UNIVERSITI PUTRA MALAYSIA

DEVELOPMENT OF AN EXPERT SYSTEM TO IDENTIFY IMPLEMENTATION GAPS OF OHSAS 18001 IN MANUFACTURING INDUSTRIES

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By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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Dedicated to my parents

Abstract of thesis presented to the Senate of Universiti Putra Malaysia
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An expert system (ES) has been developed to perform OHSAS 18001 Gap Analysis for the small and medium scale manufacturing industries in Malaysia. OHSAS 18001 is the standard for occupational safety and health management system. The expert system was written using JavaScript version 1.4 and is named Gap Analysis Expert System (GAES). Although OHSAS 18001 is a proven safety management system, the major problem among small and medium scale manufacturing companies is its implementation, mainly due to cost factors. This fact has been derived after the researcher received direct feedback from manufacturing companies during audits. The approach in the development of the system starts with surveys. Two categories of survey are done, that is the domain expert interviews and the field surveys. Two domain experts are interviewed and the questionnaires for the field survey are firmed up. The field survey covers 30 OSH consultants who comment on 30 different factors that would exert an influence on the implementation of OHSAS 18001. The raw data obtained in the field surveys is processed and a ranking of factors is subsequently derived. The field surveys reveal that the three most

important factors that exert an influence in the implementation of OHSAS 18001 are Safety Culture, Process Hazard Analysis and Job Training. Indeed the top ten factors from the survey are given close attention and they are matched against the sixteen statements found in the GAES. The sixteen statements contained in the GAES originate directly from the clauses of OHSAS 18001 standard. This exercise would indicate the statements in the GAES that would need to be considered very carefully when administering the expert system, thus enhancing accuracy and reliability. The GAES has been found to be a user friendly expert system that churns out the final safety gap of an organization expressed in percentage value. This finding is expected to initiate and spearhead efforts in the implementation of OHSAS 18001 among small and medium scale manufacturing companies. Finally, the GAES was field tested in two organizations, IBI Brass (M) Sdn Bhd and Topaz Evergreen (M) Sdn Bhd.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan ijazah Sarjana Sains

PEMBANGUNAN SISTEM PAKAR UNTUK MENGENALPASTI JURANG PERLAKSANAAN BAGI OHSAS 18001 DALAM INDUSTRI PEMBUATAN

Oleh

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Pengerusi : Profesor Madya Megat Mohd Hamdan B Megat Ahmad, PhD

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Sebuah sistem pakar demi tujuan melaksanakan Analisis Jurang OHSAS 18001 khususnya untuk industri-industri pembuatan kecil dan sederhana di Malaysia telah dibangunkan. OHSAS 18001 adalah piawaian bagi sistem pengurusan keselamatan dan kesihatan pekerjaan. Sistem pakar ini direka dengan menggunakan bahasa "JavaScript" versi 1.4 serta dinamakan Sistem Pakar Analisis Jurang (GAES).

Walaupun OHSAS 18001 merupakan sistem pengurusan keselamatan yang terbukti, masalah besar yang dihadapi oleh syarikat-syarikat pembuatan kecil dan sederhana adalah dari segi kos yang terlibat dalam perlaksanaannya. Pemerhatian ini telah dibuat setelah penyelidik mendapat maklumbalas terus daripada syarikat-syarikat pembuatan apabila membuat audit. Kaedah yang diambil dalam pembangunan sistem ini bermula dengan dua kategori kajian yang dibuat, iaitu dengan temubual-temubual yang melibatkan pakar domain serta kajian padang. Dua orang pakar domain telah ditemubual dan senarai soalan untuk kajian padang dirumuskan secara

akhirnya. Kajian padang meliputi 30 pakar dalam bidang OSH yang akan memberi komen bbmereka terhadap 30 faktor-faktor yang dapat mempengaruhi perlaksanaan OHSAS 18001. Data mentah yang diperolehi daripada kajian padang diproses dan satu siri kedudukan factor-faktor dibangkitkan. Kajian padang mendedahkan bahawa tiga faktor utama yang mempengaruhi perlaksanaan OHSAS 18001 adalah Budaya Keselamatan, Analisis Hazard Proses dan Latihan Kerja. Secara hakikatnya, sepuluh faktor utama yang diperohi daripada kajian ini adalah diberi perhatian rapat dan factor-faktor ini dibandingkan dengan kenyataan-kenyataan yang ada di dalam GAES. Daripada enambelas kenyataan-kenyataan yang berada di dalam GAES, hampir semuanya berasal terus dari petikan-petikan piawaian OHSAS 18001 sendiri. Langkah ini akan menunjuk kepada petikan-petikan daripada GAES yang mesti ditimbangkan secara berhati-hati apabila menggunakan sistem pakar ini. Proses ini sejurusnya meningkatkan ketepatan analisis sistem GAES. GAES adalah sistem pakar mesra yang memberi nilai jurang keselamatan sesebuah organisasi dalam bentuk peratus. Keputusan ini dapat memulakan dan menjuruskan usaha dalam perlaksanaan OHSAS 18001 di kalangan syarikat-syarikat pembuatan kecil dan sederhana. Secara akhirnya, GAES ini telah diuji di dua buah organisasi iaitu IBI Brass (M) Sdn Bhd and Topaz Evergreen (M) Sdn Bhd.

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This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

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DECLARATION

I 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 UPM or other institutions.

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AKASH SURI

Date: 24 April 2007

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LIST OF ABBREVIATIONS

BSI	British Standards Institute
CEO	Chief Executive Officer
DOSH	Department of Occupational Safety & Health, Malaysia
ES	Expert System
EMS	Environmental Management System
FMA	Factories & Machinery Act
GAES	Gap Analysis Expert System
GDP	Gross Domestic Product
HACCP	Hazard Analysis Critical Control Point
HSE	Health, Safety & Environment
ISO	International Organization for Standardization
ILO	International Labour Organization
MRS	Manufacturing Related Services
NIOSH	National Institute of Occupational safety & Health, Malaysia
OSH	Occupational Safety & Health
OH&S	Occupational Health & Safety
OHSAS	Occupational Health & Safety Assessment Series
OHD	Occupational Health Doctor
OSHA	Occupational Safety & Health Act
OSH-MS	Occupational Safety & Health Management System
PDCA	Plan – Do – Check – Act
QMS	Quality Management System
SOCSO	Social Security Organization

SMI	Small & Medium Scale Industries
SME	Small & Medium Scale Enterprises
SMIDEC	Small & Medium Scale Industries Development Corporation

CHAPTER 1

INTRODUCTION

1.1 Introduction

The OHSAS 18001 (OSH management system) has a total of 24 clauses. Many manufacturing companies are under the wrong impression that the OHSAS 18001 is simply an extension of ISO 9001 quality management system or ISO 14001 environmental management system. Further, many manufacturing companies think that if they are certified with ISO 9001 or a combination of ISO 9001 and ISO 14001, then there is totally no need to have any elements of OHSAS 18001.

This perception is inaccurate. The OSH Act 1994 (with its 7 regulations) and the FMA 1967 (with regulations) are laws that the manufacturing sector, along with other sectors, has to honor. Although the Malaysian OSH legislations do not speak of OHSAS 18001 as such, many elements of OHSAS 18001 (which is a generic system) are reflected in the Malaysian OSH legislations.

This translates to the fact that if the manufacturing industries take the pain to fully honor the Malaysian OSH legislations, they automatically would have a number of significant elements of the OHSAS 18001 in place.

Presently, there are no Malaysian laws that require manufacturing companies to implement the full cycle of OHSAS 18001 management system and obtain certification. However, during a recent development, in the year 2006, where a

consultant was crushed to his death due to a falling object in a residential construction area, new laws are being drafted.

The Department of Occupational Safety & Health (DOSH) of Malaysia is considering making a new regulation under the OSH Act 1994 whereby selected construction projects must implement the OHSAS 18001 management system. However, as far as the manufacturing sector is concerned, there are no plans for mandatory implementation of OHSAS 18001.

1.2 Problem Statement

Although OHSAS 18001 is a proven safety management system, the major problem is its implementation, mainly due to cost factors. This fact has been derived after the researcher received direct feedback from manufacturing companies during audits. Within the scope of implementation, performing an OHSAS 18001 Gap Analysis is another main issue that often irks many manufacturing companies, especially the small and medium scale industries. This is because when a consultant is hired to perform the Gap Analysis, whether separately or part of the entire OHSAS 18001 implementation, cost based on daily man hour rates had to be borne by the organization. As an example, if a SMI has multiple manufacturing facilities and the man day requirement to complete the Gap Analysis is 5 days, then the cost could come up to RM 7500.00.

With the availability of the OHSAS 18001 Gap Analysis Expert System (GAES), this problem is expected to be drastically reduced. The OHSAS 18001 Gap Analysis

Expert System can be admininstered by the small and medium scale industries without external help. If the system is used diligently, the results are expected to be reasonably reliable. The expert system also incorporates a checklist that could make an assessment on the correct practices of the Safety and Health Committee.

The Occupational Safety & Health Act 1994 (OSH Act 1994) is the self regulatory Act, based on the management style of Lord Ruben, that the Malaysian government enacted. Although the OSH Act 1994 has been enacted for more than a decade, many associated regulations of the act lack proper implementation – mainly due to cost factors. Table 1.1 provides the list of regulations that have been drafted over the years. Many organizations do not even know the extent of deviation of their existing safety practices against the regulatory requirements contained in the associated regulations of the OSH Act 1994. This widespread observation has been made by the researcher during quality management system audits performed in manufacturing companies. The GAES developed in this study is expected to bring relieve to this problem.

Fundamentally, many elements of the OSH Act 1994 is reflected in OHSAS 18001. Table 1.1 shows three selected correspondent clauses in the OHSAS 18001 against the OSH Act 1994.

Table 1.1 : Correspondent clauses in the OHSAS 18001 against the OSH Act 1994.

OSH element	OSH Act 1994	OHSAS 18001
Policy	1) Section 16, OSH Act 1994 2) Safety Policy Regulations 1996	Clause 4.2 Policy
Safety Committee	1) Section 30 & 31, OSH Act 1994 2) Safety & Health Committee Regulations 1996	Clause 4.4.1 Structure & Responsibility
OSH Officer	1) Safety & Health Officer Regulations, 1997 Safety & Health Officer Order, 1997	Clause 4.4.1 Structure & Responsibility

1.3 Objectives of the Study

The objectives of the study are:

(i) To identify factors affecting the implementation of OHSAS 18001.

(ii) To develop a gap analysis expert system for OHSAS 18001 implementation.

1.4 Motivations for the study

The motivations of the study are as follows:

(i) An OHSAS 18001 Gap Analysis can make the workplace safer even if a full fledge OHSAS 18001 system is not implemented.

(ii) The OHSAS 18001 Gap Analysis can speed up the certification process should the manufacturing company decide to implement a full fledge system.

(iii) The Safety & Health Committee checklist, which is part of the expert system, can act as a free 'mini legal advisor' to companies who are unwilling to outsource expertise due to costs and other reasons

1.5 Significance of the Study

Malaysia has successfully industrialized herself. Once upon a time, the main exports of Malaysia were tin, rubber and agricultural products. Today manufactured goods, mainly from the electronics sector, make up the main export of the country. When industries mushroom, it is inevitable to aim for the highest standards in the manner the industries are managed – from every angle as such. In this aspect, quality standards (ISO 9001), environmental standards (ISO 14001) and health & safety standards (OHSAS 18001) are all crucial for the success of the manufacturing industries. With the aggressive implementation of standards among Malaysian manufacturing companies and the introduction of OSH laws in the last decade of the 20th century, Malaysian industrial accident trends have demonstrated remarkable figures. Many third world countries are keen to learn how industries in Malaysia have achieved reasonably strong safety standards. From industrial accident rate (per 1000 employees) of 22.0 in 1992, the figure has plunged to 10.3 in 2002. Table 1.2 elaborates details of industrial accident trends from 1992 through 2002 (SOCSO, 2002)