapters 5 and 6 accordingly. The emergence of the theoretical model of safety knowledge extraction is considered as a major finding of this study. It provides a comprehensive understanding of the specific nature of the safety knowledge extraction from incident reports as shown in Figure 7.1. Further, it identified the basic components and necessary knowledge carriers required for safety knowledge flow and extraction. This study is considered as the first attempt to build a relevant theoretical model, which is derived from multiple cases of incident reporting processes.

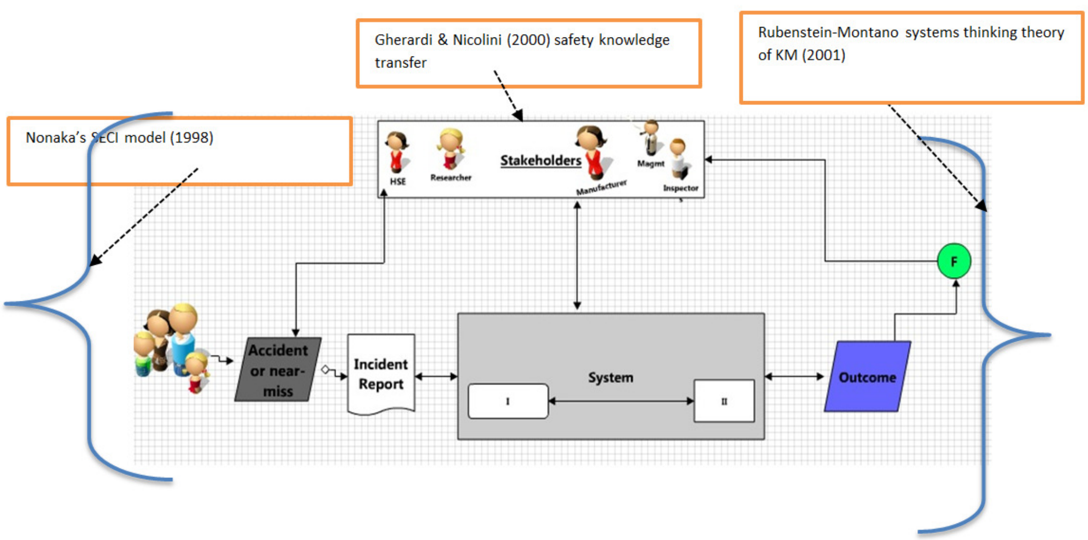

Figure 8.1: Theoretical model of safety knowledge extraction

The nature of the safety knowledge extraction process was developed according to practices found in the data. These patterns were grounded on the interpretations of HSE personels' perspectives on incident reporting processes in the organization. Accordingly, a substantive model based on their context was brought forth. To restate its significance, the development of related model was based on a paradigm model of SECI model of knowledge creation [12, 13]. Hence, the research was able to answer the research question in a practical manner, which reflected the reality of the safety environment. Indeed, the practical manifestation of theoretical model offered the potential to assist the organizations to understand how to glean safety knowledge from their mundane incident reporting processes. Thus, the following research question has been answered.

How is safety knowledge extracted from incident reports?

8.2.2 The Taxonomy of Incident Reporting Processes

The findings of the classes related to incident reporting processes were shown identified in chapter five. The taxonomy was composed of three classes: Near-Zero Stakeholder cluster, Regulator-Heavy cluster and All-Inclusive cluster.

This study found that involvement of stakeholders (operationally defined as the employees, the management, HSE, regulators, HR and manufacturers), are necessary in the formation of classes and the overarching taxonomy. The related safety knowledge extraction process as discussed in section 7.2.1 was also heavily dependent on the stakeholders' involvement. Also the research identified the class that had the most favourable safety outcome to be the All-Inclusive cluster. The charateristics of the All-Inclusive cluster are: Population: Populated by manufacturing and oil and gas; Size: small (1-10 staff) and big companies (100 and above); Involvement: HSE, HR, Victim, Regulators, Management; Safety outcome: cluster 3 Performed better than all the clusters in safety outcome.

Therefore, the following research questions were answered.

- How many classes does the analysis of case studies of incident reporting processes yield?

• Which class has the most favourable safety outcome?

The descriptions and discussions of relevant findings are in Chapters 5 and 6 accordingly.

8.3 Research Contributions and Implications

This section discusses the implications and contributions to the body of knowledge in terms of theoretical, methodological as well as practical aspects.

8.3.1 Theoretical Contributions

The findings of this research study offer several theoretical contributions. From the process perspective, this study is regarded as the first attempt to study safety knowledge extration from incident reporting processes in organizations. . The significant findings contributed to the theoretical model in order to understand the comprehensive safety knowledge extraction process. This pushes back the frontiers of safety knowledge in organizations by providing an abundance of existing understanding concerning safety knowledge creation and safety knowledge transfer research. In fact, this compliments and extends prior work and existing models in this area.

Next, this study lays the foundation for future theoretical model development of safety knowledge transfer from incident reporting in particular and safety knowledge in general. The model produces a substantive theory which may be used (1) to analyze other case studies of incident reporting processes; (2) as a guide to organizations and HSE personnel in the sampled sectors to manage their incident reporting efforts effectively and successfully to lead to better safety outcomes; (3) as a theoretical framework for studying other incident reporting processes in other organizations and sectors.

In addition, the emergence of theoretical model offers new insights into incident reporting processes scenario. It does not only document basic components of safety knowledge extraction and the carriers necessary for the safety knowledge to transfer, it also expands what has been reported in the literature by indentifying and naming different classes of incident reporting processes - and discovered the class with the most favourable safety outcome to boot.

Finally, the theoretical model and the taxonomy provides an integrative framework which identifies the extraction process, knowledge carriers, depth of involvement of stakeholders, and the relationship with safety outcomes. The integrated framework perhaps consists of a completed process of incident reporting in an organization generated with prism of systems thinking paradigm.

This paradigm accentuates the complete consideration of reality which argues for putting related systems together in order understand how they function. This is in contrast to breaking systems apart to understand their operation. Therefore, it provides a scenario that presents an area of future research in this field.

8.3.2 Methodological Contributions

This study provides not only theoretical contributions, but also methodological contributions through the fusion of grammar targeted interview, 'why why' and the narrative technique to the case studies. The application of these techniques to the case studies is rooted in the interpretive paradigm of research approach. This approach allows the researcher to unpack both the process and content of phenomena from the participants perspectives situated in their unique contexts.

Therefore, it is considered as a very useful and suitable method approach to apply for research in similar studies to unpack both process and contents in the future.

8.3.3 Practical Contributions

This research study has significant implications for management especially in the context of incident reporting best practices and its implementation in an organization. "Safety first" has been a popular maxim in the modern organizations and they spent huge amount of resources to ensure favourable safety outcomes. However, often these budgets are wasted if a proper safety system is not implemented. And this research offers such system by generating a framework, an algorithm and an application for the automation of incident reporting.

As suggested by several researchers, the full benefits of workplace safety will be achieved when a proper incident reporting technology successfully implemented in the organizations. According to the findings of this study, managers, HSE executives, and even safety regulators can benefit from knowing and understanding the process of incident reporting. The structure, process, algorithm and application provide several factors to understand how the incident reporting process operates and under what circumstances these processes are likely to succeed or fail. As a result, an ultimate outcome is created, which finally leads to safe environment and saving of lives.

Therefore, the overarching picture of the incident reporting process of this study produces a more comprehensive and holistic view to understanding the impact of KMS in an organization as compared to previous studies.

8.4 Research Limitations

There are some limitations and constraints in this research study. The following discussion will describe them in detail.

First, the study sampled six sectors only namely, manufacturing, information technology, chemical, academia, oil and gas and construction witin Malaysia. Therefore, the global applicability of the empirical findings could not be claimed. Second, as the study relies on participants' perspectives, it is subjective in nature that is difficult to measure or quantify like any other subject. In many circumstances, there is no supporting evidence to verify the views that are expressed by participants. Therefore, it is possible for the participants to report what the researchers want to hear or what they believe or perceive. In some cases, they may not fully disclose their real experiences or thoughts, which might be against the organizational policy or related to their personal privacy. However, this is beyond the researcher's control of the situation and it is not his job to evaluate the participants. Indeed, the researcher should focus on the interpretation of their perspectives that are given and accept the truthfulness of the information during the interviews with the participants [12].

Also, as with most research with human participants, caution must be exercised with these results since organizations are always going to try and make themselves look better, especially in regards to the safety of their operations, the statistics that they provide for their own organization might not always be entirely trustworthy. However, this research tried to limit as much as possible, such unreliable information. For example, a check for consistency between interview data and the survey data on safety outcome was conducted; where inconsistencies were found, such companies were removed from the sample.

8.5 Thesis Summary and Recommendation

This section gives the overarching recommendation and a snapshot of the entire study.

In spite of efforts by organizations to maintain safe working environments, occupational hazards abound: lives get maimed and lost regularly. However, research has linked incident reporting with a decrease in such unfavourable safety outcomes. Yet, there are many incident reporting procedures, and the literature is silent on which procedure uses the best practice or is linked with more favourable safety outcomes. Further, literature has also claimed that there is safety knowledge embedded in the persons and artifacts - including incident reports - of an organization, yet there is paucity of research on how safety knowledge is extracted from incident reports. Therefore, it was the aim of this study to answer five research questions: 1. How is safety knowledge extracted from incident reporting process? 2. What are the taxons (classes) i.e. different types of incident reporting processes in Malaysia? 3. What is the incident reporting process with the more favourable safety outcome out of the possible classes yielded in the second research question? 4. How can an algorithm be designed based on the incident reporting process the more favourable safety outcome which the third question generated? 5. How can an application be produced based on the results of question four to automate incident reporting process in Malaysia? To answer these questions, a mixed-method sequential approach integrating a case study tradition of qualitative approach and survey method of quantitative was adopted. Data were collected using a semi-structured technique which coalesced 'why why' prompt of inquiry, grammar-targeted interview and storytelling. The collected data were charted using a systematic charting technique. The two-step clustering technique was used to determine the classes of different incident reporting procedures and which of them performed better than others on safety outcome.

Results show four basic components and five safety knowledge carriers necessary for safety knowledge to be extracted from incident reports. Also, three classes of incident reporting procedures were generated and results show that cluster 3 named "Type Inclusive" by this study, performed better than others on safety outcome.

These results have tremendous implications for both research and practice. For future research, we now have taxonomy of incident reporting procedure, which future studies could refer to as Dooba, Kamil and Jaafar's taxonomy of incident reporting. This research has additionally shown the path of how safety knowledge is extracted from incident reports: this affords the literature and researchers the opportunity to interrogate the depth of involvement of five safety knowledge carriers or the interconnectedness of the four basic components necessary for safety knowledge extraction. To practice, safety workers, regulators and the HSE departments now know which procedure of incident reporting yields the most favourable safety outcome; and organizations now have a template and a program to automate their incident reporting.

8.5.1 Future Research

More research on this topic needs to be undertaken before the association between safety outcome and incident reporting is more clearly understood. Further research should be done to investigate the specific degree of strength in the relationship between the two variables. Research questions that could be asked include: does incident reporting predict safety outcome.

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APPENDIX A

LIST OF PUBLICATIONS

[1] I. Dooba, "Towards the Creation of Story Sharing Network of Research Supervisors," *Academic Leadership Journal,* vol. 9, pp. 22-25, 2011. Scopus indexed.

[2] I. M. Dooba, A. M. Kamil, A. G. Downe and M. J. Jaafar, "Extraction of Safety Knowledge, Clustering and Automation of Incident Reporting In Malaysia
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[5] I. M. Dooba, A. M. Kamil and M. J. Jaafar, "Extraction of Safety Knowledge from Incident Reports," *Journal of Applied Sciences and Environmental Sustainability, JASES,* vol. 1, 2012. Accepted.

[6] I. M. Dooba, A. M. Kamil and M. J. Jaafar, "What are they and how do they do? Clusters and Taxonomy of Incident Reporting," *PLoS,* 2012. Under review

[7] I. M. Dooba and A. G. Downe, "Extraction and translation of safety knowledge in organizations using incident reports," *African Journal of Business Management,* vol. 5, pp. 9794-9799, 2011. ISI indexed.

[8] I. M. Dooba, A. G. Downe and J. Jaafar, "Unpacking supervisors' tacit knowledge of research supervision," in *National Postgraduate Conference (NPC), 2011,* 2011, pp. 1-6.

[9] I. M. Dooba, A. G. Downe and J. Jaafar, "Laboratory accidents in academia: An incident-report safety knowledge transfer model," in *National Postgraduate Conference (NPC), 2011,* 2011, pp. 1-6.

[10] I. M. Dooba, A. G. Downe and A. K. Mahmood, "If professors knew what professors know: A technique for capturing university teachers' tacit knowledge of research supervision," in *Information Technology (ITSim), 2010 International Symposium in,* 2010, pp. 1-5.

[11] I. M. Dooba, A. G. Downe and J. Jafreezal, "Tales Professors Tell: Narrative Technique for Unpacking Supervisors' Tacit Knowledge of Research Supervision," *National Postgraduate Conference,* vol. 3, 2011.

[12] I. M. Dooba and A. G. Downe, "Towards the Creation of Story Sharing Network of Research Supervisors," *Academic Leadership Journal,* vol. Vol.9, pp. 22-25, 2011. Scopus indexed.

[13] Ibraheem M. Dooba, Alan G. Downe, "Accidents in Academia: An Incident-Report Safety Knowledge Transfer Model " *Europe's Journal of Pyschology*. Scopus indexed.

.

APPENDIX B

APPLICATION SCREENSHOTS

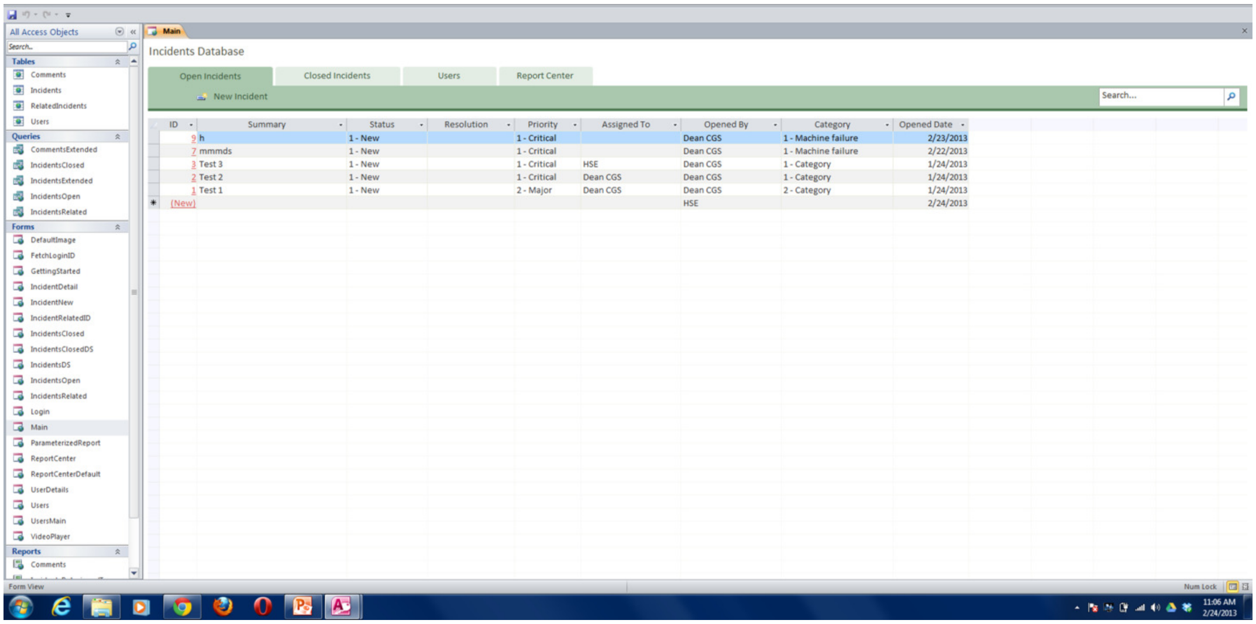


Figure 8.2: Adding New Incidents

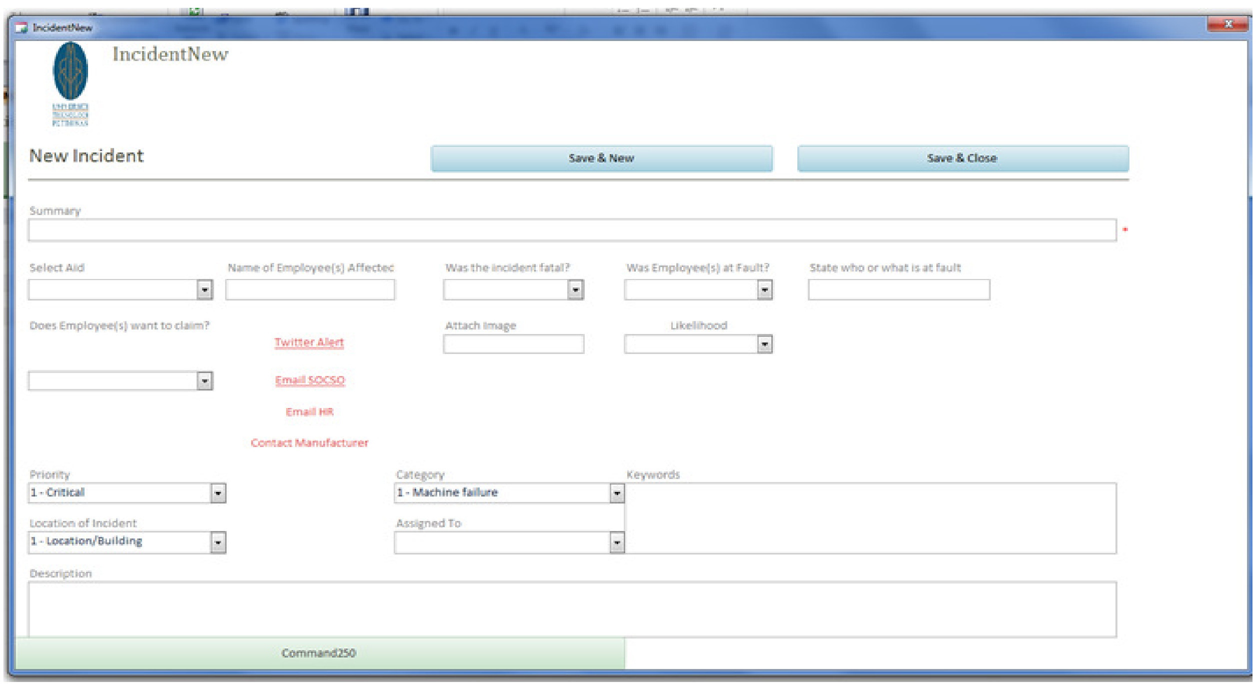


Figure 8.3: Adding New Incidents Details Page

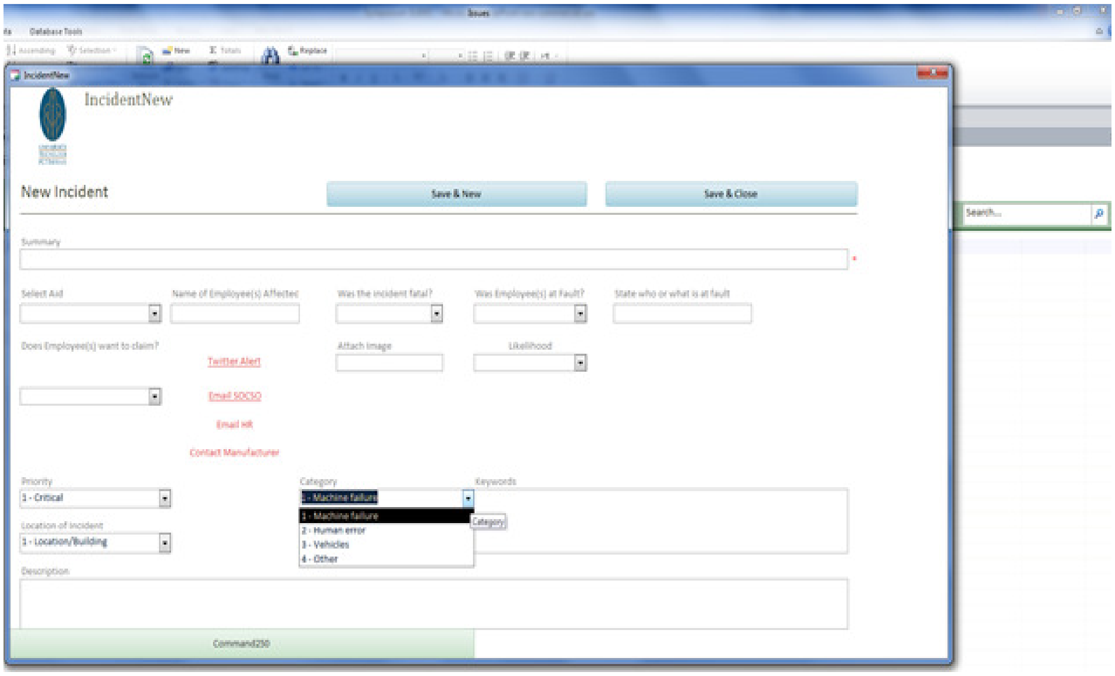


Figure 8.4: Inputting New Category

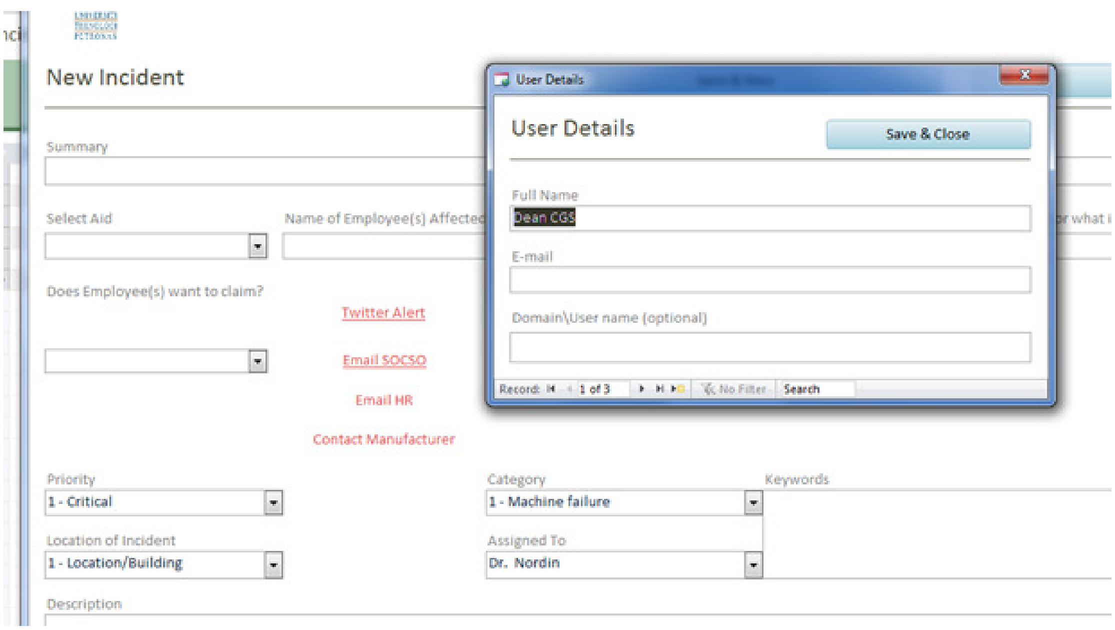


Figure 8.5: New User Access and Permission

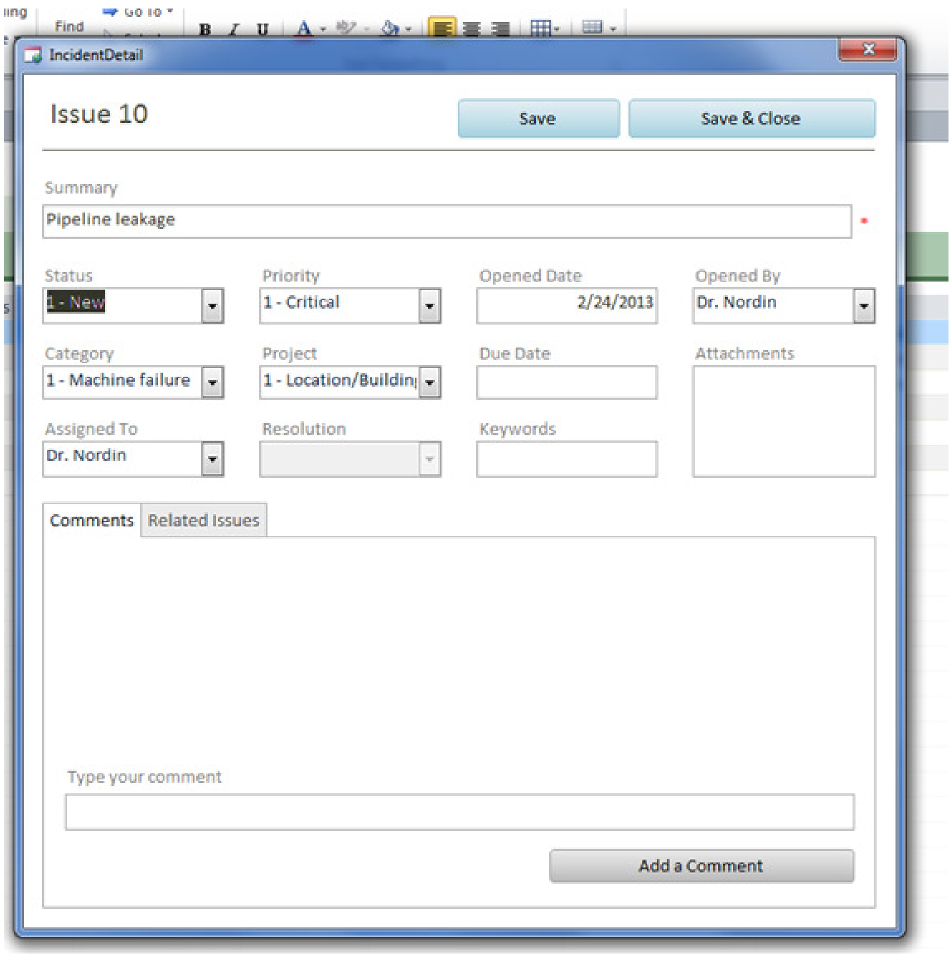


Figure 8.6: Incident Details Page

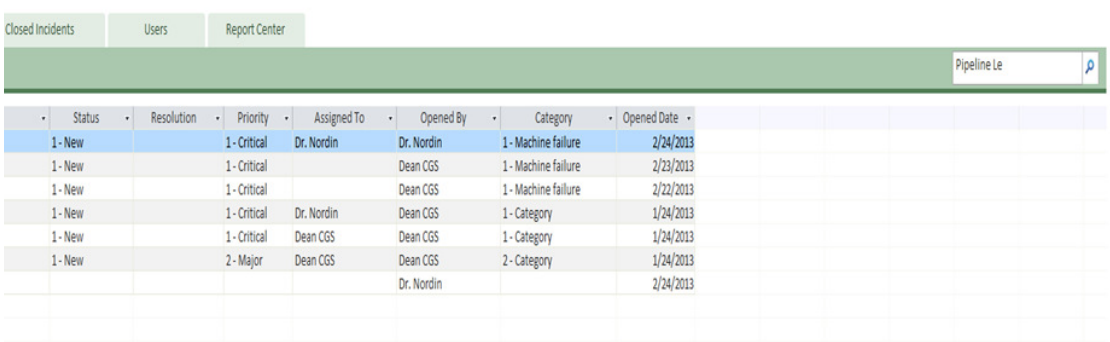


Figure 8.7: Application Search Function

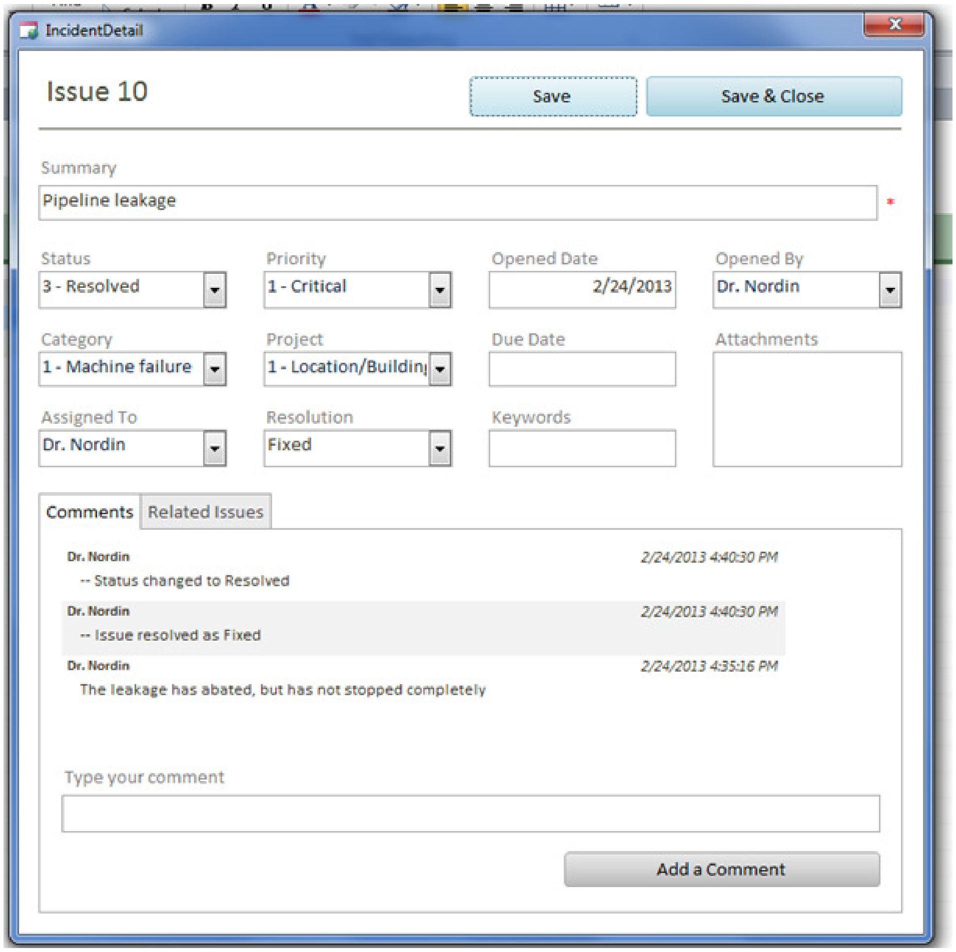


Figure 8.8: Resolution of Closing of Incident

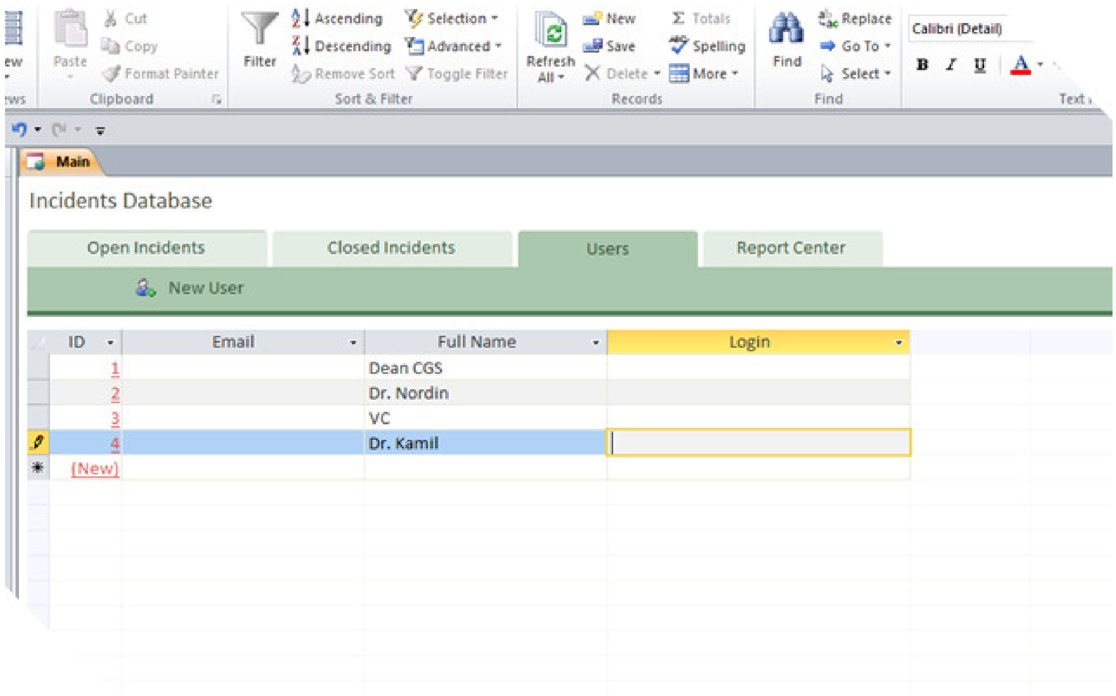


Figure 8.9: Editing Users

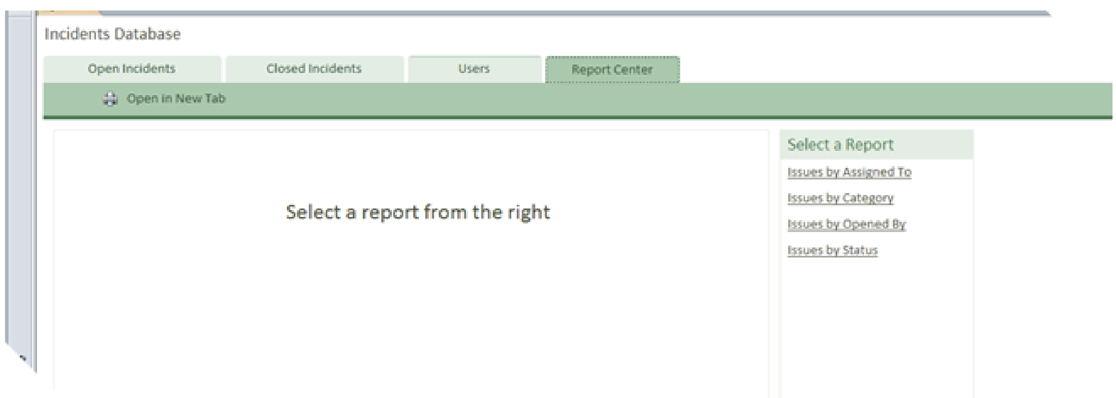


Figure 8.10: Report Center

APPENDIX C

CLUSTERING OUTPUTS

```
GET DATA
  /TYPE=XLS
  /FILE='C:\Documents and Settings\User\Desktop\ResearchData\Sectors\SectorsComb
ined.xls'
  /SHEET=name 'Sheet1'
  /CELLRANGE=full
  /READNAMES=on
  /ASSUMEDSTRWIDTH=32767.

DATASET NAME DataSet1 WINDOW=FRONT.

SAVE OUTFILE='C:\Documents and Settings\User\Desktop\ResearchData\Sectors\Sector
sCombined.sav'
  /COMPRESSED.

TWOSTEP CLUSTER
  /CATEGORICAL VARIABLES=Region Sector Size
  /CONTINUOUS VARIABLES=hseinvolvement hrinvol regulatorinvol victiminvol mangmn
tinvol
  /DISTANCE LIKELIHOOD
  /NUMCLUSTERS AUTO 15 BIC
  /HANDLENOISE 0
  /MEMALLOCATE 64
  /CRITERIA INITHRESHOLD(0) MXBRANCH(8) MXLEVEL(3)
  /PLOT BARFREQ VARCHART COMPARE BYCLUSTER CONFIDENCE 95
  /PRINT IC COUNT SUMMARY
  /SAVE VARIABLE=TSC_9947.
```

Auto-Clustering

Number of Clusters	Schwarz's Bayesian Criterion (BIC)	BIC Change[a]	Ratio of BIC Changes[b]	Ratio of Distance Measures[c]
1	2684.804			
2	2609.913	-74.892	1.000	1.182
3	2565.436	-44.477	.594	1.345
4	2563.717	-1.718	.023	1.105

5	2573.828	10.111	-.135	1.118
6	2595.790	21.962	-.293	1.259
7	2638.421	42.631	-.569	1.032
8	2683.549	45.128	-.603	1.094
9	2735.291	51.742	-.691	1.124
10	2794.803	59.512	-.795	1.080
11	2858.969	64.166	-.857	1.142
12	2930.355	71.386	-.953	1.051
13	3004.203	73.848	-.986	1.104
14	3082.615	78.412	-1.047	1.025
15	3162.089	79.474	-1.061	1.056

a. The changes are from the previous number of clusters in the table.

b. The ratios of changes are relative to the change for the two cluster solution.

c. The ratios of distance measures are based on the current number of clusters against the previous number of clusters.

Cluster Distribution

		N	% of Combined	% of Total
Cluster	1	90	44.1%	44.1%
	2	58	28.4%	28.4%
	3	56	27.5%	27.5%
	Combined	204	100.0%	100.0%
Total		204		100.0%

Cluster

Centroids

	hseinvolvement	hrinvol	regulatorinvol	victiminvol	mangmntinvol

	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Cluster 1	5.42	2.872	5.40	2.832	4.83	3.003	5.61	3.042	5.18	2.697
2	5.45	2.897	5.81	2.775	6.05	2.825	5.34	3.121	5.91	3.051
3	5.64	2.706	5.79	2.807	5.89	2.890	5.39	2.921	5.52	2.948
Combined	5.49	2.822	5.62	2.802	5.47	2.964	5.48	3.020	5.48	2.872

Frequencies

Region

	Central Msia		East Msia		North Msia		Sabah n Sarawak		South Msia	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	19	44.2%	31	72.1%	0	.0%	21	75.0%	19	30.6%
2	20	46.5%	10	23.3%	5	17.9%	4	14.3%	19	30.6%
3	4	9.3%	2	4.7%	23	82.1%	3	10.7%	24	38.7%
Combined	43	100.0%	43	100.0%	28	100.0%	28	100.0%	62	100.0%

Sector

	Academia		Chemical		Construction		Info Tech Services		Manufacturing		oil and gas	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster 1	27	75.0%	12	75.0%	10	28.6%	29	55.8%	3	10.3%	9	25.0%
2	7	19.4%	3	18.8%	19	54.3%	20	38.5%	0	.0%	9	25.0%
3	2	5.6%	1	6.2%	6	17.1%	3	5.8%	26	89.7%	18	50.0%

Sector

		Academia		Chemical		Construction		Info Tech Services		Manufacturing		oil and gas	
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster	1	27	75.0%	12	75.0%	10	28.6%	29	55.8%	3	10.3%	9	25.0%
	2	7	19.4%	3	18.8%	19	54.3%	20	38.5%	0	.0%	9	25.0%
	3	2	5.6%	1	6.2%	6	17.1%	3	5.8%	26	89.7%	18	50.0%
	Combined	36	100.0%	16	100.0%	35	100.0%	52	100.0%	29	100.0%	36	100.0%

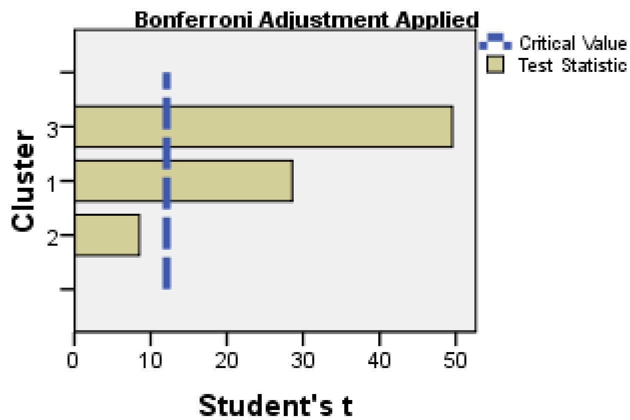
Size

		Red		blue		green		orange		red	
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster	1	0	.0%	0	.0%	49	81.7%	0	.0%	41	54.7%
	2	1	100.0%	48	81.4%	0	.0%	9	100.0%	0	.0%
	3	0	.0%	11	18.6%	11	18.3%	0	.0%	34	45.3%
	Combined	1	100.0%	59	100.0%	60	100.0%	9	100.0%	75	100.0%

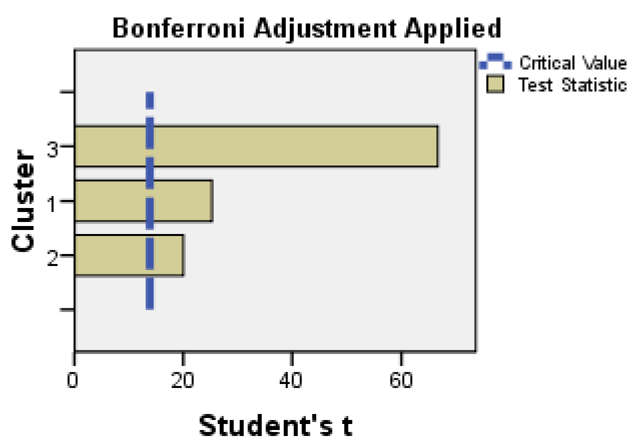
```
AIM  TSC_9947
  /CATEGORICAL Region Sector Size
  /CONTINUOUS hseinvolvement hrinvol regulatorinvol victiminvol mangmntinvol
  /PLOT ERRORBAR CATEGORY IMPORTANCE(X=GROUP Y=TEST)

  /CRITERIA ADJUST=BONFERRONI CI=95 SHOWREFLINE=YES HIDENOTSIG=NO.
```

Importance of variables

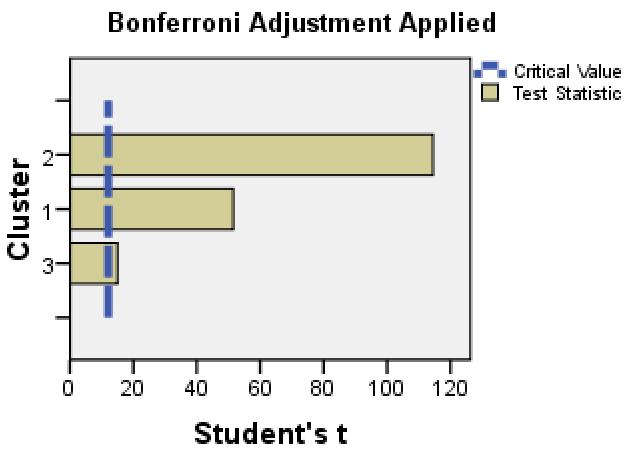
Is regulator involvement an important variable in forming the ...



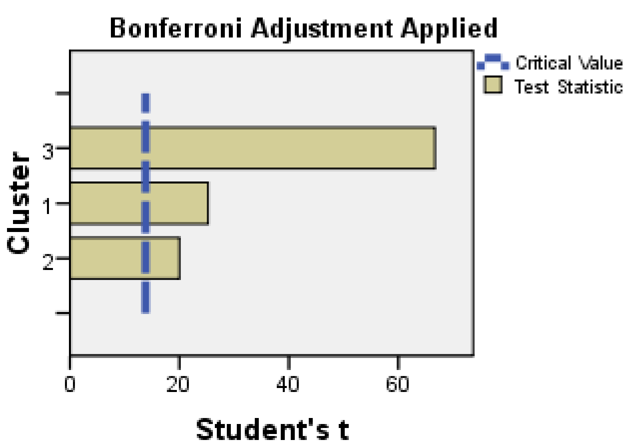
Is HSE involvement an important variable in forming the clusters?



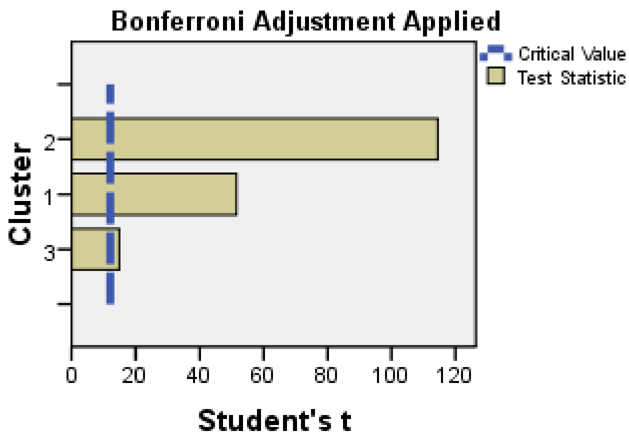
Is HR involvement an important variable in forming the clusters?



Is Victim involvement an important variable in forming the …



Is Management involvement an important variable in forming the clusters?



Means

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
SafetyOutcome * TwoStep Cluster Number	204	100.0%	0	.0%	204	100.0%

Report

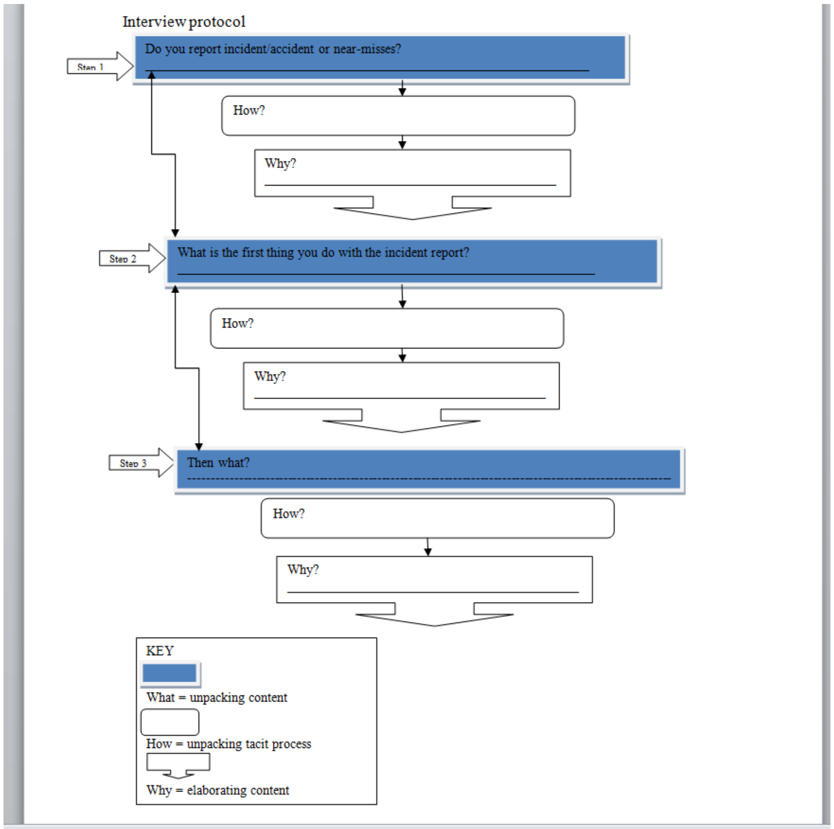
SafetyOutcome

TwoStep Cluster Number	Mean	N	Std. Deviation
1	46.29	90	27.514

2	50.98	58	28.205
3	53.70	56	29.231
Total	49.66	204	28.228

APPENDIX D

INTERVIEW PROTOCOL


Interview protocol
Step 1
Do you report incident/accident or near-misses?
How?
Why?
Step 2
What is the first thing you do with the incident report?
How?
Why?
Step 3
Then what?
How?
Why?
KEY
What = unpacking content
How = unpacking tacit process
Why = elaborating content

APPENDIX E

APPLICATION DOCUMENTATION

Properties

AlternateBackShade:	90	AlternateBackThemeColorIn	3
AlternateBackTint:	100	BackShade:	100
BackTint:	100	DatasheetForeThemeColorIn	-1
DatasheetGridlinesThemeCol	-1	DateCreated:	1/24/2013 11:40:24 AM
DefaultView:	2	DisplayViewsOnSharePointSi	1
FCMinDesignVer:	14.0.0000.0000	FCMinWriteVer:	14.0.0000.0000
FilterOnLoad:	False	GUID:	{guid {84CE3C7E-0D32-4FE5-828E-F6475E463CD0}}
HideNewField:	False	LastUpdated:	2/27/2013 7:30:31 AM
NameMap:	Long binary data	OrderByOn:	False
OrderByOnLoad:	True	Orientation:	Left-to-Right
PublishToWeb:	2	ReadOnlyWhenDisconnected	False
RecordCount:	6	RowHeight:	390
TabularGridlineShade:	100	TabularGridlineThemeColorI	3
TabularGridlineTint:	100	TabularTextShade:	100
TabularTextThemeColorInde	0	TabularTextTint:	100
ThemeFontIndex:	-1	TotalsRow:	False
Updatable:	True	WaitForPostProcessing:	False
WSSTemplateID:	120		

Columns

Name	Type	Size
ID	Long Integer	4

AggregateType:	-1
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length, Auto-Increment
Caption:	ID
CollatingOrder:	Neutral
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
CurrencyLCID:	0
DataUpdatable:	False
GUID:	{guid {611D4937-1A6F-4E35-9834-5B47FDE35D68}}
OrdinalPosition:	0
Required:	False
ResultType:	0
SourceField:	ID
SourceTable:	Comments
TextAlign:	General
WSSFieldID:	ID

Name	Type	Size
IssueID	Long Integer	4

AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length

	BoundColumn:	1
	Caption:	Issue ID
	CollatingOrder:	Neutral
	ColumnCount:	1
	ColumnHeads:	False
	ColumnHidden:	False
	ColumnOrder:	Default
	ColumnWidth:	1950
	ColumnWidths:	1440
	CurrencyLCID:	0
	DataUpdatable:	False
	DecimalPlaces:	Auto
	DisplayControl:	Combo Box
	GUID:	{guid {EE1D23D6-1CFD-49C7-9A37-061296C21EBE}}
	LimitToList:	True
	ListRows:	16
	ListWidth:	1440twip
	OrdinalPosition:	1
	Required:	False
	ResultType:	0
	RowSource:	SELECT [Incidents].ID FROM Incidents;
	RowSourceType:	Table/Query
	ShowOnlyRowSourceValues:	False
	SourceField:	IssueID
	SourceTable:	Comments
	TD_Frag_Relationship:	Issues.ID.4096
	TextAlign:	General
CommentDate		Date/Time 8
	AggregateType:	-1
	AllowZeroLength:	False
	AppendOnly:	False
	Attributes:	Variable Length
	Caption:	Comment Date
	CollatingOrder:	Neutral
	ColumnHidden:	False
	ColumnOrder:	Default
	ColumnWidth:	2895
	CurrencyLCID:	0
	DataUpdatable:	False
	GUID:	{guid {41FC6189-0C39-4A50-9A86-3F0B191787EC}}
	IMEMode:	2
	IMESentenceMode:	3
	OrdinalPosition:	2
	Required:	False
	ResultType:	0
	ShowDatePicker:	For dates
	SourceField:	CommentDate
	SourceTable:	Comments

	TextAlign:	General	
	ValidationRule:	>=#1/1/1900#	
	ValidationText:	Value must be greater than 1/1/1900.	
Comment		Memo	-
	AggregateType:	-1	

AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
Caption:	Comment
CollatingOrder:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	4515
CurrencyLCID:	0
DataUpdatable:	False
GUID:	{guid {20CAE6E2-10A0-4C01-ABBF-0B14C4B74B2F}}
IMEMode:	0
IMESentenceMode:	0
OrdinalPosition:	3
Required:	False
ResultType:	0
SourceField:	Comment
SourceTable:	Comments
TextAlign:	General
TextFormat:	Plain Text
UnicodeCompression:	True

UserID Long Integer 4

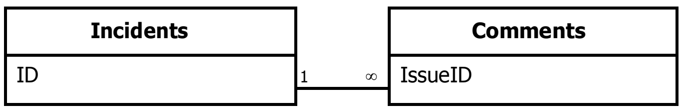
AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
BoundColumn:	1
Caption:	UserID
CollatingOrder:	Neutral
ColumnCount:	2
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
ColumnWidths:	0
CurrencyLCID:	0
DataUpdatable:	False
DecimalPlaces:	Auto
DisplayControl:	Combo Box
GUID:	{guid {CE6907BC-24BA-4ED0-A885-9B5DF480C7E1}}
LimitToList:	True
ListRows:	16
ListWidth:	1440twip
OrdinalPosition:	4
Required:	False
ResultType:	0
RowSource:	SELECT [Users].[ID], [Users].[FullName] FROM Users ORDER BY

	[FullName];
RowSourceType:	Table/Query
ShowOnlyRowSourceValues:	False
SourceField:	UserID
SourceTable:	Comments
TD_Frag_Relationship:	Users▪ID▪0

TextAlign: General

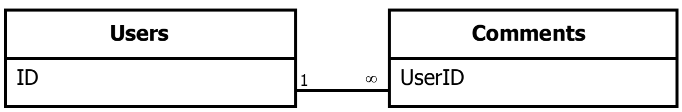
Relationships

IncidentsComments



Attributes:	Enforced, Cascade Deletes
RelationshipType:	One-To-Many

UsersComments



Attributes:	Enforced
RelationshipType:	One-To-Many

Table Indexes

Name		Number of Fields
IssuesCommentsIssueID		1
Clustered:	False	
DistinctCount:	4	
Foreign:	False	
IgnoreNulls:	False	
Name:	IssuesCommentsIssueID	
Primary:	False	
Required:	False	
Unique:	False	
Fields:		
IssueID	Ascending	
New_IssuesCommentsIssueID		1
Clustered:	False	
DistinctCount:	4	
Foreign:	True	
IgnoreNulls:	False	
Name:	New_IssuesCommentsIssueID	
Primary:	False	
Required:	False	
Unique:	False	
Fields:		

IssueID	Ascending
New_UsersCommentsUserID	1
Clustered:	False
DistinctCount:	2
Foreign:	True

IgnoreNulls:	False
Name:	New_UsersCommentsUserID
Primary:	False
Required:	False
Unique:	False
Fields:	
UserID	Ascending
PrimaryKey	1
Clustered:	False
DistinctCount:	6
Foreign:	False
IgnoreNulls:	False
Name:	PrimaryKey
Primary:	True
Required:	True
Unique:	True
Fields:	
ID	Ascending
UsersCommentsUserID	1
Clustered:	False
DistinctCount:	2
Foreign:	False
IgnoreNulls:	False
Name:	UsersCommentsUserID
Primary:	False
Required:	False
Unique:	False
Fields:	
UserID	Ascending

User Permissions

admin	Delete, Read Permissions, Set Permissions, Change Owner, Read Definition, Write Definition, Read Data, Insert Data, Update Data, Delete Data

Group Permissions

Admins	Delete, Read Permissions, Set Permissions, Change Owner, Read Definition, Write Definition, Read Data, Insert Data, Update Data, Delete Data
Users	Delete, Read Permissions, Set Permissions, Change Owner, Read Definition, Write Definition, Read Data, Insert Data, Update Data, Delete Data

Properties

AlternateBackShade:	90	AlternateBackThemeColorIn	3
AlternateBackTint:	100	BackShade:	100
BackTint:	100	DatasheetForeThemeColorIn	-1
DatasheetGridlinesThemeCol	-1	DateCreated:	1/24/2013 11:40:24 AM
DefaultView:	2	DisplayViewsOnSharePointSi	1
FCMinDesignVer:	14.0.0000.0000	FCMinWriteVer:	14.0.0000.0000
FilterOnLoad:	False	GUID:	{guid {3AA0D334-0046-432C-A820-3E3312B7938C}}
HideNewField:	False	LastUpdated:	2/27/2013 7:30:31 AM
NameMap:	Long binary data	OrderByOn:	False
OrderByOnLoad:	True	Orientation:	Left-to-Right
PublishToWeb:	2	ReadOnlyWhenDisconnected	False
RecordCount:	10	RowHeight:	330
TabularGridlineShade:	100	TabularGridlineThemeColorI	3
TabularGridlineTint:	100	TabularTextShade:	100
TabularTextThemeColorInde	0	TabularTextTint:	100
ThemeFontIndex:	-1	TotalsRow:	False
Updatable:	True	ValidationText:	Dates must be after 1/1/2009.
WaitForPostProcessing:	False	WSSTemplateID:	1100

Columns

Name	Type	Size
ID	Long Integer	4

AggregateType:	-1
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length, Auto-Increment
Caption:	ID
CollatingOrder:	Neutral
ColumnHidden:	False
ColumnOrder:	1
ColumnWidth:	885
CurrencyLCID:	0
DataUpdatable:	False
GUID:	{guid {E1EE987C-2BCE-44FD-A48D-5C0982124506}}
OrdinalPosition:	0
Required:	False
ResultType:	0
SourceField:	ID
SourceTable:	Incidents
TextAlign:	General
WSSFieldID:	ID

Summary	Text	255

AggregateType:	-1
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
Caption:	Summary
CollatingOrder:	General

ColumnHidden:	False
ColumnOrder:	2
ColumnWidth:	2850
CurrencyLCID:	0
DataUpdatable:	False
DisplayControl:	Text Box
GUID:	{guid {BBC29371-B39F-4750-AE75-6B4EF022AD05}}
IMEMode:	0
IMESentenceMode:	0
OrdinalPosition:	1
Required:	True
ResultType:	0
SourceField:	Summary
SourceTable:	Incidents
TextAlign:	General
UnicodeCompression:	True

Status Text 255

AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
BoundColumn:	1
Caption:	Status
CollatingOrder:	General
ColumnCount:	2
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	3
ColumnWidth:	Default
ColumnWidths:	0;2100
CurrencyLCID:	0
DataUpdatable:	False
DefaultValue:	="1"
DisplayControl:	Combo Box
GUID:	{guid {9B11EC28-BB83-4A6F-BC32-1321D219BF22}}
IMEMode:	0
IMESentenceMode:	0
LimitToList:	True
ListRows:	16
ListWidth:	2100twip
OrdinalPosition:	2
Required:	True
ResultType:	0
RowSource:	1;"1 - New";2;"2 - Active";3;"3 - Resolved";4;"4 - Closed"
RowSourceType:	Value List
ShowOnlyRowSourceValues:	False
SourceField:	Status

SourceTable:	Incidents
TextAlign:	General
UnicodeCompression:	True
WSSFieldID:	Status

Priority		Text	255
	AggregateType:	-1	
	AllowMultipleValues:	False	
	AllowValueListEdits:	True	
	AllowZeroLength:	False	
	AppendOnly:	False	
	Attributes:	Variable Length	
	BoundColumn:	1	
	Caption:	Priority	
	CollatingOrder:	General	
	ColumnCount:	1	
	ColumnHeads:	False	
	ColumnHidden:	False	
	ColumnOrder:	4	
	ColumnWidth:	Default	
	ColumnWidths:	1440	
	CurrencyLCID:	0	
	DataUpdatable:	False	
	DefaultValue:	"1 - Critical"	
	DisplayControl:	Combo Box	
	GUID:	{guid {06F6DA9F-7214-4ABC-8035-3D1B5925CEBC}}	
	IMEMode:	0	
	IMESentenceMode:	0	
	LimitToList:	True	
	ListRows:	16	
	ListWidth:	1440twip	
	OrdinalPosition:	3	
	Required:	False	
	ResultType:	0	
	RowSource:	"1 - Critical";"2 - Major";"3 - Minor";"4 - Trivial"	
	RowSourceType:	Value List	
	ShowOnlyRowSourceValues:	False	
	SourceField:	Priority	
	SourceTable:	Incidents	
	TextAlign:	General	
	UnicodeCompression:	True	
	WSSFieldID:	Priority	
Category		Text	255
	AggregateType:	-1	
	AllowMultipleValues:	False	
	AllowValueListEdits:	True	
	AllowZeroLength:	False	
	AppendOnly:	False	
	Attributes:	Variable Length	
	BoundColumn:	1	
	Caption:	Category	
	CollatingOrder:	General	
	ColumnCount:	1	
	ColumnHeads:	False	
	ColumnHidden:	False	

ColumnOrder:	5
ColumnWidth:	Default
ColumnWidths:	1440
CurrencyLCID:	0

DataUpdatable:	False	
DefaultValue:	"1 - Category"	
DisplayControl:	Combo Box	
GUID:	{guid {B4819567-58BD-43D4-9149-823F960292DC}}	
IMEMode:	0	
IMESentenceMode:	0	
LimitToList:	True	
ListRows:	16	
ListWidth:	1440twip	
OrdinalPosition:	4	
Required:	False	
ResultType:	0	
RowSource:	"1 - Machine failure";"2 - Human error";"3 - Vehicles";"4 - Other"	
RowSourceType:	Value List	
ShowOnlyRowSourceValues:	False	
SourceField:	Category	
SourceTable:	Incidents	
TextAlign:	General	
UnicodeCompression:	True	
WSSFieldID:	Category	

Project	Text	255
AggregateType:	-1	
AllowMultipleValues:	False	
AllowValueListEdits:	True	
AllowZeroLength:	False	
AppendOnly:	False	
Attributes:	Variable Length	
BoundColumn:	1	
Caption:	Project	
CollatingOrder:	General	
ColumnCount:	1	
ColumnHeads:	False	
ColumnHidden:	False	
ColumnOrder:	6	
ColumnWidth:	Default	
ColumnWidths:	1440	
CurrencyLCID:	0	
DataUpdatable:	False	
DefaultValue:	"1 - Project"	
DisplayControl:	Combo Box	
GUID:	{guid {B0201C0C-FAA8-4276-9B6A-5F64AE186796}}	
IMEMode:	0	
IMESentenceMode:	0	
LimitToList:	True	
ListRows:	16	
ListWidth:	1440twip	
OrdinalPosition:	5	
Required:	False	
ResultType:	0	
RowSource:	"1 - Project";"2 - Project";"3 - Project"	

RowSourceType:	Value List
ShowOnlyRowSourceValues:	False
SourceField:	Project
SourceTable:	Incidents

	TextAlign:	General	
	UnicodeCompression:	True	
OpenedDate		Date/Time	8
	AggregateType:	-1	
	AllowZeroLength:	False	
	AppendOnly:	False	
	Attributes:	Variable Length	
	Caption:	Opened Date	
	CollatingOrder:	Neutral	
	ColumnHidden:	False	
	ColumnOrder:	7	
	ColumnWidth:	2445	
	CurrencyLCID:	0	
	DataUpdatable:	False	
	DefaultValue:	=Date()	
	Format:	Short Date	
	GUID:	{guid {1744410E-2ACB-4A1A-828E-553EDB537513}}	
	IMEMode:	2	
	IMESentenceMode:	3	
	Locked:	True	
	OrdinalPosition:	6	
	Required:	True	
	ResultType:	0	
	ShowDatePicker:	For dates	
	SourceField:	OpenedDate	
	SourceTable:	Incidents	
	TextAlign:	General	
	ValidationRule:	>=#1/1/1900#	
	ValidationText:	Value must be greater than 1/1/1900.	
	WSSFieldID:	OpenedDate	
DueDate		Date/Time	8
	AggregateType:	-1	
	AllowZeroLength:	False	
	AppendOnly:	False	
	Attributes:	Variable Length	
	Caption:	Due Date	
	CollatingOrder:	Neutral	
	ColumnHidden:	False	
	ColumnOrder:	8	
	ColumnWidth:	Default	
	CurrencyLCID:	0	
	DataUpdatable:	False	
	GUID:	{guid {21E599A9-EB8D-436C-9A85-9EC9194CAF1F}}	
	IMEMode:	2	
	IMESentenceMode:	3	
	OrdinalPosition:	7	
	Required:	False	

ResultType:	0
ShowDatePicker:	For dates
SourceField:	DueDate
SourceTable:	Incidents
TextAlign:	General
ValidationRule:	>=#1/1/1900#

ValidationText:	Value must be greater than 1/1/1900.		
WSSFieldID:	DueDate		
Keywords		Text	255
AggregateType:	-1		
AllowZeroLength:	False		
AppendOnly:	False		
Attributes:	Variable Length		
Caption:	Keywords		
CollatingOrder:	General		
ColumnHidden:	False		
ColumnOrder:	9		
ColumnWidth:	Default		
CurrencyLCID:	0		
DataUpdatable:	False		
DisplayControl:	Text Box		
GUID:	{guid {A73C0405-8CDA-47B6-8314-EC2238A4D512}}		
IMEMode:	0		
IMESentenceMode:	0		
OrdinalPosition:	8		
Required:	False		
ResultType:	0		
SourceField:	Keywords		
SourceTable:	Incidents		
TextAlign:	General		
UnicodeCompression:	True		
Resolution		Text	255
AggregateType:	-1		
AllowMultipleValues:	False		
AllowValueListEdits:	True		
AllowZeroLength:	False		
AppendOnly:	False		
Attributes:	Variable Length		
BoundColumn:	1		
Caption:	Resolution		
CollatingOrder:	General		
ColumnCount:	1		
ColumnHeads:	False		
ColumnHidden:	False		
ColumnOrder:	10		
ColumnWidth:	3045		
ColumnWidths:	1440		
CurrencyLCID:	0		
DataUpdatable:	False		
DisplayControl:	Combo Box		
GUID:	{guid {F99422AE-AF0F-4BCF-97D2-832C283143EB}}		
IMEMode:	0		
IMESentenceMode:	0		

LimitToList:	True
ListRows:	16
ListWidth:	1440twip
OrdinalPosition:	9
Required:	False
ResultType:	0

RowSource:	"Fixed";"By Design";"Won't Fix";"Invalid";"Duplicate"	
RowSourceType:	Value List	
ShowOnlyRowSourceValues:	False	
SourceField:	Resolution	
SourceTable:	Incidents	
TextAlign:	General	
UnicodeCompression:	True	

ResolvedVersion		Text	255
AggregateType:	-1		
AllowZeroLength:	False		
AppendOnly:	False		
Attributes:	Variable Length		
Caption:	Resolved Version		
CollatingOrder:	General		
ColumnHidden:	False		
ColumnOrder:	11		
ColumnWidth:	3420		
CurrencyLCID:	0		
DataUpdatable:	False		
DisplayControl:	Text Box		
GUID:	{guid {10242489-91A0-450F-B21A-17698F02F121}}		
IMEMode:	0		
IMESentenceMode:	0		
OrdinalPosition:	10		
Required:	False		
ResultType:	0		
SourceField:	ResolvedVersion		
SourceTable:	Incidents		
TextAlign:	General		
UnicodeCompression:	True		

Attachments		Attachment Data	4
AggregateType:	-1		
AllowZeroLength:	False		
AppendOnly:	False		
Attributes:	Fixed Size		
Caption:	Attachments		
CollatingOrder:	2		
ColumnHidden:	False		
ColumnOrder:	12		
ColumnWidth:	Default		
CurrencyLCID:	0		
DataUpdatable:	False		
DisplayControl:	126		
GUID:	{guid {C9F950F5-6BB2-4A6E-810B-296AED713934}}		
OrdinalPosition:	11		
Required:	False		
ResultType:	0		
SourceField:	Attachments		
SourceTable:	Incidents		

TextAlign:	General	
WSSFieldID:	Attachments	

OpenedByUserID	Long Integer	4

AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
BoundColumn:	1
Caption:	Opened By
CollatingOrder:	Neutral
ColumnCount:	2
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	13
ColumnWidth:	6240
ColumnWidths:	0
CurrencyLCID:	0
DataUpdatable:	False
DecimalPlaces:	Auto
DisplayControl:	Combo Box
GUID:	{guid {E0BBA9A7-265B-4E39-9FEB-E6949E5CBF86}}
LimitToList:	True
ListRows:	16
ListWidth:	1440twip
OrdinalPosition:	12
Required:	False
ResultType:	0
RowSource:	SELECT [Users].[ID], [Users].[FullName] FROM Users ORDER BY [FullName];
RowSourceType:	Table/Query
ShowOnlyRowSourceValues:	False
SourceField:	OpenedByUserID
SourceTable:	Incidents
TD_Frag_Relationship:	Users.ID.0
TextAlign:	General

AssignedToUserID Long Integer 4

AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
BoundColumn:	1
Caption:	Assigned To
CollatingOrder:	Neutral
ColumnCount:	2
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	14

ColumnWidth:	4770
ColumnWidths:	0
CurrencyLCID:	0
DataUpdatable:	False
DecimalPlaces:	Auto
DisplayControl:	Combo Box

GUID:	{guid {4D7757AB-2DD7-41CC-8195-1C48C3231A41}}
LimitToList:	True
ListRows:	16
ListWidth:	1440twip
OrdinalPosition:	13
Required:	False
ResultType:	0
RowSource:	SELECT [Users].[ID], [Users].[FullName] FROM Users ORDER BY [FullName];
RowSourceType:	Table/Query
ShowOnlyRowSourceValues:	False
SourceField:	AssignedToUserID
SourceTable:	Incidents
TD_Frag_Relationship:	Users.ID.0
TextAlign:	General

ChangedByUserID Long Integer 4

AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
BoundColumn:	1
Caption:	Changed By
CollatingOrder:	Neutral
ColumnCount:	2
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	15
ColumnWidth:	5190
ColumnWidths:	0
CurrencyLCID:	0
DataUpdatable:	False
DecimalPlaces:	Auto
DisplayControl:	Combo Box
GUID:	{guid {5F31DEF7-08A3-4E6F-A81F-04B131D0AE14}}
LimitToList:	True
ListRows:	16
ListWidth:	1440twip
OrdinalPosition:	14
Required:	False
ResultType:	0
RowSource:	SELECT [Users].[ID], [Users].[FullName] FROM Users ORDER BY [FullName];
RowSourceType:	Table/Query
ShowOnlyRowSourceValues:	False
SourceField:	ChangedByUserID

SourceTable:	Incidents	
TD_Frag_Relationship:	Users▪ID▪0	
TextAlign:	General	

Select Aid		4
AggregateType:	-1	

AllowMultipleValues:	True
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Fixed Size
BoundColumn:	1
CollatingOrder:	3
ColumnCount:	1
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	16
ColumnWidth:	Default
ColumnWidths:	1440
CurrencyLCID:	0
DataUpdatable:	False
DisplayControl:	Combo Box
GUID:	{guid {66954F50-68B4-4A48-8D07-FDA7E8788168}}
IMEMode:	0
IMESentenceMode:	3
LimitToList:	True
ListRows:	16
ListWidth:	1440twip
OrdinalPosition:	15
Required:	False
ResultType:	0
RowSource:	"First aid";"Police";"Fire Service";"Ambulance";"Doctor";"Self-aid"
RowSourceType:	Value List
ShowOnlyRowSourceValues:	False
SourceField:	Select Aid
SourceTable:	Incidents
TextAlign:	General
UnicodeCompression:	True

Was the incident fatal　　Text　　255

AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
BoundColumn:	1
CollatingOrder:	General
ColumnCount:	2
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	17
ColumnWidth:	Default
ColumnWidths:	1440;2625
CurrencyLCID:	0
DataUpdatable:	False

DisplayControl:	Combo Box
GUID:	{guid {9D779F30-0237-49FC-BD7E-E6DEC39F4DE3}}
IMEMode:	0
IMESentenceMode:	3
LimitToList:	True

ListRows:	16
ListWidth:	4065twip
OrdinalPosition:	16
Required:	False
ResultType:	0
RowSource:	"Yes";"Report to DOSH and Management";"No";"You may report to Management";"Other";"HSE should use discretion"
RowSourceType:	Value List
ShowOnlyRowSourceValues:	False
SourceField:	Was the incident fatal
SourceTable:	Incidents
TextAlign:	General
UnicodeCompression:	True

Was employee at fault Text 255

AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
BoundColumn:	1
CollatingOrder:	General
ColumnCount:	2
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	18
ColumnWidth:	Default
ColumnWidths:	1440;3795
CurrencyLCID:	0
DataUpdatable:	False
DisplayControl:	Combo Box
GUID:	{guid {F4F5140F-1358-4033-BFCD-90AA9C1629D3}}
IMEMode:	0
IMESentenceMode:	3
LimitToList:	True
ListRows:	16
ListWidth:	5235twip
OrdinalPosition:	17
Required:	False
ResultType:	0
RowSource:	"Yes";"Inform HR";"No";"Note (not at fault)";"Other";"Leave a note below stating who or what is at fault"
RowSourceType:	Value List
ShowOnlyRowSourceValues:	False
SourceField:	Was employee at fault
SourceTable:	Incidents
TextAlign:	General
UnicodeCompression:	True

State who or what is at fault	Text	255

AggregateType:	-1
AllowZeroLength:	False
AppendOnly:	False

Attributes:	Variable Length
CollatingOrder:	General
ColumnHidden:	False
ColumnOrder:	19
ColumnWidth:	Default
CurrencyLCID:	0
DataUpdatable:	False
DisplayControl:	Text Box
GUID:	{guid {86A6C237-DDA4-448B-BD99-9F232D8667D1}}
IMEMode:	0
IMESentenceMode:	3
OrdinalPosition:	18
Required:	False
ResultType:	0
SourceField:	State who or what is at fault
SourceTable:	Incidents
TextAlign:	General
UnicodeCompression:	True

Does employee want to claim Text 255

AggregateType:	-1
AllowMultipleValues:	False
AllowValueListEdits:	True
AllowZeroLength:	False
AppendOnly:	False
Attributes:	Variable Length
BoundColumn:	1
CollatingOrder:	General
ColumnCount:	2
ColumnHeads:	False
ColumnHidden:	False
ColumnOrder:	20
ColumnWidth:	Default
ColumnWidths:	1440;1980
CurrencyLCID:	0
DataUpdatable:	False
DisplayControl:	Combo Box
GUID:	{guid {588D4323-12BF-4145-9D05-4E6AA9DC2C79}}
IMEMode:	0
IMESentenceMode:	3
LimitToList:	True
ListRows:	16
ListWidth:	3420twip
OrdinalPosition:	19
Required:	False
ResultType:	0
RowSource:	"Yes";"Inform HR & SOCSO";"No";"Employee may claim later"
RowSourceType:	Value List
ShowOnlyRowSourceValues:	False
SourceField:	Does employee want to claim

SourceTable:	Incidents	
TextAlign:	General	
UnicodeCompression:	True	

Name(s) of Employee(s) Affected	Text	255