PROJECT INTEGRATED MANAGEMENT SYSTEM FRAMEWORK FOR UPSTREAM OIL AND GAS CONTRACTORS

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DEDICATION

This thesis specially dedicated to my beloved family; Alias Bin Hj Ahmad, Amarul Firdaus Bin Alias, Alifah Ilyana Binti Alias and Afiqah Khayrin Binti Alias. Thank you for your loving support of my aspiration to achieve my late father's dream for her eldest daughter to become a "doctor".

And in loving memory of my father and mother; Abdul Kadir Bin Hj Husin and Nik Zainun Binti Nik Ismail. This is your dream too, as you have always wished for your daughter to become a "doctor". Although I am not a medical doctor, but I know you take great pride that I am now a "doctor" in my subject of expertise.

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ABSTRACT

Certification to the Quality Management System standard (ISO 9001), Environmental Management System standard (ISO 14001), and Occupational Health and Safety Management System standard (OHSAS 18001) is a pre-requisite requirement for tender to the upstream oil and gas contractors set by the oil and gas companies (client). The main issue within the Management Systems of these upstream oil and gas contractors is that separate Management System requirements were established either at the organisation level to meet the organisation requirements or at the project level to meet the oil and gas companies specific requirements. The aim of this research is to propose the Project Integrated Management System (IMS) Framework for application by upstream oil and gas contractors in meeting both the organisation and client requirements. In this study, a mixed method was used: survey, focus group interviews, document study and observation. First, to examine the IMS implementation in the oil and gas industry, questionnaires were sent to all 32 registered contractors with the Malaysia Oil and Gas Service Council (MOGSC), but only 6 contractors responded. The data was analysed using IBM SPSS. The findings showed the similarities in the approaches used in the IMS implementation. To understand further, focus group interviews were conducted with seven personnel of quality, health, safety and environment (QHSE) experts, who have 10 to 30 years of experience working in the upstream oil and gas projects. The analysis of the interview data was based on deductive approach, that is pre-determined themes such as business processes involved, documentation structure, application of risk and process approaches, and the scope of their management systems, were selected from the questionnaire. The study concluded with three proposed components to form the Project IMS Framework: (i) five stages of approaches; (ii) hierarchy of documents; and (iii) degree of integrations. The five stages of approaches include review of contractual requirements, identification of the commonalities of the deliverables, risk-based approach, process-based approach, and integration of the risk and process using plan-do-check-act (PDCA), and responsible accountable consulted and informed (RACI) concepts. The framework was validated by one upstream oil and gas contractor at their Front-End Engineering Design (FEED) project. The result indicated that the proposed Project IMS Framework met both organisation and client requirements on the management systems. Given that there is a lack of detailed framework for the development of the Project IMS from the perspective of the upstream oil and gas contractors, this Project IMS framework may be used by them in their projects to comply with both client and organisation requirements.

ABSTRAK

Pensijilan kepada standard Sistem Pengurusan Kualiti (ISO 9001), standard Sistem Pengurusan Alam Sekitar (ISO 14001), dan standard Sistem Pengurusan Kesihatan dan Keselamatan Pekerjaan (OHSAS 18001) adalah keperluan prasyarat untuk tender kepada kontraktor minyak dan gas huluan yang ditetapkan oleh syarikat minyak dan gas (pelanggan). Isu utama dalam Sistem Pengurusan kontraktor minyak dan gas huluan ini ialah keperluan Sistem Pengurusan yang berasingan sama ada di peringkat organisasi untuk memenuhi keperluan organisasi atau di peringkat projek untuk memenuhi keperluan khusus syarikat minyak dan gas. Tujuan penyelidikan ini adalah untuk mencadangkan Rangka Kerja Sistem Pengurusan Bersepadu Projek (IMS) untuk permohonan oleh kontraktor minyak dan gas huluan dalam memenuhi keperluan organisasi dan pelanggan. Dalam kajian ini, kaedah campuran telah digunakan iaitu: tinjauan, wawancara kumpulan fokus, kajian dokumen dan pemerhatian. Pertama, untuk mengkaji pelaksanaan IMS dalam industri minyak dan gas, soal selidik telah diedar kepada semua 32 kontraktor berdaftar dengan *Malaysia Oil and Gas Service Council* (MOGSC), tetapi hanya 6 kontraktor yang memberi maklum balas. Data dianalisis menggunakan IBM SPSS. Dapatan menunjukkan persamaan dalam pendekatan yang digunakan dalam pelaksanaan IMS. Untuk memahami dengan lebih lanjut, temuduga kumpulan fokus telah dijalankan dengan tujuh kakitangan pakar kualiti, kesihatan, keselamatan dan persekitaran (QHSE), yang mempunyai pengalaman 10 hingga 30 tahun yang bekerja dalam projek minyak dan gas huluan. Analisis data temubual adalah berdasarkan pendekatan deduktif, iaitu tema pra-ditentukan seperti proses perniagaan yang terlibat, struktur dokumentasi, penggunaan pendekatan risiko dan proses, dan skop sistem pengurusan mereka, dipilih dari soal selidik. Kajian ini disimpulkan dengan tiga komponen yang dicadangkan untuk membentuk Rangka Kerja Projek IMS: (i) lima peringkat pendekatan; (ii) hirarki dokumen; dan (iii) tahap integrasi. Lima peringkat pendekatan termasuk mengkaji semula keperluan kontrak, mengenal pasti persamaan hasil, pendekatan berasaskan risiko, pendekatan berasaskan proses, dan penyepaduan risiko dan proses menggunakan *plan-do-check-act* (PDCA), dan *responsible accountable consulted and informed* (RACI). Rangka kerja ini telah disahkan oleh satu kontraktor minyak dan gas hulu di projek *front end engineering design* (FEED) mereka. Hasilnya menunjukkan bahawa Rangka Kerja Project IMS yang dicadangkan memenuhi keperluan organisasi dan klien mengenai sistem pengurusan. Memandangkan terdapat kekurangan rangka kerja terperinci untuk pembangunan Projek IMS dari perspektif kontraktor minyak dan gas huluan, Rangka Kerja Projek IMS ini boleh digunakan oleh mereka untuk mematuhi keperluan pelanggan dan organisasi.

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LIST OF ABBREVIATIONS

BSI	-	British Standard Institute
CQI	-	Chartered Quality Institute
E&P	-	Exploration and Production
EMS	-	Environmental Management System
EPC	-	Engineering, Procurement and Construction
EPCIC	-	Engineering, Procurement, Construction, Installation and Commissioning
EQHS	-	Environment, Quality, Health and Safety Management Systems
FPSO	-	Floating Production Storage and Offloading
HSE	-	Health, Safety and Environment
HSE-MS	-	Health, Safety and Environmental Management System
IEOC	-	International Egyptian Oil Company
IIRSM	-	International Institute of Risk and Safety Management
IMS	-	Integrated Management System
ISO	-	International Standardisation of Organisation
MOGSC	-	Malaysian Oil and Gas Services Council
OIMS	-	Operations Integrity Management System
OGP	-	Oil and Gas Producers
OHSAS	-	Occupational Health and Safety Assessment System
OHSMS	-	Occupational Health and Safety Management System
PDCA	-	Plan-Do-Check-Act
PEDIMS	-	Process Embedded Design of an IMS
QMS	-	Quality Management System
SC	-	Subsea Construction
SMS	-	Safety Management System
TPM	-	Total Productive Maintenance

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CHAPTER 1

INTRODUCTION

1.1 Introduction to the Oil and Gas Industry

The oil and gas industry are divided into two segments as shown in Figure 1.1 i.e. the upstream/offshore segment and the downstream/shore segment.

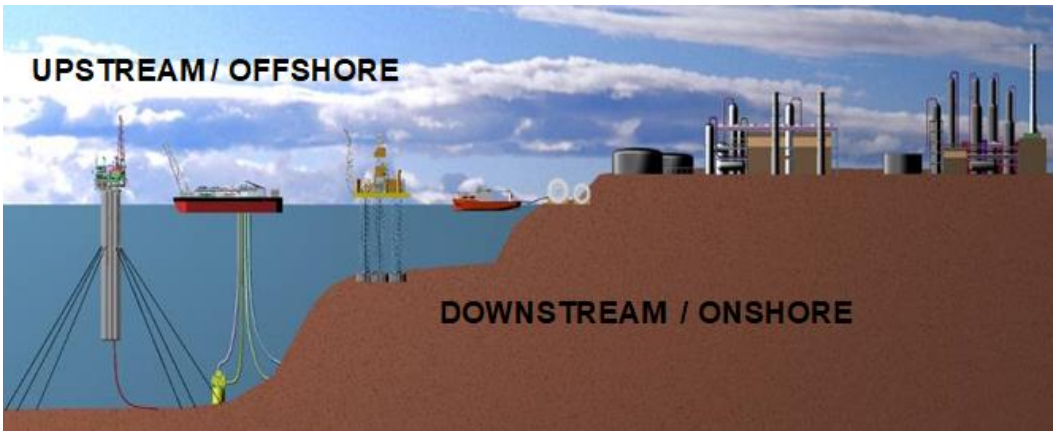

Figure 1.1 Two Main Segments in the Oil and Gas Industry (Kadir *et al.*, 2009)

The upstream/offshore segment covers the oil and gas resources' exploration process which includes the development and production phase, whilst the downstream/onshore segment involves actions in the post-production phase which includes refining plants and the commercial side of the business such as petrol/gas stations and also product sales, for example lubricants. Upstream oil and gas contractors are involved in every aspect of the upstream construction, except for offshore operations and production. In this aspect, upstream oil and gas offshore contractors are involved in the design and construction of the upstream segment such as jackets, pipelines, platforms, and the mooring of the floating structures (platforms, FPSO, FSO) to the seabed.

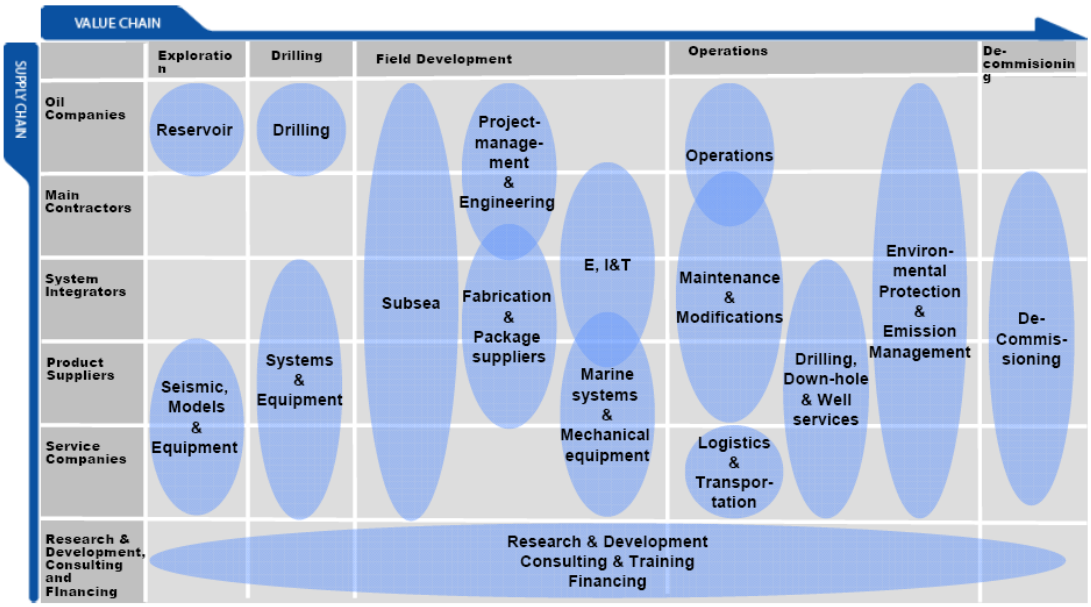

Figure 1.2 Supply and Value Chain of the Offshore Oil and Gas Industry (Kadir *et al.*, 2009)

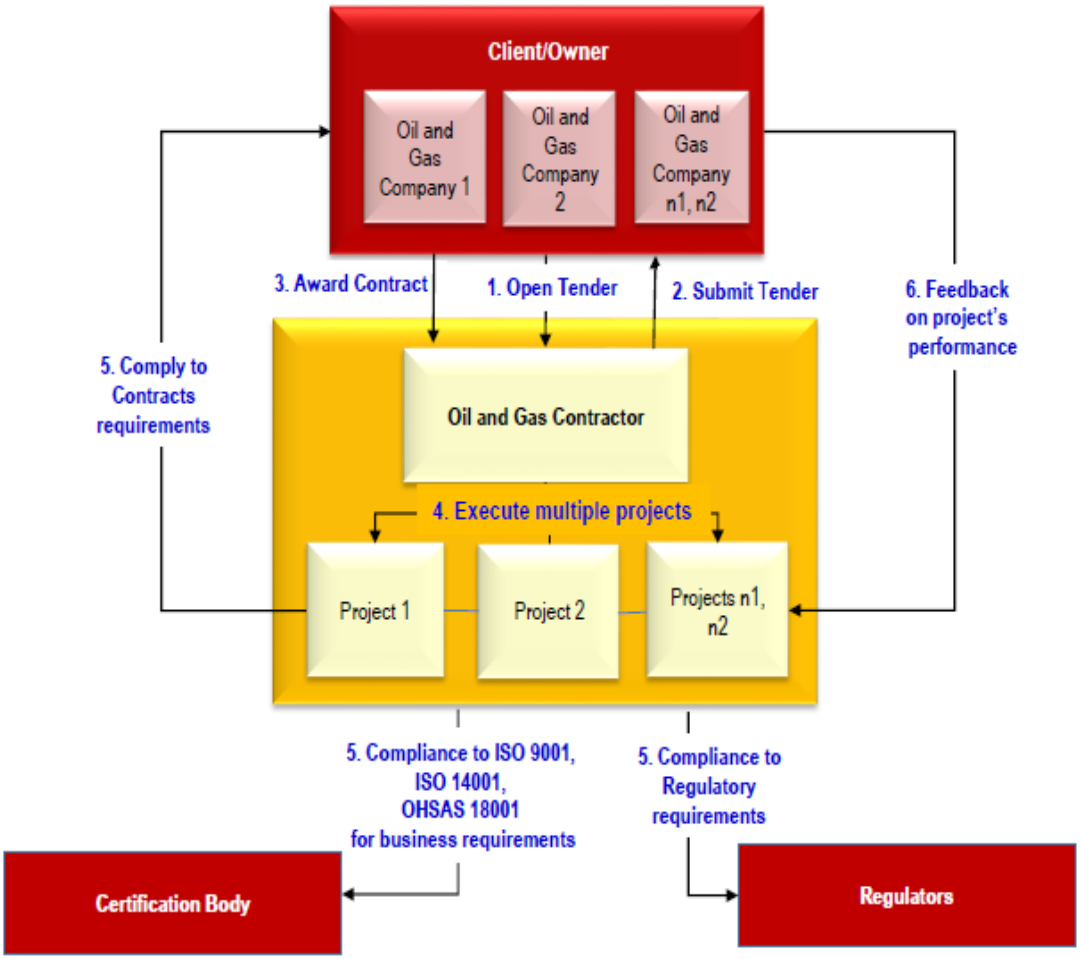

Figure 1.3 Interface Process between Oil and Gas Companies and Upstream Oil and Gas Contractors during Tender and Award of Projects

The value chain of the upstream oil and gas industry encompasses numerous organisations that are involved in the exploration, drilling, field development, operations and de-commissioning contracts as shown in Figure 1.2. The industry's supply chain comprises of the oil companies, main contractors, system integrators, product suppliers or vendors, service, research and development organisations, consultants and financiers for the projects.

Typically, during an oil and gas tender stage, oil and gas companies open tenders to pre-qualified oil and gas contractors. These oil and gas contractors submit their tenders to the oil and gas companies where their capabilities will be assessed. Tenders will be awarded to oil and gas contractors who meet the requirements as shown in Figure 1.3.

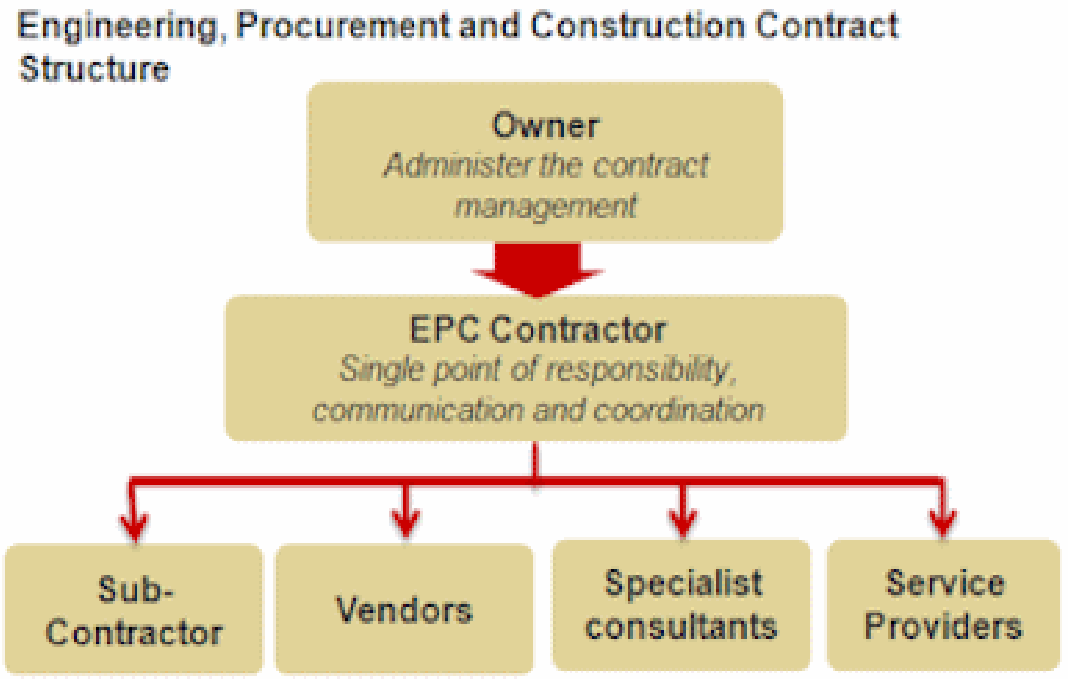

Figure 1.4 EPCI Contract Structure. Global Intelligence Alliance, ILF Consulting. (MBRAIN, 2017)

Engineering, Procurement and Construction (EPC) contracts provide a turnkey system for oil and gas companies, which is commonly called as "Client or Owner" to the contractor. In EPCs, a single contract is awarded by the Client to the Contractor with an entire scope of design/engineering, supply chain of materials/equipment, construction works, installation works, and commissioning

works which include start-up, training, final acceptance and testing activities prior to the handover to the Client or Owner (MBRAIN, 2017). The common structure is shown in Figure 1.4.

Upon award of the projects, the oil and gas contractors shall execute the projects in compliance with the oil and gas companies' requirements which include regulatory, Quality and HSE Management System requirements. When the project reaches the completion and handover stage, the oil and gas companies may provide feedback on the contractors' project performance via lessons learned sessions or other means such as "Client" feedback forms.

Note: The word "oil and gas companies" and "Client" will be used interchangeably.

1.2 Background of the Study

Winning tenders for new businesses or projects is the main objective of any type of business including for upstream oil and gas contractors. However, many international tenders issued by oil and gas Companies such as Shell, British Petroleum, Chevron, and ConocoPhillips, have indicated specific requirements for upstream oil and gas contractors to implement and be certified according to the Quality Management System standard (ISO 9001), the Environmental Management System standard (ISO 14001) and the Occupational Health and Safety Management System standard (OHSAS 18001) in order to qualify for tender participations. Therefore, the implementation and certification of these three Management System standards are considered as a pre-requisite for the oil and gas contractors' survival in business.

Certification systems that work separately have increasingly been seen as efforts wasted, due to excessive bureaucracy, costs and redundancies. In this context, many organisations have pointed out the integration of Management Systems that work in separate ways to improve the overall management system efficiency (Zeng *et al.*, 2007; Santos *et al.*, 2011; Simon *et al.*, 2012; Oliveira, 2013; Abad *et al.*,

2014; Bernardo *et al.*, 2015). Integrating Management Systems is a challenging process, however, managing and maintaining a multiple parallel Management System that complies with the Quality and HSE Management System standard is even more challenging particularly in ensuring their alignments to their organisation.

1.3 Problem Statement

The main issue within the Management Systems of these upstream oil and gas contractors is that separate Management System requirements were established either at the organisation level (to meet the organisation's requirements) or at the project level (to meet the oil and gas companies' specific requirements). The projects were driven to meet the requirements of oil and gas companies in order to ensure compliance as the oil and gas contractors will be affected if attention is not given towards this.

The Researcher has had the experience of working with three upstream oil and gas contractors in Malaysia in the past decade where similar experiences and challenges were encountered in the development, implementation and maintenance of the Quality and HSE Management System in their organisations when meeting the pre-requisite requirements of the oil and gas companies during the tender and project execution stage. The three upstream oil and gas contractors were involved in the EPC field development projects with various Clients located in Malaysia, Australia, Vietnam, Iraq, Indonesia, and Japan as shown in Figure 1.5.

When the Client's requirements have been clearly specified and there is full involvement from the Client in ensuring the respective project compliances, the Project IMS will then be better developed and implemented as compared to projects which have not gotten full involvements from the Clients. This can be evidenced from the Client's feedback upon completion of the projects. There were similar observations across the upstream oil and gas contractors where the development and implementation of the Management Systems at the project level was driven by the

Client's specific requirements, without considering the standard internal procedures established within the upstream oil and gas contractors in managing the project.

From years 2011 to 2014, the Researcher has developed the IMS using the process and risk approach identified in ISO 9001 (Quality Management), ISO 14001 (Environmental Management System) and OHSAS 18001 (Occupational Health and Safety Management System) as a basis for the integration due to the Client's contractual project requirements. However, the initiative was not implemented as the upstream oil and gas contractors were downsized due to issues concerning the oil and gas business. When the Researcher was employed by another company in 2014, she made similar observations, where she found that the Client's requirements had preceded the internal requirements; as such, the project Management System was developed based on the Client's specific requirements.

When the projects were differently managed, the project performance assessments from different Clients were affected. Upon the completion of projects and while waiting for new projects to be awarded, the upstream oil and gas contractor which the Researcher was currently attached to, had set up a continual improvement project in 2016 for an internal business processes improvement, which includes the development of a standard integrated project delivery approach to comply with both internal requirements and the Client's requirements. It was acknowledged by the appointed team that for an integrated project delivery approach to be developed, references to other upstream oil and gas contractors, international specifications, Management System standards, models and frameworks as well as the Client's common requirements need to be studied prior to recommending the best way forward. This is to comply with both internal requirements and the Client's requirements for delivery of the project.

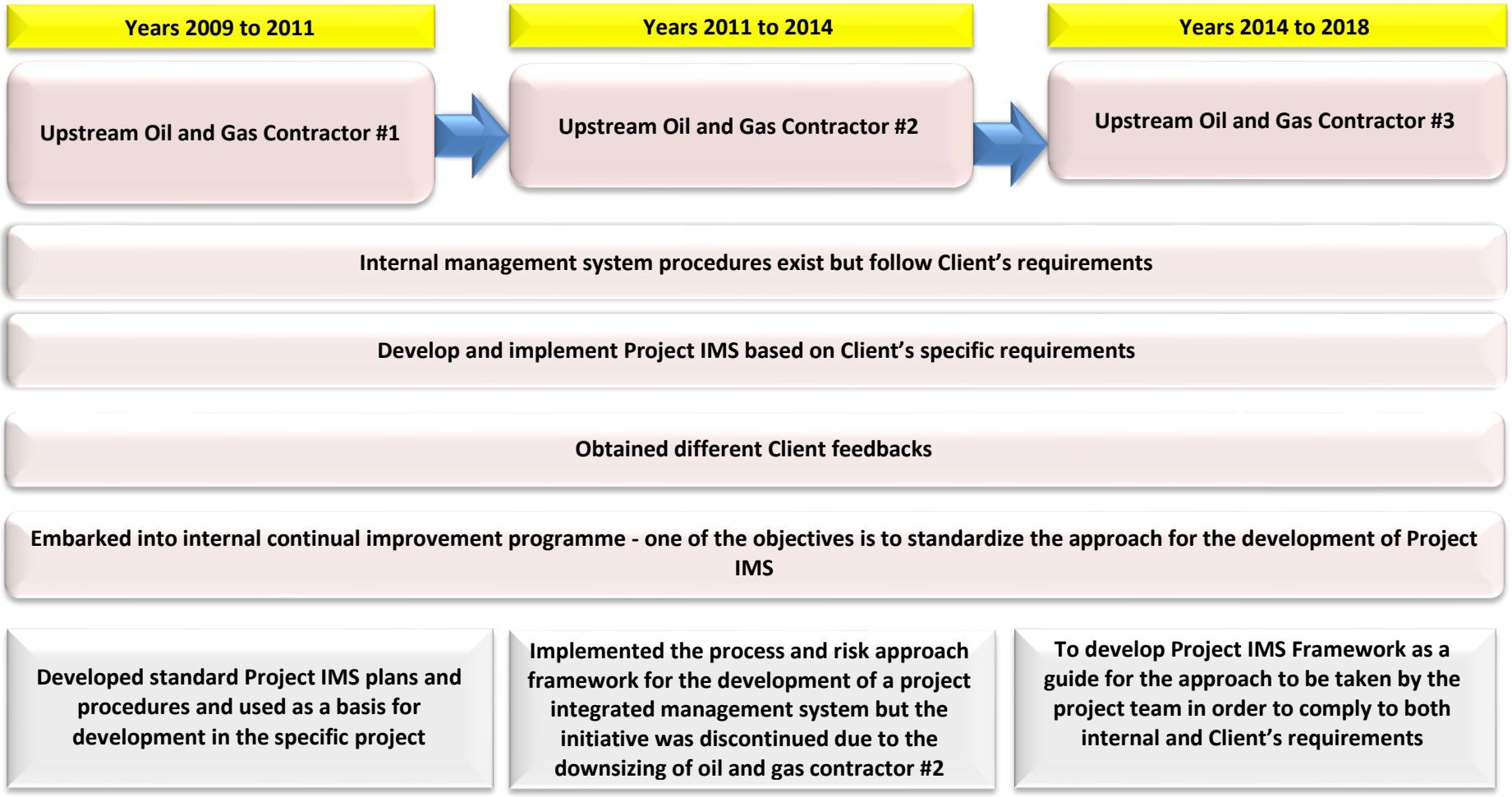

Figure 1.5 Problem Statement Infographic

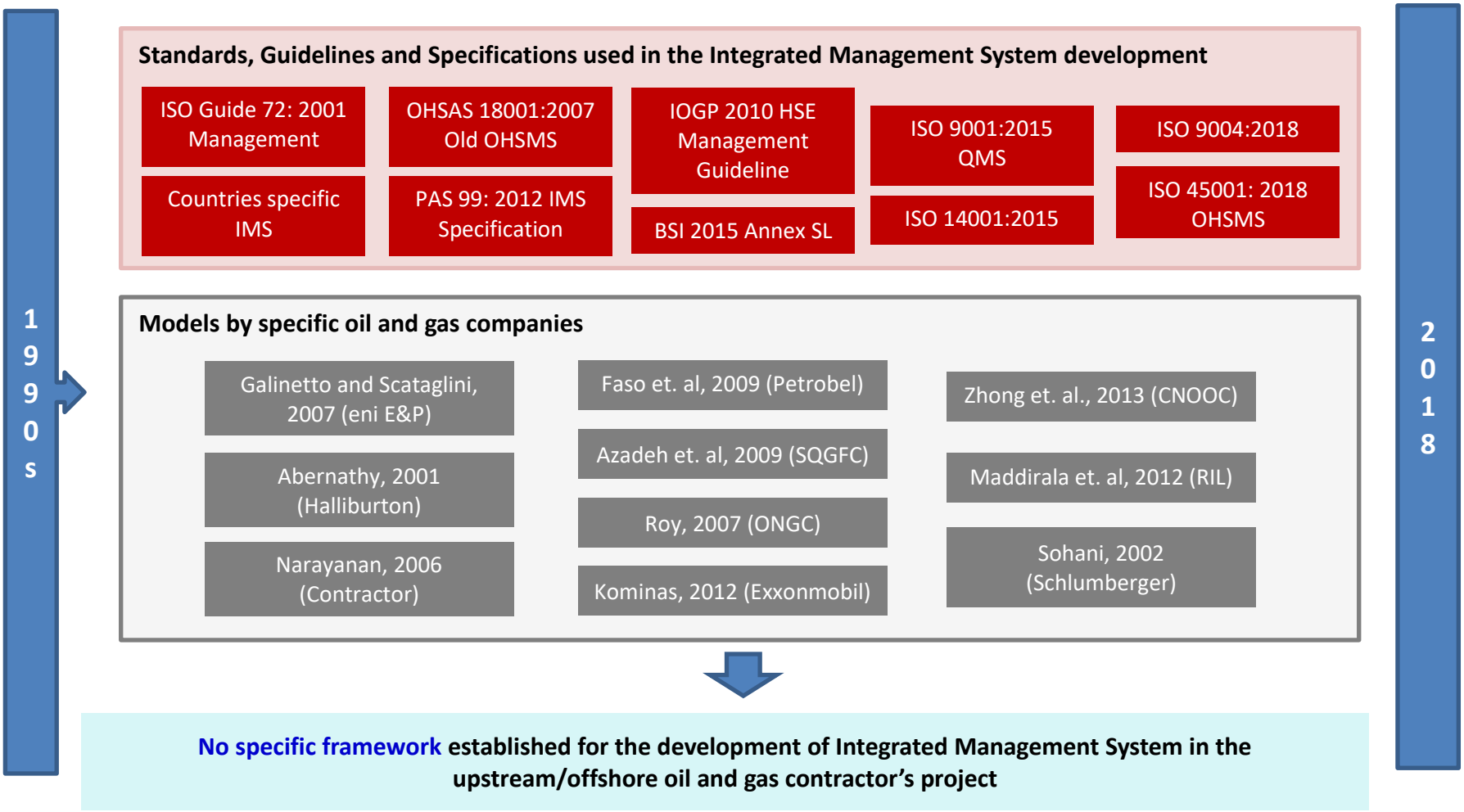

Figure 1.6 References to Standards, Guidelines, Specifications and Models from the 1990s to 2018

Several Management System standards, models, frameworks and guidelines have been studied in the oil and gas industry since 1990s until the present time (see Figure 1.6). Standards such as the ISO Guide 72: 2001 (SL, 2015) is a guideline for the justification and development of Management System standards for use by the standards' writer, and not for industry practitioners. The United Kingdom (UK) for example, introduced publicly available specification (PAS 99) guidelines, whilst other countries such as Spain, France, Belgium and Denmark also developed their national guidelines which will be translated into specific industry and company needs. IMS models from the oil and gas industry are limited, particularly from the oil and gas contractors' perspectives.

Based on previous researches, there has been no specific framework for the development of IMS for the upstream oil and gas contractor's project. Hence, there is a strong need to develop a Project IMS Framework for upstream oil and gas contractors who are involved particularly in the upstream oil and gas projects to guide them on the IMS development approach in ensuring both consistency and compliance to internal requirements and the Client's requirements.

1.4 Research Objectives

The aim of this research is to develop a framework for the development of the Project IMS for upstream oil and gas contractors in Malaysia. The research objectives are as follows:

a) Explore and assess the current status of IMS amongst upstream oil and gas contractors in Malaysia.

b) Identify the current strategies and approaches taken by upstream oil and gas contractors in Malaysia for the development of the Project IMS.

c) Propose a framework for the development of Project IMS for upstream oil and gas contractors in Malaysia.

d) Determine the applicability of the Project IMS Framework amongst the specific upstream/offshore oil and gas contractors.

1.5 Research Questions

In order to achieve the objectives of the research, a number of research questions were developed based on the identified research objectives:

a) First Objective – Explore the current status of the IMS implementation amongst upstream oil and gas contractors.

Question No. 1-1: What is the scope of IMS implemented?

Question No. 1-2: What are the approaches and methods used for IMS?

Question No. 1-3: What is the level of integration for IMS' documentation?

Question No. 1-4: What are the challenges and barriers in IMS?

Question No. 1-5: What are the benefits of IMS?

Question No. 1-6: What is the future direction of IMS?

b) Second Objectives –Identify the current strategies and approaches taken by upstream oil and gas contractors in Malaysia for the development of the Project IMS:

Question No. 2-1: What are the current strategies taken by the oil and gas contractors for their projects?

Question No. 2-2: Does the current approach/es involve partial or full integration of the Project IMS?

Question No. 2-3: What are the approaches used or applied in the Project IMS?

c) Third Objective –Propose a framework for the development of Project IMS for upstream oil and gas contractors in Malaysia:

Question No. 3-1: What are the models and frameworks developed by oil and gas contractors for their projects?

Question No. 3-2: What are the required considerations for the development of Project IMS?

Question No. 3-3: What are the proposed frameworks for the development of Project IMS?

d) Fourth Objective – Determine the applicability of the Project IMS Framework amongst the specific upstream oil and gas contractors:

Question No. 4-1: What are the proofs and evidences from the specific upstream oil and gas contractors in determining the applicability of the proposed Project IMS Framework?

1.6 Scope of Study

This study mainly focuses on the framework for the development of Project IMS and its compliance with the most popular Management Systems that includes Quality Management System (ISO 9001), Safety Management System (OHSAS 18001), and Environmental Management System (ISO 14001). The development of the Project IMS Framework covers the upstream oil and gas contractors' project management scope, from the phases of engineering, procurement, construction, installation and commissioning. A mixed method research approach is adopted so that the evolution of the currently implemented Management System is thoroughly understood through the collection of quantitative and qualitative data.

The data collection is conducted in two phases where the first phase is based on a survey-questionnaire and the second phase is based on interviews (one-on-one and focus groups). A structured survey is used to obtain quantitative data where

target informants are the upstream oil and gas contractors in Malaysia, whilst one-one-one and focus group interviews are used to obtain qualitative data by targeting experts in the Management Systems. In this study, management experts are defined as those who have knowledge and experience of at least 10 years in the quality, safety and environmental management in Malaysia.

1.7 Significance of Study

This study is one of the first researches on IMS for upstream oil and gas contractors which covers the engineering, procurement, construction, installation and commissioning (EPCIC) business processes. This is due to research limitation of IMS in the oil and gas industry particularly in the upstream segment. Furthermore, the strategies, approaches and frameworks developed for this study help to reflect a better Management System performance for the oil and gas industry in Malaysia. Besides that, this study is able to guide industry practitioners in establishing their own Project IMS as well as create an opportunity for oil and gas contactors to be exemplary leaders in the field of IMS. Furthermore, this study increases the understanding of the integration of Quality, Safety and Environment Management Systems, as well as identifying the weaknesses and strengths of the current IMS. Therefore, this research would prove to be useful information not only for the standards' writers, but also for other researchers, specifically for future improvements in a similar setup or scope of business.

1.8 Limitation of Study

Academic research on the development of Integrated Quality, Safety and Environmental Management System amongst upstream oil and gas contractors is rather limited as the research papers are more relevant towards the sharing of practical experiences in forums and seminars. Hence, most academic references of the Integrated Quality, Safety and Environmental Management System which being used in this research are based on other industries. Besides that, accessibility to the

Informants was limited as the research was conducted at a time when the oil and gas industry was facing tough times.

Oil and gas prices were decreasing and affecting the value and supply chain of the business. New field development projects were put on hold. A number of employees from the oil and gas contractors lost their jobs which resulted in limited responses. Moreover, another limitation in this study was the lack of literature availability in the oil and gas industry, particularly from the perspective of the oil and gas contractors. Finally, there was also limited time to study the implementation of the proposed framework in the upstream oil and gas projects as there was no new project within the respective companies.

1.9 Organisation of the Thesis

Chapter 1 discusses the background and problem statements of this study and identifies the study's research objectives. The scope, significance and limitations of this study are also discussed in this Chapter.

Chapter 2 discusses all relevant literatures that are included in this study which include the oil and gas industry; quality, safety and environmental Management Systems; IMS and level of integration with respect to oil and gas contractors. Frameworks and integration models are also discussed.

Chapter 3 discusses the research methodology of this study. The research background and design of this study is discussed, along with the methodological flow chart. Besides that, the framework structure, and the adoption of mixed method design is described.

Chapter 4 presents the results and outcomes of the study. Under this chapter, the development of study framework, together with the description, is discussed. The results of the interview questionnaire and interviews are also discussed. Lastly, the final framework design is shown and explained.

Chapter 5 presents the conclusions of the study and recommendations for future studies. Under this chapter, the thesis summary, discussions, conclusions, contributions, implications and recommendations for future works are discussed. Finally, the concluding remarks summarises the overall study.

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APPENDICES

Appendix A IMS Area of Study

Area of Study	Author (Year)		
	Years 1990 - 2000	**Years 2001-2010**	**Year 2011-2018**
Philosophical aspects	Alderman and Donegani (1994), Karapetrovic (1998), Fonseca and Filho (1998), Clement *et al.* (1996), Jong (1996), Wills *et al.* (1996), Griffith (2000), Kuijk and Kuijper (2000), Madkour (2000)	Wilkinson and Dale (2001, 2002), Tramier (2002), Karapetrovic (2003), McDonald (2003), Beckmerhagen *et al.* (2003), Labodova (2004), Zeng *et al.* (2007), Karapetrovic and Casadesús (2009),	Santos *et al.* (2011), Simon *et al.* (2012), Oliveira (2013), Abad *et al.* (2014), Bernardo *et al.* (2015), Zeng *et al.* (2007),
Motivation of integration	Amaral (2000), Tess (2001), Abernathy (2001), Beyk and Paradas (2002), Sohani and Haugnaess (2002), Robson and Parsons (2004), Nouri (2005), Roy (2007), Unnikrishnan and Rajab (2008), Lopez *et al.* (2008), Faso *et al.* (2009), Wadi (2009)	Asif *et al.* (2008), Muhammad Asif (2008)	Savino and Barbaatar (2015), Gianni and Gotzamani (2015), Bernardo *et al.*, 2015), Abad *et al*(2014), Simon *et al.* (2012)
Benefit of integration	Winder (2000), Wright (2000), Amaral (2000)	Abernathy (2001), Tess (2001), Beyk and Paradas	Savino and Barbaatar (2015), Gianni and

Appendix A IMS Area of Study (Continue)

Area of Study	Author (Year)		
	Years 1990 - 2000	**Years 2001-2010**	**Year 2011-2018**
		(2002), Matias and Coelho (2002), Sohani and Haugnaess (2002), Beckmerhagen *et al.* (2003), McDonald (2003), Robson and Parsons (2004), Zutshi and Sohal (2005), Nouri (2005), Roy (2007), Asif *et al.* (2008), Lopez *et al.* (2008), Unnikrishnan and Rajab (2008), Faso *et al.* (2009), Wadi (2009), Tarí and Molina-Azorín (2010)	Gotzamani (2015), Bernardo *et al.* (2015), Abad *et al.* (2014), Oliveira (2013), Simon *et al.* (2012), Zeng (2011), Santos *et al.* (2011)
Degree of integration		Karapetrovic (2002), Beckmerhagen *et al.* (2003), Pojasek (2006), Asif *et al.* (2008), Jørgensen (2008), Khanna *et al.* (2010),	Gianni and Gotzamani (2015), Abad *et al* (2014), Simon *et al.* (2012).

Appendix A IMS Area of Study (Continue)

Area of Study	Author (Year)		
	Years 1990 - 2000	**Years 2001-2010**	**Year 2011-2018**
		Bernardo *et al.* (2009, 2010)	
Strategies and approaches of integration	Bamber *et al.* (2000), Douglas and Glen (2000), Karapetrovic and Willborn (1998, 2000)	Karapetrovic (2002, 2003, 2008) Beckmerhagen *et al.* (2003), Jonker (2004), Mohammad (2006), Jørgensen *et al.* (2006), Rocha *et al.* (2007), Zeng (2007), Asif *et al.* (2009),	Galinetto (2011), Campbell *et al.* (2012), Wild and Middleton (2012), Kominas (2012), Maddirala (2012), Zhong (2013), Savino and Barbaatar (2015)
Challenges of integration	Weibye (1994)	Matias and Coelho (2002), Beckmerhagen *et al.* (2003), McDonald (2003), Pheng and Pong (2003), Oskarsson and Malmborg (2005), Zutshi and Sohal (2005), Zeng *et al.* (2007), Asif *et al.* (2008), Salomone (2008),	Santos *et al.* (2011), Simon *et al.* (2012), Abad *et al*, (2014), Bernardo *et al.* (2015), Gianni and Gotzamani (2015), Savino and Barbaatar (2015)

Appendix A IMS Area of Study (Continue)

Area of Study	Author (Year)		
	Years 1990 - 2000	**Years 2001-2010**	**Year 2011-2018**
Models of integration		Lopez-Fresno (2010), Vrassidas et. al. (2010)	Singh (2011), Dalling and Holt (2012), Simon (2012), Oliveira, 2013), Dominiques *et al.* (2014, 2016), Arezes (2016)
IMS and Sustainability, Performance and Innovation			Nunhes *et al.* (2016), Nawas and Koc (2018), Asif *et al.* (2013), Llach *et al.* (2013), Abad *et al.* (2014), Bernardo (2014), Holm *et al.* (2015), Savino and Barbaatar (2015), Kurdve *et al.* (2016), Siva *et al.* (2016), Witjes *et al.* (2016)

Appendix B Country and Industry being Studied for IMS

Country	Author (Year)	Industry	Topic	Main Findings
Macedonia	Gianni *et al.* (2017)	No specific industry	Multiple Perspectives on IMSs and Corporate Sustainability Performance	Proposed strategy via **framework** for Management Systems' integration and corporate sustainability.
Slovak Republic	Majernik (2017)	No specific industry	Design of IMS According to the Revised ISO Standards	Proposed **strategy via framework**: Algorithm of IMS implementation according to the standard with High Level Structure in Deming cycle Plan-Do-Check-Act.
US	Snodgrass (2013)	Oil and gas Industry	Integrating Social Performance Management: A Comparison with HSE Performance Management	Proposed **strategy based on approach** in integrating the social performance management into the existing Health, Safety and Environmental Management System.
China	Zhong (2013)	Oil and gas Industry	HSE Management for China Offshore Drilling Project	Proposed **strategy based on approach** and model implemented for the offshore drilling project in China.
India	Maddirala (2012)	Oil and gas Industry	Best Practices on Systems and Processes Implementation at KGD6 Deep Water Fields in India	Proposed **strategy based on approach and model** of IMS implementation in KGD6 deep water field in India.
UAE	Campbell, (2012)	Oil and gas Industry	HSE Management System: KEEP IT SIMPLE!	Proposed **strategy based on approach and model.**
Portugal	Sampaio *et al.* (2012)	No specific industry	Management Systems: Integration or Addition?	The integration of a Management System should be supported by an integrated approach where any attempt to implement an isolated subsystem should be avoided.
India	Shalini Singh (2011)	Manufacturing and service	An Integrative Approach to Management Systems and Business Excellence	Proposed model called SECQA **Model.**
Lithuania	Agota Giedrė Raišienė (2011)	No specific industry	Advantages and Limitations of IMS: The Theoretical Viewpoint	**IMS benefits, challenges and strategies.**

Appendix B Country and Industry being Studied for IMS (Continue)

Country	Author (Year)	Industry	Topic	Main Findings
Spain	Simon *et al.* (2012)	No specific industry	Evolution of IMSs in Spanish Firms	Most organisations prefer integration despite the **IMS challenges** as they experienced **the benefits** over a certain period, which include evolvement towards a complete integration and better planning that leads to improvement. Hence, the organisation foresees a reduced importance in the difficulties they experienced earlier in the integration.
	Simon *et al* (2012)	No specific industry	Difficulties and Benefits of IMSs	Proposed **models** on (1) the system integration's difficulties that affect the IMS degree of integration, (2) the effect of the integration level on the IMS benefits.
India	Khanna *et al.*, (2010)	Manufacturing	A survey on Indian Experience on Integrated Management Standards (IMS)	IMS implementation's **critical success factors** include (1) stakeholder's focus, (2) top management's commitment, (3) training.
Australia	Zutshi and Sohal (2005)	Pharmaceutical, Furniture, Radio & Telecommunications Companies	IMS: The Experiences of Three Australian Organisations	**Benefits** include (1) Savings of dollars, (2) Better utilisation of resources, (3) Improved communication across the organisation.
China	Zeng (2007)	No specific industry	A Synergetic Model for Implementing an IMS: An Empirical Study in China	Proposed a multi-level synergy **model** which include (1) "strategic" synergy, (2) "organisational structural-resource-cultural" synergy, (3) "documentation" synergy.
	Zeng (2010)	No specific industry	An Empirical Examination of Benefits from Implementing IMSs	Key **motivations** for implementing IMS include to satisfy the client's requirements, to react to government's request and to manage the pressure from competitors. The substantial benefits achieved include easier certification process, and reduced management costs and paperwork.

Appendix B Country and Industry being Studied for IMS (Continue)

Country	Author (Year)	Industry	Topic	Main Findings
	Zeng (2010)	Enterprise	Towards Effectiveness of IMSs for Enterprises	IMS implementation **benefits** include reduction in paperwork, management costs, complexity of internal management as well as easier certification process which enable continuous improvements.
Malaysia	Abdul Hamid (2004)	Construction	Integration of Safety, Health, Environment and Quality (SHEQ) Management System in construction: A Review	Proposed the **SHEQ MS System guidelines** using six elements which include (1) policy, (2) planning, (3) implementation and operation. (4) checking and corrective action, (5) management review and (6) continual improvement. **Benefits** include business improvement motivation due to waste reduction in the operational processes as well as Management Systems, which then lead to both decreased duplications and minimise barriers between departments and functions. **Challenges** include increased number of generalists and reduced specialists and experts.
UK	Bhutto (2004)	Construction	Integration of Quality, Health and Safety and Environmental Management System in Contractor Organisations	Connection between IMS and **sustainable construction themes** is in existence.
	Griffith and Bhutto (2008)	Construction	Improving Environmental Performance through IMSs in the UK	Despite majority prominent UK principal contracting organisations implementing effective **integrated standards-based systems approach** in managing their construction project's environment, quality, and safety, the industry-based **challenges** are still evident through lacking of both Management System s awareness and the environmental view; controversial project's stakeholders, and commercially driven cultures.

Appendix C List of Oil and Gas Industry Researches and Scope on IMS from 1990s to the Recent Years

No	Author (Year)	Research Title	Country	Company	Integration Scope	Motivation	Benefits	Challenges	Critical Success factors	Strategy @Approaches	Strategy @ Models/ Framework	Sustainability, Performance and Innovation
1	Celiento and Gherbi (2017)	Dynamic HSE System to Enhance HSE Values	Italy	Eni	HSE and Culture					√		√
2	Forbes and Walker (2016)	Operational Benefits of an Integrated QHSE and Sustainable Development Management System: A Case Study from the UK	UK	Schlumberger	QHSE and Sustainability Development	√	√	√	√	√		√
3	Snodgrass (2013)	Integrating Social Performance Management: A Comparison with HSE Performance Management	US	Extractive companies	HSE					√		√
4	Zhong (2013)	HSE Management for China Offshore Drilling Project	China	CNOOC	HSE					√	√	
5	Maddirala (2012)	Best practices on Systems and Processes Implementation at KGD6 Deep water Fields in India	India	Reliance Industries Limited	HSE					√	√	
6	Campbell (2012)	HSE Management System: Keep it Simple	UAE	Total UAE	HSE					√	√	
7	Kominas (2012)	Integrating Premier Standards of Socioeconomic Management in the Upstream Activities through Management Systems	-	Exxon Mobil	HSSE & Socioeconomic					√		
8	Uddin (2012)	Implementation of HSE Management System on EPC Projects in E&P Environment	-	-	HSE			√	√	√		
9	Wild (2012)	Integrating Social Responsibility into Management Systems to Mitigate Risks	-	-	HSE					√		
10	Galinetto (2011)	The HSE IMS: A Framework Supporting Global Challenges and Sustainable Business Governance	-	Eni	HSE					√	√	√

Appendix C List of Oil and Gas Industry Researches and Scope on IMS from 1990s to the Recent Years (Continue)

No	Author (Year)	Research Title	Country	Company	Integration Scope	Motivation	Benefits	Challenges	Critical Success factors	Strategy @Approaches	Strategy @ Models/ Framework	Sustainability, Performance and Innovation
11	Faso (2009)	Set Up and Implementation of an IMS In Petrobel	Egypt	Petrobel	HSEQ					√	√	
12	Azadeh (2009)	Integrated HSEE Management Systems for Industry: A Case Study in Gas Refinery	Iran	Gas Refinery	HSE and Energy					√	√	
13	Wadi (2009)	An Integrated Approach to Managing HSE Requirements at Oil and Gas Facilities	-	-	HSE		√			√		
14	Lopez *et al.* (2008)	Integrated Implementation of a Management System in Qatar: An Innovative Approach towards a Sustainable Performance Excellence	Qatar	Schlumberger	HSE	√					√	√
15	Kim (2008)	Improved EPC Integration Management for FPSOs	-	Samsung Heavy Industries	HSEQ					√		
16	Roy (2007)	Integrated Quality, Occupational Health, Safety, and Environment Management System in ONGC – A Pursuit for Excellence	India	ONGC	HSEQ	√	√			√		√
17	Galinetto (2007)	HSE IMS Worldwide Implementation: The Eni E&P Division Methodology	World wide	Eni	HSE					√	√	
18	Valeur and Clowers (2006)	Structure and Functioning of the ISO 14001 and OHSAS 18001 Certified HSE Management System of the Offshore Installation South Arne	Denmark	Ameralda HESS Corp	HSE					√		
19	Buell (2006)	Creating a Culture to Deliver Sustainable HSE Performance		Chevron	HSE					√		√
20	Narayanan (2006)	IMS – Implementing QHSE into Projects from Beginning to End	-	-	HSEQ					√	√	

Appendix C List of Oil and Gas Industry Researches and Scope on IMS from 1990s to the Recent Years (Continue)

No	Author (Year)	Research Title	Country	Company	Integration Scope	Motivation	Benefits	Challenges	Critical Success factors	Strategy @Approaches	Strategy @ Models/ Framework	Sustainability, Performance and Innovation
21	Nouri (2005)	Comparison of Environmental Performance-HSEQ Management System, Regarding the International and Iranian Oil and Gas General Contractors	Iran	Iranian & International Upstream contractors	HSEQ		√	√		√		√
22	Robson (2004)	Benefits of an ISO-Registered Management System in Atlantic Eastern Canada	Canada	-	HSEQ		√					
23	Hosseinabbasi (2004)	Health, Safety and Environmental Management System-HSE-MS	-	National Iranian Company	HSE							
24	Prewitt (2003)	Quality in HSE Management Systems		Offshore Drilling Inc	HSEQ					√		
25	Calder (2003)	Health, Safety, and Environment Management and ISO 14001 in Shell Canada: Addressing Increasing Public Expectations in Exploration, Development, and Operations	Canada	Shell Canada	HSE					√	√	
26	Beyk (2002)	Quality, Health, Safety and Environment Synergy by Creating Alliances Between Oil and Service Companies in Integrated Projects	-	-	HSE					√		
27	Tramier (2002)	Health, Safety, Environmental Management Overview; Future	-	-	HSE							
28	Wiig (2002)	Technical Integrity – Implementation of a Fully Integrated and Risk-Based Management System	-	ExxonMobil	HSE & Risk	√						
29	Sohani and Haugnaess (2002)	Contractor Management by Integration into the Safety Management System	-	-	Safety	√				√	√	

Appendix C List of Oil and Gas Industry Researches and Scope on IMS from 1990s to the Recent Years (Continue)

No	Author (Year)	Research Title	Country	Company	Integration Scope	Motivation	Benefits	Challenges	Critical Success factors	Strategy @Approaches	Strategy @ Models/ Framework	Sustainability, Performance and Innovation
30	Tess (2002)	Case Study: Implementation and Integration of a Safety Management System within an ISO 14000 and ISO 9000 Certified Facility	-	-	HSE	√				√		
31	Abernathy (2001)	Creation of an IMS	-	-	HSEQ	√				√		
32	Amaral (2000)	The Implementation of an Integrated Environment, Quality, Health and Safety Management System in the Brazilian Oil Industry	Brazil	-	SEQ	√			√	√		
33	Kuijk, 2000)	HSE-Management System in Action	-	-	HSE					√		
34	Coats (2000)	An Overview of the Global Health, Safety, and Environmental Program for Advanced Well-Construction Systems and the Transition from R&D to Operationally Fit for Purpose	-	-	HSE					√		
35	Carter (1999)	Integrating Quality, Environment, Health and Safety Systems with Customers and Contractors	-	AMEC	HSEQ					√		
36	Hamid (1998)	Environmental, Health & Safety Management System (EHSMS): An Implementation	-	Mobil Oil Indonesia	HSE		√			√		
37	Fonseca and Filho (1998)	Health, Safety and Environment IMS in Amazonia	-	-	HSE					√		
38	Silva (1998)	Developing and Implementing an HSE Management System within the Frame Work of a Quality Culture based on ISO 9002. A Drilling Contractor's Experience	-	-	HSEQ					√		
39	Pemberton (1998)	Building a Quality Model for HSE Policy Implementation	-	-	HSEQ					√	√	

Appendix C List of Oil and Gas Industry Researches and Scope on IMS from 1990s to the Recent Years (Continue)

No	Author (Year)	Research Title	Country	Company	Integration Scope	Motivation	Benefits	Challenges	Critical Success factors	Strategy @Approaches	Strategy @ Models/ Framework	Sustainability, Performance and Innovation
40	Clement (1996)	Business Integration of Safety, Health and Environmental Management	-	-	HSE					√		
41	Wills (1996)	The Use of IMSs Assessments for Continuous Improvement of EHS Programs	-	-	HSE					√		
42	Jong (1996)	Evolution from Safety Management System (SMS) to HSE MS: Incorporating Health Aspects into the HSE Management System	-	-	HSE					√		
43	Downey (1995)	Health, Safety and Environmental Management System Guidelines, in Offshore Europe	-	-	HSE					√		
44	Alderman and Donegani (1994)	Development of Integrated Safety, Environmental, and Quality Management Systems for the Oil and Gas Industries	-	-	HSEQ	√	√			√		
45	Forum (1994)	Guidelines for the Development and Application of Health, Safety and Environmental Management Systems	-	-	HSE					√		

Appendix D Scope of Integration – General and Non-Oil and Gas Industries

No	Author (Year)	Quality Management System (QMS)	Environmental Management System (EMS)	Occupational Health and Safety Management System (OH&SMS)	Other Management Systems
1	Dominique *et al*. (2016)	x	x	x	
2	Moumen *et al.* (2016)	x	x	x	
3	Arezes (2016)	x	x	x	
4	Trierweiller *et al.* (2016)	x	x	x	CSR
5	Kafel (2016)	x	x	x	
6	Kaupilla *et al.* (2015)	x	x	x	
7	Muesli *et al.* (2015, 2013, 2007)	x	x	x	
8	Almeida *et al.* (2014)	x	x	x	
9	Dominique *et al.* (2014)	x	x	x	
10	Sampaio *et al.* (2012, 2010)	x	x	x	
11	Simon *et al.* (2012)	x	x	x	
12	Dalling and Holt 2012	x	x	x	
13	Rebelo and Santos (2012)	x	x	x	
14	Simon *et al.* (2012)	x	x	x	
15	Castillo-Rojas (2012)	x	x	x	
16	Bernardo *et al.* (2006, 2008, 2009, 2012)	x	x	x	
17	Domingues *et al* (2011, 2012)	x	x	x	
18	Zeng *et al.* (2007, 2010, 2011)	x	x	x	
19	Robertsone (2011)	x	x	x	
20	Asif *et al.* (2008, 2009, 2010, 2011)	x	x	x	
21	Molina-Azorı´n, (2010)	x	x	x	
22	Tarı´ and Molina Azorı´n (2010)	x	x		
23	Harjeev K Khanna *et al.* (20100	x	x	x	CSR
24	López-Fresno (2010)	x	x	x	JAR145
25	Vrassidas *et al.* (2010)	x	x		
26	Kadir *et al.* (2009)	x	x	x	
27	Karapetrovic and Casadesus (2009)	x	x	x	
28	Carvalho and Zouain (2009)	x	x	x	
29	Badreddine *et al.* (2009)	x	x	x	
30	Salomone (2008)	x	x	x	
31	Suttiprasit (2008)	x	x	x	
32	Karapetrovic (2008)	x	x	x	
33	Jorgensen (2008)	x	x	x	
34	Beckmerhagen and Berg (2008)	x	x	x	
35	Rasmussen (2007)	x	x	x	
36	Griffith (2007, 2005, 2000)	x	x	x	
37	Griffith and Bhutto (2007)	x	x	x	
38	Jørgensen (2007, 2005)	x	x	x	
39	Rocha *et al.* (2007)	x	x	x	
40	Jørgensen *et al.*, (2006)	x	x	x	
41	Pojasek (2006)	x	x	x	
42	Filho and Souza (2006)	x	x	x	
43	Mohammad (2006)	x	x	x	
44	Foley (2005)	x	x	x	
45	Zutshi and Sohal (2005)	x	x	x	
46	Jørgensen *et al.* (2007, 2006, 2005)	x	x	x	
47	Oskarsson *et al.* (2005)	x	x	x	
48	Nouri (2005)	x	x	x	

Appendix D Scope of Integration – General and Non-Oil and Gas Industries (Continue)

No	Author (Year)	Quality Management System (QMS)	Environmental Management System (EMS)	Occupational Health and Safety Management System (OH&SMS)	Other Management Systems
49	Fresner and Engelhardt (2004)	x	x	x	
50	Abdul Rahim (2004)	x	x	x	
51	Jonker and Karapetrovic (2004)	x	x	x	
52	Labodová (2004)	x	x	x	
53	Douglas and Glen (2000)	x	x	x	
54	Winder (2000)	x	x	x	
55	Renzi and Cappelli (2000)	x	x	x	
56	Von and Funck (2001)	x	x	x	
57	Holdsworth (2003)	x	x	x	
58	McDonald *et al.* (2003)	x	x	x	
59	Zweetsloot (2000)	x	x	x	
60	Beckmerhagen *et al.* (2003)	x	x	x	
61	Low and Pong (2003)	x	x	x	

No	Author (Year)	Quality Management System (QMS)	Environmental Management System (EMS)	Occupational Health and Safety Management System (OH&SMS)	Other Management Systems
62	Poksinska *et al.* (2003)	x	x	x	
63	Karapetrovic (2003)	x	x	x	
64	Karapetrovic and Jonker (2003)	x	x	x	
65	McDonald *et al*, (2003)	x	x	x	
66	Pheng and Pong (2003)	x	x	x	
67	Mackau (2003)	x	x	x	
68	Matias and Coelho (2002)	x	x	x	
69	Karapetrovic (2002)	x	x	x	
70	Wilkinson and Dale (2002, 2001)	x	x	x	
71	Suarez Garcia (2001)	x	x	x	
72	Wright (2000)	x	x	x	
73	Bamber *et al.* (2000)	x	x	x	

Appendix E Scope of Integration – Oil and Gas Industry

No	Author (Year)	Company Name	Oil and Gas Company	Oil and Gas Contractor/System Integrator/Supplier	Quality Management System (QMS)	Environmental Management System (EMS)	Health and Safety Management System (H&SMS)	Other Scope
1	Celiento and Gherbi (2017)	Eni	x			x	x	Culture
2	Forbes and Walker (2016)	Schlumberger		x	x	x	x	Sustainability Development
3	Snodgrass (2013)	Extractive Companies	x			x	x	Social Performance Management
4	Zhong (2013)	CNOOC	x			x	x	
5	Maddirala (2012)	Reliance Industries Limited		x		x	x	
6	Campbel (2012)	Total UAE	x			x	x	
7	Kominas (2012)	ExxonMobil	x			x	x	Socioeconomic Management
8	Uddin (2012)	-				x	x	
9	Wild (2012)	-				x	x	
10	Galinetto (2011)	Eni	x			x	x	Sustainable Governance
11	Faso (2009)	Petrobel	x		x	x	x	
12	Azadeh (2009)	Gas Refinery	x			x	x	Ergonomic Management
13	Wadi (2009)	Oil and Gas Plant	x		x	x	x	
14	Lopez *et al.* (2008)	Schlumberger		x	x	x	x	
15	Kim (2008)	Samsung Heavy Industries		x	x	x	x	Regulatory
16	Roy (2007)	ONGC	x		x	x	x	
17	Galinetto (2007)	Eni	x			x	x	Sustainable Development
18	Valeur and Clowers (2006)	Ameralda HESS Corp	x			x	x	
19	Buell (2006)	Chevron	x		x	x	x	
20	Narayanan (2006)	-			x	x	x	
21	Nouri (2005)	Iranian & International Upstream Contractors		x	x	x	x	
22	Robson (2004)	-			x	x	x	
23	Hosseinabbasi (2004)	National Iranian Company	x			x	x	

Appendix E Scope of Integration – Oil and Gas Industry (Continue)

No	Author (Year)	Company Name	Oil and Gas Company	Oil and Gas Contractor/System Integrator/Supplier	Quality Management System (QMS)	Environmental Management System (EMS)	Health and Safety Management System (H&SMS)	Other Scope
24	Beyk (2002)	-				x	x	
25	Tramier (2002)	-	x			x	x	
26	Prewitt (2003)	Offshore Drilling Inc	x		x	x	x	
27	Calder (2003)	Shell Canada	x			x	x	
28	Wiig (2002)	ExxonMobil	x			x	x	Risk-Based Management
29	Sohani and Haugnaess (2002)		x		x	x	x	
30	Tess (2002)		x					
31	Abernathy (2001)		x		x	x	x	
32	Amaral (2000)		x		x	x	x	
33	Coats (2000)					x	x	
34	Carter (1999)	AMEC		x	x	x	x	
35	Hamid (1998)	Mobil Oil Indonesia	x			x	x	
36	Fonseca and Filho (1998)		x			x	x	
37	Silva (1998)		x			x	x	Quality Culture
38	Pemberton (1998)		x		x	x	x	
39	Wills (1996)		x			x	x	
40	Jong (1996)		x			x	x	
41	Downey (1995)		x			x	x	
42	Alderman (1994)		x		x	x	x	
43	Forum (1994)		x			x	x	

Appendix F Motivation Factors in Embarking the IMS: Non-Oil and Gas Industry Vs Oil and Gas Industry

Author (Year)	Internal								External				
	Productivity increase	Internal communication improvement	Improved processes performance	Similarity and compatibility between standards	Cost reduction	Redundancies elimination	Synergies maximisation	Increased organisational flexibility	Marketing	Customers' and stakeholders' pressure	Business development issues	Market share increase	Fulfilment of legal requirements
General/ Non-Oil and Gas Industry													
Almeida *et al.* (2014)									x				
Sampaio *et al.* (2012)	x							x	x				x
Simon *et al.* (2012)	x		x		x					x			
Simon (2012)		x		x									
Bernardo *et al.* (2012)								x					
Zeng *et al.* (2011)			x		x								x
Molina-Azorı´n (2010)	x	x	x	x	x						x	x	
Tarı´ and MolinaAzorı´n (2010)									x	x			x
Asif *et al.* (2010)		x			x								x
Zeng *et al.* (2010)										x			x
Bernardo *et al.* (2008) (2012)						x	x						
Saraiva and Sampaio (2010)						x							
Tarı´ *et al.* (2010)						x							
Tarı´ and Molina-Azorı´n (2010)						x							
Karapetrovic and Casadesus (2009)							x			x		x	
Rasmussen (2007)		x	x		x								
Zeng (2007)				x									
Jørgensen *et al.* (2006)		x		x			x					x	
Zutshi and Sohal (2005)		x		x	x								
Beckmerhagen *et al.* (2003)					x								
Karapetrovic (2002)		x					x						x
Matias and Coelho (2002)		x		x									
Wilkinson and Dale (2002)				x									
Wright (2000)		x		x									
Oil and Gas Industry													
Zhong (2013)										x			x
Kominas (2012)										x			x
Lopez (2008)			x				x						
Roy (2007)					x								
Tess (2002)										x			x

Appendix F Motivation Factors in Embarking the IMS: Non-Oil and Gas Industry Vs Oil and Gas Industry (Continue)

Author (Year)	Internal								External				
	Productivity increase	Internal communication improvement	Improved processes performance	Similarity and compatibility between standards	Cost reduction	Redundancies elimination	Synergies maximisation	Increased organisational flexibility	Marketing	Customers' and stakeholders' pressure	Business development issues	Market share increase	Fulfilment of legal requirements
Sohani and Haugnaess (2002)										x			x
Wiig (2002)										x			x
Abernathy (2001)				x		x							
Amaral (2000)			x										
Alderman (1994)										x			x

Appendix G Benefits of Integration: General/Non-Oil and Gas Industry versus Oil and Gas Industry

Author (Year)	Systemic bureaucracy reduction	Cost reduction	Objectives, processes and resources alignment	Decrease on productive processes stoppages	Synergies between several MSs	Improved efficiency and effectiveness	Competitive advantage	Improvement of promotional features	Fulfilment of legal and regulatory requirements	External audits integration	Progress towards corporate responsibility	Progress towards sustainability	Enhance customer satisfaction	Operational Benefits	Resources Allocations	Cultural Change	Improved Compliance	Fewer accident/ reduction of loss due to incidents	Enhance image with public and regulators	Improved HSE performance	Reduced liability
General/Non-Oil and Gas Industry																					
Almeida *et al*. (2014)	x					x		x													
Bernardo *et al.* (2012)	x	x			x																
Rebelo and Santos (2012)	x	x			x																
Zeng (2011)	x																				
Asif *et al.* (2011)														x							
Domingues *et al.* (2011)				x																	
Zeng *et al* (2011)									x	x											
Molina-Azorı´n (2010)	x						x	x													
Tarı´ *et al.* (2010)	x	x	x			x															
Asif *et al.* (2010)	x				x				x	x											
Zeng (2010)		x					x														
Bernardo *et al.* (2008)			x		x					x											
Salomone (2008)										x				x							
Rasmussen (2007)	x		x			x		x		x											
Zeng (2007)		x				x									x						

Appendix G Benefits of Integration: General/Non-Oil and Gas Industry versus Oil and Gas Industry (Continue)

Author (Year)	Systemic bureaucracy reduction	Cost reduction	Objectives, processes and resources alignment	Decrease on productive processes stoppages	Synergies between several MSs	Improved efficiency and effectiveness	Competitive advantage	Improvement of promotional features	Fulfilment of legal and regulatory requirements	External audits integration	Progress towards corporate responsibility	Progress towards sustainability	Enhance customer satisfaction	Operational Benefits	Resources Allocations	Cultural Change	Improved Compliance	Fewer accident/ reduction of loss due to incidents	Enhance image with public and regulators	Improved HSE performance	Reduced liability
Filho and Souza (2006)	x	x		x	x	x	x														
Jørgensen *et al.* (2006)	x		x				x			x	x	x									
Zutshi and Sohal (2005)		x		x				x						x		x					
Jørgensen *et al.* (2005)		x												x							
Fresner and Engelhardt (2004)														x							
McDonald (2003)		x																			
Beckmerhagen *et al.* (2003)	x		x			x															
Holdsworth (2003)														x							
Wilkinson and Dale (2002)	x	x																			
Matias and Coelho (2002)		x	x	x								x									
Karapetrovic (2002)			x						x	x											
Wilkinson and Dale (2002)		x	x																		
Douglas and Glen (2000)		x											x	x							
Wright (2000)						x															
Oil and Gas Industry																					
Wifi (2010)		x			x		x		x	x			x	x							

Appendix G Benefits of Integration: General/Non-Oil and Gas Industry versus Oil and Gas Industry (Continue)

Author (Year)	Systemic bureaucracy reduction	Cost reduction	Objectives, processes and resources alignment	Decrease on productive processes stoppages	Synergies between several MSs	Improved efficiency and effectiveness	Competitive advantage	Improvement of promotional features	Fulfilment of legal and regulatory requirements	External audits integration	Progress towards corporate responsibility	Progress towards sustainability	Enhance customer satisfaction	Operational Benefits	Resources Allocations	Cultural Change	Improved Compliance	Fewer accident/ reduction of loss due to incidents	Enhance image with public and regulators	Improved HSE performance	Reduced liability
Roy (2007)						x									x			x		x	
Nouri (2005)			x		x	x												x			
Ahmed (2000)	x		x																		
Hamid (1998)						x	x	x	x								x		x	x	x
Alderman (1994)			x			x			x					x							

Appendix H Integration Challenges: General/Non-Oil and Gas Industry versus Oil and Gas Industry

	Internal Challenges															External Challenges			
Author (Year)	Human resources restrictions	Financial restrictions	Implementation cost	Fuzzy information concerning the new system to be implemented	Lack of commitment or involvement from key workers	Lack of information concerning the new roles to be ascribed	Lack of motivation during the implementation process	Perception that the existing MSs are sufficient	Doubts concerning the add value provided by the new system	Middle management scepticism	Bad past experiences	Bureaucracy increase	Unfavourable company culture	Disappearance of a single identity	Obstacle to innovation	Lack of experts covering all the standards	Lack of pressure from customers or competitors	Lack of support by the certification entities	Lack of a guideline
General/Non- Oil and Gas Industry																			
Simon *et al.* (2012)	x	x		x		x	x			x									
Bernardo *et al.* (2012)							x												
Castillo-Rojas (2012)															x				
Domingues (2012)														x					
Sampaio *et al.* (2012)																	x		
Domingues *et al.* (2011)		x	x	x	x		x	x	x	x				x					x
Zeng *et al.* (2011)												x	x						
Molina-Azorı´n (2010)	x		x		x	x										x			
Bernardo *et al.* (2008)						x								x					
Salomone (2008)										x									
Asif *et al.* (2008)																		x	x
Zeng (2007)	x												x					x	x
Zutshi and Sohal, (2005)	x		x							x						x		x	x
Beckmerhagen *et al.* (2003)						x		x	x	x	x						x		
Matias and Coelho (2002)				x		x						x							
Oil and Gas Industry																			
Nouri (2005)		-	-	x	x	x	x	x	x	x	x	x	x	-	x	x	-	-	x

Appendix I Strategies for IMS in the Non-Oil and Gas Industry

Country	Author (Year)	Strategy of Integration
General strategies		
Denmark	Jørgensen *et al.*, (2005), Wilkinson and Dale (2001)	**Alignment and Full Integration**
Strategy based on Sequence of Integration		
Canada	Karapetrovic (1998)	**Sequence of integration** based on implementation of Management Systems. Three options for integration: 1. QMS first and then add EMS 2. Establish EMS first and then add QMS 3. Introduce QMS and EMS concurrently using "A system of Systems" approach
Malaysia	Mohamad (2006)	Start with **implementing the** Management System **s individually** and then followed by integration. The sequence of integration as follows: 1. Establish the QMS first 2. Integrate the EMS with the existing QMS (EMS + QMS = QEMS) 3. Integrate OHSMS with the existing QEMS (Quality and Environmental Management System).
Strategy Based on Approach for Integration		
UK	Wilkinson and Dale (2001)	**Total Quality Approach.** Integrated Processes with support of integrated organisational structure, strong culture and promoting the involvement of people.
Canada	Karapetrovic (1998)	**"A System through Systems" Approach** where the system approach leads to loss of independence of each system and make the system more comprehensive.
Canada	Karapetrovic (2002)	**Two-pronged Approach** where the first phase involves the creation of a generic Management System standard to support the integration. The second phase relates to auditing.

Appendix I Strategies for IMS in the Non-Oil and Gas Industry (Continue)

Country	Author (Year)	Strategy of Integration
Canada	Jonker (2004)	**System Approach** where business is viewed as a single system in which the integration of the individual systems give rise to an amorphous system that changes the shape depending on prevalent stakeholders and objectives to be achieved.
UK	Badreddine *et al.* (2009)	**Multi Objective Approach** which is one of the most commonly used graphical decision models for reasoning under uncertainty with multiple objectives.
UK	Badreddine *et al.* (2009)	**New Process Approach** is based on three aspects: a) process-based approach b) risk management c) global monitoring system The above is used as integrating factors to satisfy three important levels of integration which are correspondence, coordination and integration. The different steps of the proposed approach cover the whole PDCA (Plan,-Do-Check-Act) scheme.
Czech Rep	Labodová (2004)	**Risk Analysis-Based Approach** using a combination of "seven steps" risk analysis and OHS management spiral.
The Netherlands and Canada	Asif *et al.* (2009b)	**System Approach and Techno-centric Approach** where System Approach is used at the management level and Techno-centric Approach is used at Operations level.
Strategy based on model for integration:		
China	Zeng (2007)	**Synergetic model** where integration needs to take place at 3 levels i.e. Strategic synergy, Organisational structural-resource-cultural synergy and Documentation synergy.
Tunisia	Badreddine (2009), Hamid and Yusof (2004)	**Process-Based Approach Model** covers the whole PDCA (Plan-Do-Check-Act) structure.

Appendix I Strategies for IMS in the Non-Oil and Gas Industry (Continue)

Country	Author (Year)	Strategy of Integration
UK	Dalling and Holt (2012)	**Taxonomy Model** allows any management standard, regulation, license or other stakeholder formal requirements to be completely mapped into a single integrated structure.
UK	Wilkinson and Dale (2001)	**Total Quality Approach Model** which shows the integrated process of common scope with the integrated organisational structure and strong culture promoting the involvement of people in the integration.
Portugal	Dominique *et al.* (2015)	**Capability Maturity Model** is an integrated statistical-based component which states the relationships between three independent variables which are the key process agents, externalities and the excellence management pillars which encompass a multiple regression linear model and other variables.

Appendix J List of Oil and Gas companies and their IMS Strategies

Research Paper	Company Name	IMS Strategy	Type of IMS Strategies
Celiento and Gherbi (2017)	Eni	Enhance correlation between HSE Management System and HSE culture by: • Developing systems that can cascade the large company HSE system used for the operational activities for all HSE system elements to operate effectively in respect of the local laws without causing disruption to the existing organisations. • Competency training that requires improvement and development of top managers for continuous commitment and performance of safe operations. • Consistent risk analysis performance with a focus on High Level risks rather than generate generic risk assessment. • Company ability to analyse and self-evaluate lessons learned and audit results as opportunities for improvement.	• Sequence of integration • Systematic approach for integration
Forbes and Walker (2016)	Schlumberger	The Management Systems for quality, HSE, and sustainable development, were integrated into one Management System instead of considering each subject within its own individual system. The initiative involved designing the process and procedures, implementing the system into operational planning, and developing certain key features such as customised dashboards for line managers to track outcomes.	• Sequence of integration • Systematic approach for integration
Zhong (2013)	CNOOC	The quality management is embedded within the HSE Management System framework, but the IMS emphasises on HSE due to its social responsibility. However, the approach for the development of model is based on Management System approach, PDCA methodology, business process and documentation structure.	• Model for integration
Maddirala (2012)	Reliance Industry Limited (RIL)	HSE Management System includes ISO 17776 which is the hazards and effect management process. The word “quality” is not being used directly in the model, instead, it is embedded in the operations Management System model.	• Model for integration
Kominas (2012)	ExxonMobil	The framework for the integration of Management System showed that Operations Integrity Management System is integrated into the Upstream Socio-economic Management Standard to produce Project Specific Plans. Common factors for the consideration for IMS framework are Management System, PDCA methodology, business process approach, risk approach and documentation structure.	• Model for integration
Kim (2008)	Samsung Heavy Industries	Appointed dedicated interface manager to manage the integration process, integration workshops and ongoing integration assessment. Use E&P forum guideline for HSE Management System to align with international Project Management Practices (PMI) due to the Client’s requirements.	• Model for integration
Faso (2009)	Petrobel	The model covers the mission, vision and objectives of the organisation, providing a methodology of how it should be organised and how the entire business is managed through assets, processes and people. Moreover, IMS has the scope of creating a basis for a cultural change, from which a continuous improvement can proceed. The model	• Model for integration

Appendix J List of Oil and Gas companies and their IMS Strategies (Continue)

Research Paper	Company Name	IMS Strategy	Type of IMS Strategies
		is founded on the IMS model which uses a mix of alignment and integrated approach using documentation as a basis for both approaches.	
Azadeh (2009)	Sarkhoun and Qeshn Gas Refining Company	The proposed approach for the IMS is an integrated Health, Safety, Environment (HSEE) Management System through systems integration of conventional HSE Management System with job systems and re-engineering organisational structures and electronic data interchange technology. The Management System and document structure are the two common considerations for the integration.	• Model for integration
Galinetto (2007)	Eni E&P	HSE IMS organisation is founded on the principle of continuous improvement according to the methodology known as PDCA - Plan-Do-Check-Act (Deming Cycle) to manage Exploration Projects (EMS), Development Projects (DMS) and Operations Projects (OMS) which are their main business process areas. Risk and documentation assessment were part of their considerations in the establishment of the IMS model.	• Model for integration
Roy (2007)	ONGC	Appointed in-house experts, as their previous experiences proved that the personnel from within the organisation who have been exposed to different functions and knowledge of the standards were better appointed in creating the required synergy of the system.	• Model for integration
Narayanan (2006)	-	The approaches include, for the organisation to define the business model and primary functions, to analyse business processes using flowcharts, to use standard and failure mode analysis techniques, to formulate operational policies that will manage the process and their inter-linkages, to develop internal business procedures to control each business process that define who does what, when and how, to implement new and improved practices as and when required, and to identify optimum documentation needs by having a linkage to the control procedures and to document the system.	• Model for integration
Tess (2002)	Rockwell, Automation, USA	Began the integration process with Quality Management System, followed by Environmental Management System and then Safety Management System. Finally, aligned three Management System s: quality, safety, and environmental, and perform one internal audit.	• Sequence of integration • Systematic approach for integration
Sohani and Haugnaess (2002)	Schlumberger	Implemented the Contractor Management System which is based on the model recommended at the Oil and Gas Producers (OGP) Forum.	• Model for integration
Abernathy (2001)	Halliburton	Kicked off the integration with separate Quality and HSE Management Systems before the creation of a Halliburton Management System (HMS) which is an IMS that provides a structure covering HSE and Quality within the framework of each activity.	• Sequence of integration • Systematic approach for integration
Amaral (2000)	Petrobras, Brazil	The appointed working group was divided into three sub-groups to develop an integrated EQHS policy, guidelines for integrated auditing and guidelines to prepare a manual of IMS and thereafter to implement all Management System s simultaneously.	• Sequence of integration • Systematic approach for integration

Appendix J List of Oil and Gas companies and their IMS Strategies (Continue)

Research Paper	Company Name	IMS Strategy	Type of IMS Strategies
Fonseca and Filho (1998)	Petrobras, Amazonia	Commenced integration with the integrated environmental and health Management System due to the nature of their projects which are in the Amazonia areas. This was followed by integrating the safety management into the health and environmental Management System to become the HSE Management System.	• Sequence of integration • Systematic approach for integration

Appendix K Phase 1 Exploratory Study via Mail

Refer to the next pages.

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Appendix L Phase 1 Exploratory Survey via Online

Refer to the next pages.

(Page 1 of 25 to Page 25 of 25)

Appendix M Phase 2 Explanatory Study – Interview Questions

Refer to the next pages.

(Page 1 of 10 to Page 10 of 10)

Appendix N Brief Information of the Oil and Gas contractors that Responded to the Survey

Name of the Organisation	Brief Information of the Organisation
Organisation #1	A Malaysia-based international provider of offshore production and support services with a presence in over 17 countries, spread across five continents, supported by over 1,700 people from 49 nationalities. They are also top-ten world FPSO operators. The Floating, Production Storage Offloading (FPSO) and Subsea Construction (SC) Projects Business Unit is responsible for the engineering, procurement and construction (EPC) contracts for this organisation. At the time of the study, the organisation has upstream projects in Indonesia, Angola, Malta and the North Sea. At peak, the project teams can reach as high as 800 personnel ranging from project management, engineering, procurement, construction, installation and commissioning engineers and support services.
Organisation #2	A Malaysian-based company and subsidiary of the national oil companies. Their Offshore Business unit is involved from concept selection and engineering design to operations and decommissioning. They are one of the top-ten FPSO players in Malaysia. Their offshore business offers a comprehensive suite of services tailored to meet the dynamic floating solutions for the offshore business landscape, catering for shallow water to deep water field developments. They have an expansive reach across Malaysia, Vietnam, Brazil, and other strategic locations to meet today's global demands of the oil and gas industry. They were involved in the same Sabah offshore project with Organisation #3 for the same Client. Their scope is for the platform structure scope whilst Organisation #3 is for the pipeline scope.

Appendix N Brief Information of the Oil and Gas contractors that Responded to the Survey (Continue)

Name of the Organisation	Brief Information of the Organisation
Organisation #3	A subsidiary of a Malaysian-based international oil and gas contractor that provides engineering and construction services and registered with MOGSC. The company offers procurement; design, fabrication, and installation engineering; offshore transportation, construction, and installation; pre-commissioning and commissioning; and decommissioning services. It provides its services for deep water, conventional, and decommissioning projects in Malaysia, Vietnam, Myanmar, Thailand, India, China, Australia, Japan, Mexico, and Brunei. At the time of the study, the organisation has 500 highly experienced engineers, project management, and support personnel that specialise in technologically sophisticated deepwater projects and decommissioning activities.
Organisation #4	A subsidiary of a well-known Australian construction company which is based in Malaysia and registered under MOGSC as an oil and gas contractor. During their active period, they were involved in major upstream pipeline and offshore platform projects in Iraq, Tanzania and Indonesia.
Organisation #5	An integrated oil and gas company focused on providing innovative floating solutions, i.e. floating production storage & offloading (FPSO), floating storage & offloading (FSO), floating regasification & storage unit (FSRU), mobile operating platform unit (MOPU), and tension leg platform (TLP) for marginal field development. The projects are mainly in Malaysia.
Organisation #6	It offers services in the provision of customised engineered equipment, project managements, maintenance and parts, marine services, and other support services for oil and gas industries. The company was incorporated in 1983 and is based in Kuala Lumpur, Malaysia. Their projects are mainly located in offshore Malaysia.

Appendix O Selection and Credibility of the Informants in Phase 2 Explanatory Study via Interviews

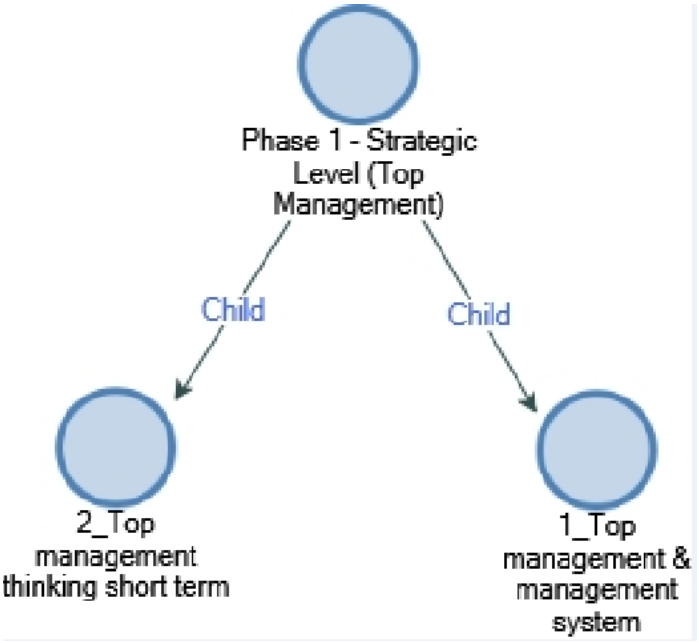
Organisation #1	
Description	A Malaysia-based international provider of offshore production and support services with a presence in over 17 countries, spread across five continents, supported by over 1,700 people from 49 nationalities. They are also top-ten world FPSO operators. The Floating, Production Storage Offloading (FPSO) and Subsea Construction (SC) Projects Business Unit is responsible for the engineering, procurement and construction (EPC) contracts for this organisation. At the time of the study, the organisation has upstream projects in Indonesia, Angola, Malta and North Sea. At peak, the project teams can reach as high as 800 personnel ranging from project management, engineering, procurement, construction, installation and commissioning engineers and support services.
Participants in the One-On-One Interview	
Roland Martland (Vice President HSSEQ)	He has more than 30 years of experience in HSE Management System in the oil and gas industry. He led the HSSEQ Department at the organisation level after completion of the project. When he was working at the project level, he was the Project HSE Manager who was responsible for the Project HSE Management System and its alignment with Quality Management System into the IMS implementation.
Arduni Mastura Abu Bakar (Corporate Environment Manager)	She has more than 15 years of experience in the Environmental Management System development and implementation at project level. She is involved directly for the incorporation of Environmental Management System (EMS) as an Integrated Management System for Corporate and Projects. Normally, the project team will refer to her for the development of environmental related document deliverables to the Client at the early stage of project as there was no full-time environmental manager allocated at project level, unless the Client requires one as stated in the Contracts.
Participants in the Focus Group Interview	
Razali Zainal Abidin (Corporate Senior Quality Engineer)	He has more than 20 years' experience in the Quality Management System in Engineering and Projects. He is involved directly in the incorporation of the Quality Management System (QMS) into the IMS either at corporate and at project level.
Mohd Khalil Yakub (Corporate Risk Manager)	He has more than 15 years' experience in risk management. He is involved directly in the incorporation of risk management at Corporate and project level. He was invited by the Corporate Senior Quality Engineer to join the Focus Group Interview due to his involvement at project level for

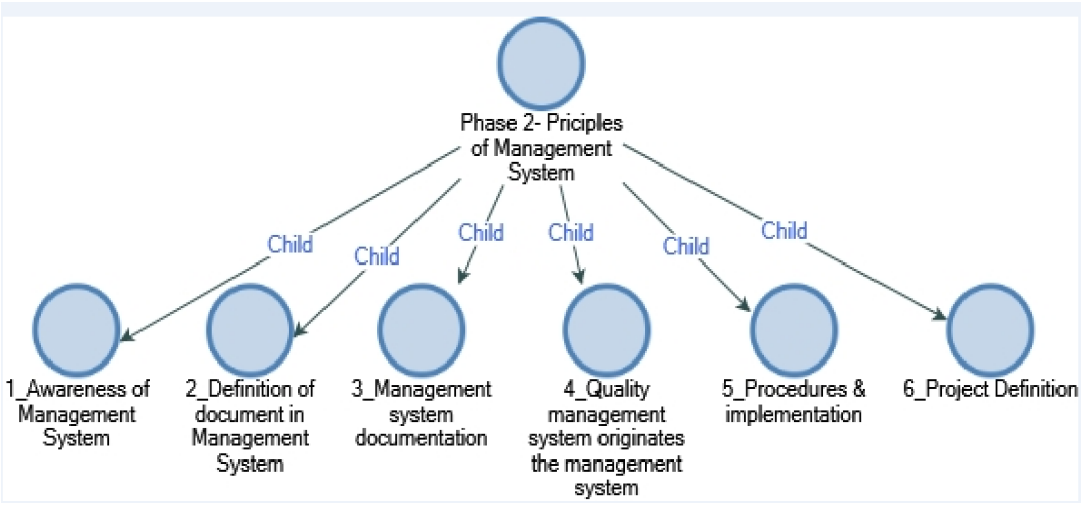
Appendix O Selection and Credibility of the Informants in Phase 2 Explanatory Study via Interviews (Continue)

	risk assessment process.
Remarks	In this organisation, the Corporate HSSEQ functions assist the development of the Project IMS as the project HSE and Quality team was only employed upon award of the project. Hence, at the early stage of the project, the corporate HSSEQ is involved in the development stage of the Project IMS.

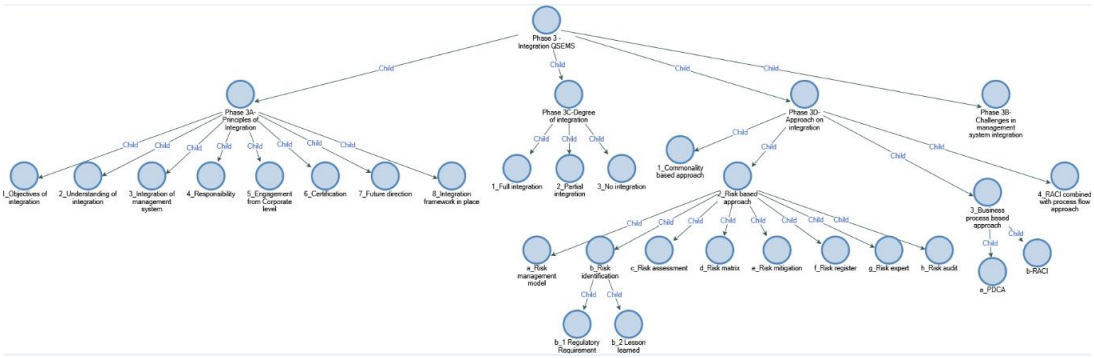
Organisation # 3	
Description	Organisation #3 is a subsidiary of a Malaysian-based international oil and gas contractor that provides engineering and construction services that registered with MOGSC. The company offers procurement; design, fabrication, and installation engineering; offshore transportation, construction, and installation; pre-commissioning and commissioning; and decommissioning services. It provides its services for deep water, conventional, and decommissioning projects in Malaysia, Vietnam, Myanmar, Thailand, India, China, Australia, Japan, Mexico, and Brunei. At the time of the study, the organisation has 500 highly experienced engineers, project management, and support personnel that specialise in technologically sophisticated deepwater projects and decommissioning activities.
Participants in the Focus Group Interview	
Yadi Kusmayadi (Project HSE Manager)	He has more than 20 years of experience in the HSE and Management Systems. He was involved in the development of HSE Management System for the project and works, together with the Project Quality Manager for the IMS for the project in his current Organisation #3, and also in his previous Organisation #4.
Yeo Cheng Kwan (Asset HSEQ Manager)	He has more than 30 years of experience in Quality and HSE Management System due to the marine industry requirements for ISM certification. He was involved in the development and implementation of HSEQ Management System for Asset and worked closely with the Project HSE Manager and Project Quality Manager to ensure the established Project Integrated Management System was aligned with Asset HSEQ Management System due to the use of vessel during offshore installation.
Mohd Mustaqim (Project Quality Manger)	He has more than 10 years in the Project Quality and Management System. He was involved in the development of Quality Management System and worked together with the Project HSE Manager implementation of the IMS (QHSE) at project level and closely worked with the Asset HSEQ Manager to ensure alignment with Asset HSEQ Management System.

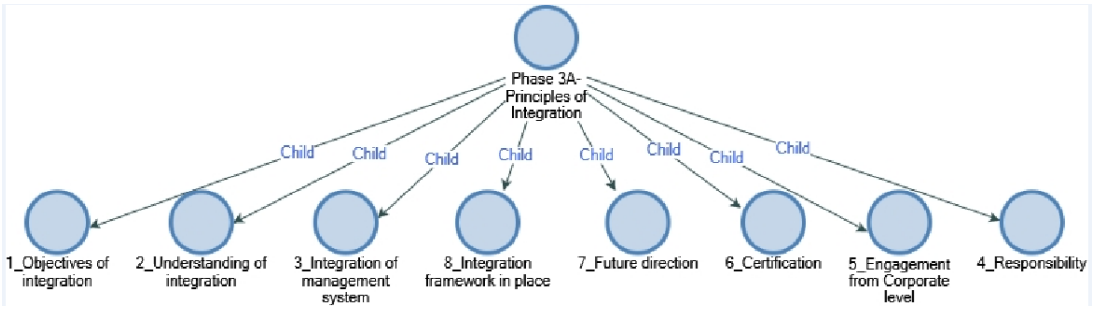
Appendix P NVIVO Nodes for Phase 2 Explanatory Study

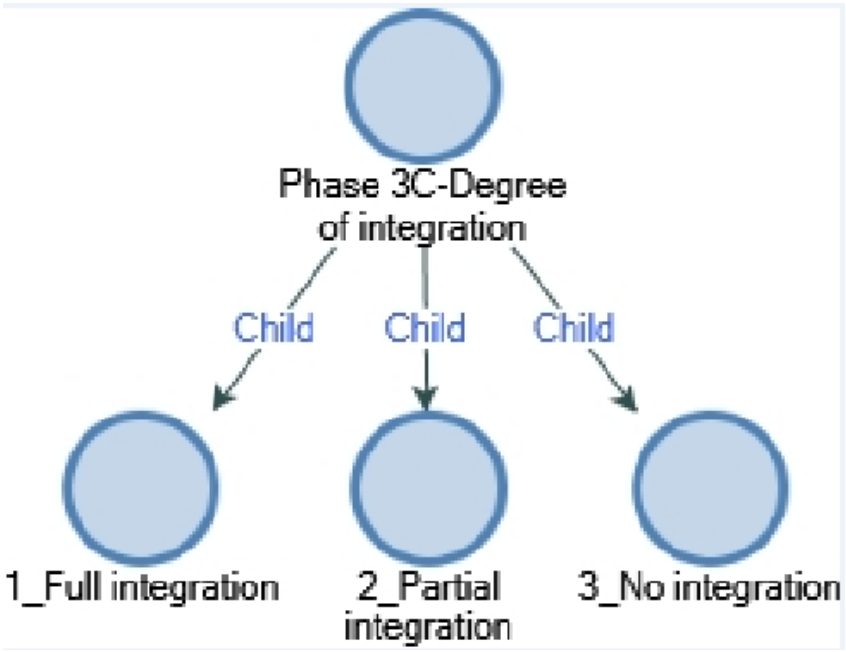




Appendix P NVIVO Nodes for Phase 2 Explanatory Study (Continue)







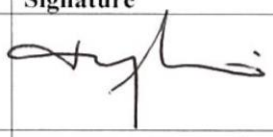
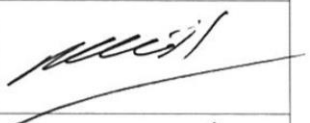
Appendix Q Attendance List of One-on-One and Focus Group Interviews

FOCUS GROUP INTERVIEW

PROJECT INTEGRATED MANAGEMENT SYSTEM FRAMEWORK IN THE UPSTREAM OIL AND GAS CONTRACTORS

DATE: 14 April 2016
TIME:2pm to 5pm
VENUE: Menara Etiqa, Kuala Lumpur
COMPANY: Organisation #1

PARTICIPANTS:

Name	Position	Signature
Razali Zainal Abidin	Senior Quality Engineer	
Mohd Khalil Yakub	Corporate Risk Manager	
Arduni Mastura Abu Bakar	Corporate Environmental Manager	Didn't attend, Separate interview to be arranged. Separate interview were conducted on 15/4/2016.

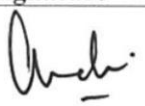
Appendix Q Attendance List of One-on-One and Focus Group Interviews (Continue)

ONE-ON-ONE INTERVIEW

PROJECT INTEGRATED MANAGEMENT SYSTEM FRAMEWORK IN THE UPSTREAM OIL AND GAS CONTRACTORS

DATE: 15 April 2016
TIME:12pm to 3pm
VENUE: Menara Etiqa, Kuala Lumpur
COMPANY: Organisation #1

PARTICIPANTS:

Name	Position	Signature
Arduni Mastura Abu Bakar	Corporate Environmental Manager	

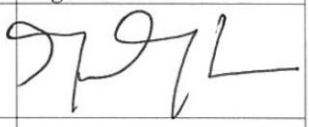
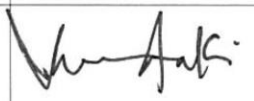
Appendix R Attendance List of Focus Group Interviews

FOCUS GROUP INTERVIEW

PROJECT INTEGRATED MANAGEMENT SYSTEM FRAMEWORK IN THE UPSTREAM OIL AND GAS CONTRACTORS

DATE: 15 March 2016
TIME:10am to 1pm
VENUE: Level 8, Sapura@Mines, Kuala Lumpur

PARTICIPANTS:

Name	Position	Signature
Yeo Cheng Kwan	HSEQ Asset Manager	
Yadi Kusmayadi	Project HSE Manager	
Mohd Mustaqim	Project Quality Manager	
Shahar Hashim	VP, HSSEQ	Couldn't attend the discussion due to offshore site work.

Appendix S Appointment Letter of the Subject Matter Expert

Refer to the next page.

Appendix T Invitation Letter for the Interviews

Refer to the next page.

Appendix U Sample of Statistical Analysis

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Quality_Management_System	19	1	1	1.00	.000
Environmental_Management_System	19	1	1	1.00	.000
Occupational_Health_and_Safety_Mnagement	19	1	1	1.00	.000
ISO_9001	19	0	1	.95	.229
ISO_29001	14	0	1	.07	.267
ISO_14001	18	0	1	.78	.428
OHSAS_18001	18	0	1	.72	.461
Quality_Manager_QMS	17	1.00	1.00	1.0000	.00000
Quality_manager_EMS	17	.00	.00	.0000	.00000
Quality_manager_OHSMS	17	.00	1.00	.0588	.24254
Quality_manager_QHSE	17	.00	.00	.0000	.00000
Health_and_Safety_Manager_QMS	17	.00	.00	.0000	.00000
Health_and_Safety_Manager_EMS	16	.00	1.00	.3750	.50000
Health_and_Safety_Manager_OHSMS	16	.00	1.00	.7500	.44721
Health_and_Safety_Manager_QHSE	16	.00	1.00	.1250	.34157
Environmental_Manager_QMS	15	.00	.00	.0000	.00000
Environmental_Manager_EMS	15	.00	1.00	.6000	.50709
Environmental_Manager_OHSMS	15	.00	1.00	.0667	.25820
Environmental_Manager_QHSE	15	.00	.00	.0000	.00000
Health_Safety_Environmental_Manager_QMS	16	.00	.00	.0000	.00000
Health_Safety_Environmental_Manager_EMS	16	.00	1.00	.4375	.51235
Health_Safety_Environmental_Manager_OHSMS	16	.00	1.00	.7500	.44721
Health_Safety_Environmental_Manager_QHSE	17	.00	4.00	.2941	.98518
QHSE_Manager_QMS	15	.00	4.00	.3333	1.04654
QHSE_Manager_EMS	13	.00	1.00	.0769	.27735
QHSE_Manager_OHSMS	13	.00	1.00	.1538	.37553
QHSE_Manager_QHSE	13	.00	1.00	.3077	.48038
Organisation_Developed_Integrated_Management_System	17	.00	1.00	.3529	.49259
organisation_currently_stage_developing	16	.00	1.00	.3750	.50000
Organisation_planning_Integrated_System	15	.00	1.00	.4000	.50709
Organisation_NoIntention_Develop_Management_System	14	.00	1.00	.1429	.36314
Initiative_from_top_management	16	2.00	5.00	4.0625	.92871
To_Improve_Internet_Business_Process	16	3.00	5.00	4.5000	.63246
To_reduce_number_of_procedures_paperwork	16	3.00	5.00	4.3750	.80623
To_easily_manage_management_system_documents	16	2.00	5.00	4.3750	.88506
Current_management_matured_require_new_initiative	16	3.00	5.00	4.3750	.71880
Reduced_cost_compared_individual_management_system	16	2.00	5.00	4.3125	.87321
To_reduce_number_of_audits_in_org	16	2.00	5.00	4.1875	.98107
Other_oil_and_gas_integrating	16	3.00	5.00	4.1875	.75000
Response_to_pressure_from_competitors	16	2.00	5.00	3.5000	1.09545
Topmanagement_isnot_interested	12	1.00	4.00	2.5833	1.16450
Topmanagement_is_unaware_of_integration	12	1.00	5.00	2.7500	1.35680
Not_part_of_organisation	12	1.00	5.00	3.0000	1.34840
The_current_individual_management_implemented_effectively	12	1.00	4.00	2.3333	1.07309

Appendix U Sample of Statistical Analysis (Continue)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The_Current_implementation_notyet_matured	12	1.00	4.00	2.6667	1.23091
Lack_of_budget	12	1.00	4.00	2.1667	1.02986
Require_extra_cost	12	1.00	4.00	2.4167	1.08362
Lack_of_internal_knowledge	12	1.00	5.00	2.8333	1.46680
Lack_of_External_Expert	12	1.00	5.00	2.7500	1.35680
No_certification_required	12	1.00	4.00	2.0833	.90034
Not_part_client	12	1.00	5.00	3.2500	1.05529
Not_many_oil_gas_org_successful	12	1.00	5.00	2.8333	1.26730
Process_Improvement	19	3.00	5.00	4.3158	.58239
Productivity_improvement	19	3.00	5.00	4.2105	.63060
Management_of_coct_reduction	19	2.00	5.00	4.0000	1.00000
Continual_improvement	19	4.00	5.00	4.3684	.49559
local_community_require	19	1.00	5.00	3.2105	1.08418
Clients_require	19	2.00	5.00	3.6842	1.05686
suppliers_pressure	19	1.00	5.00	3.3684	1.16479
Public_authority	19	1.00	5.00	3.3158	1.20428
Competitiveness	18	1.00	5.00	3.7778	1.16597
Image_improvement	19	2.00	5.00	4.1579	.76472
New_market_Opportunity	19	2.00	5.00	4.2632	.80568
Adhoc_considered	19	1.00	4.00	2.5789	1.07061
setup_steering	19	2.00	5.00	4.0000	.88192
Setup_integrated_management	19	2.00	5.00	3.9474	.97032
Assign_budget	19	2.00	5.00	4.0000	.88192
Assign_existing_internal_resources_has_expertise	19	2.00	5.00	3.8947	.93659
Assign_existing_internal_not_have_expertise	19	2.00	5.00	3.5789	1.01739
Appoint_external_consultant	19	2.00	5.00	3.2632	1.24017
Employ_new_employee	19	1.00	5.00	3.3684	1.21154
Assign_QHSE_Lead	19	3.00	5.00	4.3158	.67104
Senior_management_team_part_development_team	19	2.00	5.00	4.0526	.91127
Business_process_mapping	18	.00	1.00	.8889	.32338
Analysis_common_elements	17	.00	1.00	.8824	.33211
Develop_organisation_model	16	.00	1.00	.7500	.44721
PDCA_cycle	18	.00	1.00	.8889	.32338
Risk_Mapping	17	.00	1.00	.5882	.50730
company_policy_QMS	19	.00	1.00	.1579	.37463
company_policy_EMS	19	.00	1.00	.2105	.41885
company_policy_SMS	19	.00	1.00	.2105	.41885
company_policy_Integration	18	1.00	3.00	2.1667	.92355
company_objectives_QMS	19	.00	1.00	.1579	.37463
company_objectives_EMS	19	.00	1.00	.1579	.37463
company_objectives_SMS	19	.00	1.00	.1579	.37463
company_objectives_Integration	19	1.00	3.00	2.2632	.87191
company_manuals_QMS	19	.00	1.00	.1579	.37463
company_manuals_EMS	19	.00	1.00	.1579	.37463
company_manuals_SMS	19	.00	1.00	.1579	.37463
company_manuals_INTEGRATION	18	.00	4.00	2.0556	1.10997
management_procedures_QMS	19	.00	1.00	.0526	.22942
management_procedures_EMS	19	.00	1.00	.0526	.22942
management_procedures_SMS	19	.00	1.00	.0526	.22942
management_procedures_INTEGRATION	18	1.00	3.00	2.2222	.64676
standard_working_procedure_QMS	19	.00	1.00	.0526	.22942
standard_working_procedure_EMS	19	.00	1.00	.0526	.22942
standard_working_procedure_SMS	19	.00	1.00	.0526	.22942
standard_working_procedure_INTEGRATION	18	1.00	3.00	1.9444	.80237
project_management_plans_QMS	19	.00	1.00	.0526	.22942

Appendix U Sample of Statistical Analysis (Continue)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
project_management_plans_EMS	19	.00	1.00	.0526	.22942
project_management_plans_SMS	19	.00	1.00	.0526	.22942
project_management_plans_INTEGRATION	18	1.00	3.00	1.8333	.78591
work_instruction_QMS	19	.00	1.00	.0526	.22942
work_instruction_EMS	19	.00	1.00	.0526	.22942
work_instruction_SMS	19	.00	1.00	.0526	.22942
work_instruction_INTEGRATION	18	1.00	4.00	1.9444	.87260
process_maps_QMS	19	.00	1.00	.0526	.22942
process_maps_EMS	19	.00	1.00	.0526	.22942
process_maps_SMS	19	.00	1.00	.0526	.22942
process_maps_INTEGRATION	18	1.00	3.00	1.8889	.75840
Forms_QMS	19	.00	1.00	.0526	.22942
Forms_EMS	19	.00	1.00	.0526	.22942
Forms_SMS	19	.00	1.00	.0526	.22942
Forms_INTEGRATION	18	1.00	3.00	1.9444	.72536
business_development_QMS	19	.00	1.00	.1053	.31530
business_development_EMS	19	.00	1.00	.1053	.31530
business_development_SMS	19	.00	1.00	.1053	.31530
business_development_INTEGRATION	18	1.00	3.00	1.8333	.78591
Tender_management_QMS	19	.00	1.00	.0526	.22942
Tender_management_EMS	19	.00	1.00	.1053	.31530
Tender_management_SMS	19	.00	1.00	.0526	.22942
Tender_management_INTEGRATION	18	1.00	3.00	1.7778	.73208
Human_resources_QMS	19	.00	1.00	.0526	.22942
Human_resources_EMS	19	.00	1.00	.1053	.31530
Human_resources_SMS	19	.00	1.00	.0526	.22942
Human_resources_INTEGRATION	18	.00	4.00	1.9444	1.05564
training_competency_QMS	19	.00	.00	.0000	.00000
training_competency_EMS	19	.00	1.00	.0526	.22942
training_competency_SMS	19	.00	1.00	.0526	.22942
training_competency_integration	18	1.00	4.00	2.0000	.76696
Commercial_management_QMS	19	.00	.00	.0000	.00000
Commercial_management_EMS	19	.00	1.00	.0526	.22942
Commercial_management_SMS	19	.00	1.00	.0526	.22942
Commercial_management_INTEG	18	1.00	3.00	1.8333	.78591
Risk_management_QMS	19	.00	.00	.0000	.00000
Risk_management_EMS	19	.00	1.00	.0526	.22942
Risk_management_SMS	19	.00	1.00	.0526	.22942
Risk_management_INTEG	18	1.00	3.00	2.0000	.68599
Contracts_management_QMS	19	.00	.00	.0000	.00000
Contracts_management_EMS	19	.00	1.00	.0526	.22942
Contracts_management_SMS	19	.00	1.00	.0526	.22942
Contracts_management_INTEG	18	.00	3.00	1.7778	.87820
Design_engineering_QMS	19	.00	.00	.0000	.00000
Design_engineering_EMS	19	.00	1.00	.0526	.22942
Design_engineering_SMS	19	.00	1.00	.0526	.22942
Design_engineering_INTEG	18	1.00	3.00	1.9444	.80237
Installation_engineering_QMS	19	.00	.00	.0000	.00000
Installation_engineering_EMS	19	.00	1.00	.0526	.22942
Installation_engineering_SMS	19	.00	.00	.0000	.00000
Installation_engineering_INTEG	19	1.00	3.00	1.9474	.77986
procurement_QMS	19	.00	.00	.0000	.00000
procurement_EMS	19	.00	1.00	.0526	.22942
procurement_SMS	19	.00	.00	.0000	.00000
procurement_INTEG	19	1.00	3.00	2.0000	.74536
subcontract_QMS	19	.00	.00	.0000	.00000
subcontract_EMS	19	.00	1.00	.0526	.22942
subcontract_SMS	19	.00	.00	.0000	.00000
subcontract_INTEGR	19	1.00	3.00	2.0000	.66667
project_startup_QMS	19	.00	.00	.0000	.00000

Appendix U Sample of Statistical Analysis (Continue)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
project_startup_EMS	19	.00	1.00	.0526	.22942
project_startup_SMS	19	.00	.00	.0000	.00000
project_startup_INTEG	19	1.00	3.00	2.0526	.62126
project_execution_QMS	19	.00	1.00	.0526	.22942
project_execution_EMS	19	.00	1.00	.1053	.31530
project_execution_SMS	19	.00	1.00	.0526	.22942
project_execution_INTEG	19	1.00	3.00	2.0526	.70504
project_completion_QMS	19	.00	1.00	.0526	.22942
project_completion_EMS	19	.00	1.00	.1053	.31530
project_completion_SMS	19	.00	1.00	.0526	.22942
project_completion_INTEG	19	1.00	3.00	2.0526	.70504
Marin_assets_QMS	19	.00	1.00	.0526	.22942
Marin_assets_EMS	19	.00	1.00	.1053	.31530
Marin_assets_SMS	19	.00	1.00	.0526	.22942
Marin_assets_INTEG	19	1.00	3.00	1.8947	.73747
Marin_Operations_QMS	19	.00	1.00	.0526	.22942
Marin_Operations_EMS	19	.00	1.00	.1053	.31530
Marin_Operations_SMS	19	.00	1.00	.0526	.22942
Marin_Operations_INTEG	19	1.00	3.00	1.8947	.73747
Management_Review_QMS	19	.00	1.00	.0526	.22942
Management_Review_EMS	19	.00	1.00	.0526	.22942
Management_Review_SMS	19	.00	1.00	.0526	.22942
Management_Review_INTEG	19	1.00	3.00	2.4211	.76853
Internal_Audits_QMS	19	.00	1.00	.0526	.22942
Internal_Audits_EMS	19	.00	1.00	.1053	.31530
Internal_Audits_SMS	19	.00	1.00	.0526	.22942
Internal_Audits_INTEG	19	1.00	3.00	2.4211	.76853
control_non_conformities_QMS	19	.00	1.00	.0526	.22942
control_non_conformities_EMA	19	.00	1.00	.1053	.31530
control_non_conformities_SMS	19	.00	1.00	.0526	.22942
control_non_conformities_INTEG	19	1.00	3.00	2.3684	.76089
corrective_action_QMS	19	.00	1.00	.0526	.22942
corrective_action_EMS	19	.00	1.00	.1053	.31530
corrective_action_SMS	19	.00	1.00	.0526	.22942
corrective_action_INTEG	19	1.00	3.00	2.4211	.76853
preventive_action_QMS	19	.00	1.00	.0526	.22942
preventive_action_EMS	19	.00	1.00	.1053	.31530
preventive_action_SMS	19	.00	1.00	.0526	.22942
preventive_action_INTEG	19	1.00	3.00	2.4211	.76853
document_control_QMS	19	.00	1.00	.0526	.22942
document_control_EMS	19	.00	1.00	.1053	.31530
document_control_SMS	19	.00	1.00	.0526	.22942
document_control_INTEG	19	1.00	3.00	2.6316	.59726
records_control_QMS	19	.00	1.00	.0526	.22942
records_control_EMS	19	.00	1.00	.1053	.31530
records_control_SMS	19	.00	1.00	.0526	.22942
records_control_INTEG	19	1.00	3.00	2.5789	.69248
operational_control_QMS	19	.00	1.00	.0526	.22942
operational_control_EMS	19	.00	1.00	.1053	.31530
operational_control_SMS	19	.00	1.00	.0526	.22942
operational_control_INTEG	19	1.00	3.00	2.2105	.78733
compliance_evaluation_QMS	19	.00	1.00	.0526	.22942
compliance_evaluation_EMS	19	.00	1.00	.1053	.31530
compliance_evaluation_SMS	19	.00	1.00	.0526	.22942
compliance_evaluation_INTEG	19	1.00	3.00	2.2632	.80568
emergency_response_QMS	18	.00	1.00	.0556	.23570
emergency_response_EMS	18	.00	1.00	.1111	.32338
emergency_response_SMS	18	.00	1.00	.0556	.23570
emergency_response_INTEG	18	1.00	3.00	2.0556	.72536
Project_execution_management_QMS	19	.00	1.00	.2105	.41885
Project_execution_management_EMS	19	.00	1.00	.2632	.45241

Appendix U Sample of Statistical Analysis (Continue)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Project_execution_management_SMS	19	.00	1.00	.2632	.45241
Project_execution_management_INTEG	19	.00	3.00	1.8947	.93659
project_planning_control_QMS	19	.00	1.00	.0526	.22942
project_planning_control_EMS	19	.00	1.00	.1053	.31530
project_planning_control_SMS	19	.00	1.00	.1053	.31530
project_planning_control_INTEG	19	.00	3.00	1.7895	.85498
project_engineering_management_QMS	19	.00	1.00	.0526	.22942
project_engineering_management_EMS	19	.00	1.00	.1053	.31530
project_engineering_management_SMS	19	.00	1.00	.1053	.31530
project_engineering_management_INTEG	19	.00	3.00	1.7895	.85498
project_procurement_management_QMS	19	.00	1.00	.1053	.31530
project_procurement_management_EMS	19	.00	1.00	.1053	.31530
project_procurement_management_SMS	19	.00	1.00	.1053	.31530
project_procurement_management_INTEG	19	.00	3.00	1.8421	.89834
project_materials_QMS	19	.00	1.00	.1053	.31530
project_materials_EMS	19	.00	1.00	.1053	.31530
project_materials_SMS	19	.00	1.00	.1053	.31530
project_materials_INTEG	19	.00	3.00	1.7895	.91766
project_logistic_QMS	19	.00	1.00	.1053	.31530
project_logistic_EMS	19	.00	1.00	.1053	.31530
project_logistic_SMS	19	.00	1.00	.1053	.31530
project_logistic_INTEG	19	.00	3.00	1.7895	.91766
project_subcontract_QMS	19	.00	1.00	.1053	.31530
project_subcontract_EMS	19	.00	1.00	.1053	.31530
project_subcontract_SMS	19	.00	1.00	.1053	.31530
project_subcontract_INTEG	19	.00	3.00	1.8947	.80930
project_fabrication_QMS	19	.00	1.00	.1053	.31530
project_fabrication_EMS	19	.00	1.00	.1053	.31530
project_fabrication_SMS	19	.00	1.00	.1053	.31530
project_fabrication_INTEG	19	.00	4.00	1.9474	.97032
project_construction_QMS	19	.00	1.00	.1053	.31530
project_construction_EMS	19	.00	1.00	.1053	.31530
project_construction_SMS	19	.00	1.00	.1053	.31530
project_construction_INTEG	19	.00	3.00	1.8947	.80930
project_commissioning_QMS	19	.00	1.00	.1053	.31530
project_commissioning_EMS	19	.00	1.00	.1053	.31530
project_commissioning_SMS	19	.00	1.00	.1053	.31530
project_commissioning_INTEG	19	.00	3.00	1.8421	.83421
project_completion_QMS	19	.00	1.00	.1053	.31530
project_ completion _EMS	19	.00	1.00	.1053	.31530
project_ completion _SMS	19	.00	1.00	.1053	.31530
project_ completion _INTEG	19	.00	3.00	1.9474	.91127
project_closeout_QMS	19	.00	1.00	.1053	.31530
project_closeout_EMS	19	.00	1.00	.1053	.31530
project_closeout_SMS	19	.00	1.00	.1053	.31530
project_closeout_INTEG	19	.00	4.00	2.1053	.99413
project_document_control_QMS	19	.00	1.00	.1053	.31530
project_document_control_EMS	19	.00	1.00	.1053	.31530
project_document_control_SMS	19	.00	1.00	.1053	.31530
project_document_control_INTEG	19	.00	3.00	2.2105	.85498
project_interface_management_QMS	19	.00	1.00	.1053	.31530
project_interface_management_EMS	19	.00	1.00	.1053	.31530
project_interface_management_SMS	19	.00	1.00	.1053	.31530
project_interface_management_INTEG	19	.00	3.00	2.0000	.81650
project_contracts_QMS	19	.00	1.00	.1053	.31530

Appendix U Sample of Statistical Analysis (Continue)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
project_contracts_EMS	19	.00	1.00	.1053	.31530
project_contracts_SMS	19	.00	1.00	.1053	.31530
project_contracts_INTEG	19	.00	3.00	1.9474	.84811
project_administration_QMS	19	.00	1.00	.0526	.22942
project_administration_EMS	19	.00	1.00	.1579	.37463
project_administration_SMS	19	.00	1.00	.1579	.37463
project_administration_INTEG	19	.00	4.00	2.1579	1.01451
project_health_and_safety_QMS	18	.00	.00	.0000	.00000
project_health_and_safety_EMS	18	.00	1.00	.1111	.32338
project_health_and_safety_SMS	18	.00	1.00	.1111	.32338
project_health_and_safety_INTEG	18	.00	3.00	2.0000	.84017
project_environmental_manage_QMS	19	.00	1.00	.0526	.22942
project_environmental_manage_EMS	19	.00	1.00	.0526	.22942
project_environmental_manage_SMS	19	.00	1.00	.1053	.31530
project_environmental_manage_INTEG	18	.00	3.00	2.0000	.84017
project_emergency_response_QMS	19	.00	1.00	.0526	.22942
project_emergency_response_EMS	19	.00	1.00	.1053	.31530
project_emergency_response_SMS	19	.00	1.00	.1053	.31530
project_emergency_response_INTEG	18	.00	3.00	2.0000	.76696
project_quality_management_QMS	19	.00	1.00	.1053	.31530
project_quality_management_EMS	19	.00	1.00	.1053	.31530
project_quality_management_SMS	19	.00	1.00	.1053	.31530
project_quality_management_INTEG	18	.00	3.00	2.0556	.80237
project_regulatory_QMS	19	.00	1.00	.0526	.22942
project_regulatory_EMS	19	.00	1.00	.1053	.31530
project_regulatory_SMS	19	.00	1.00	.1053	.31530
project_regulatory_INTEG	19	.00	3.00	1.9474	.84811
project_risk_managements_QMS	19	.00	1.00	.1053	.31530
project_risk_managements_EMS	19	.00	1.00	.1579	.37463
project_risk_managements_SMS	19	.00	1.00	.1579	.37463
project_risk_managements_INTEG	19	.00	3.00	1.8421	.89834
An_integrated_policy_exist	8	.00	1.00	.5000	.53452
The_organisation_objectives_relate_quality_environment_safety	8	.00	1.00	.7500	.46291
Organisational_business_plans_clear_to_achieve	8	.00	1.00	.7500	.46291
organisational_quality_mutually_aligned_degree	8	.00	1.00	.6250	.51755
organisation_has_quality_aligned_operations	7	.00	1.00	.7143	.48795
managers_have_combined	8	.00	1.00	.1250	.35355
managers_develop_integrated_manual	8	.00	1.00	.1250	.35355
managers_emphasise_need	8	.00	1.00	.6250	.51755
most_of_time_outcomes	8	.00	1.00	.7500	.46291
integrated_audits_carriedout	8	.00	1.00	.6250	.51755
managers_have_combined_responsibilities	8	.00	1.00	.6250	.51755
managers_are_primarily_concerned	8	.00	1.00	.8750	.35355
performance_evaluation_based_specific_job	8	.00	1.00	.8750	.35355
only_sometimes_do_managers_interact	8	.00	1.00	.7500	.46291
Audits_are_pertially_integrated_document_control	8	.00	1.00	.7500	.46291
managers_have_own_function	7	1.00	1.00	1.0000	.00000
Most_of_times_managers_notinteract_outcome	7	.00	1.00	.1429	.37796
There_are_separateprocedures	7	.00	1.00	.4286	.53452
In_general_individual_functions_considered	7	1.00	1.00	1.0000	.00000
separate_audit_carried_out	7	.00	1.00	.5714	.53452

Appendix U Sample of Statistical Analysis (Continue)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Most_of_the_work_instructions_integrated	7	.00	1.00	.2857	.48795
Varies_aspects_of_processes_execution	7	.00	1.00	.4286	.53452
Some_of_work_instructions_integrated	8	.00	1.00	.5000	.53452
The_execution_operational_manner	8	.00	1.00	.5000	.53452
seperate_records_work_instructions_checklists	7	.00	1.00	.7143	.48795
No_integration_among_various_aspects	7	.00	1.00	.2857	.48795
Bid_Tender_Management_QMS	19	.00	1.00	.2105	.41885
Bid_Tender_Management_EMS	19	.00	1.00	.2105	.41885
Bid_Tender_Management_SMS	19	.00	1.00	.1579	.37463
Bid_Tender_Management_INTEG	19	1.00	3.00	2.1053	.73747
Project_execution_management_QMS	19	.00	1.00	.2105	.41885
Project_execution_management_EMS	19	.00	1.00	.2105	.41885
Project_execution_management_SMS	19	.00	1.00	.1579	.37463
Project_execution_management_INTEG	19	1.00	3.00	2.0526	.70504
engineering_management_QMS	19	.00	1.00	.1053	.31530
engineering_management_EMS	19	.00	1.00	.1053	.31530
engineering_management_SMS	19	.00	1.00	.1053	.31530
engineering_management_INTEG	19	1.00	3.00	1.8947	.73747
procurement_management_QMS	19	.00	1.00	.1053	.31530
procurement_management_EMS	19	.00	1.00	.1053	.31530
procurement_management_SMS	19	.00	1.00	.1579	.37463
procurement_management_INTEG	19	1.00	3.00	1.9474	.77986
construction_management_QMS	19	.00	1.00	.1053	.31530
construction_management_EMS	19	.00	1.00	.1053	.31530
construction_management_SMS	19	.00	1.00	.1579	.37463
construction_management_INTEG	19	1.00	3.00	1.8421	.76472
installation_management_QMS	19	.00	1.00	.1053	.31530
installation_management_EMS	19	.00	1.00	.1053	.31530
installation_management_SMS	19	.00	1.00	.1579	.37463
installation_management_INTEG	19	1.00	3.00	1.9474	.77986
commissioning_management_QMS	19	.00	1.00	.1053	.31530
commissioning_management_EMS	19	.00	1.00	.1053	.31530
commissioning_management_SMS	19	.00	1.00	.1053	.31530
commissioning_management_INTEG	19	1.00	3.00	1.8947	.87526
handover_management_QMS	19	.00	1.00	.1053	.31530
handover_management_EMS	19	.00	1.00	.1053	.31530
handover_management_SMS	19	.00	1.00	.0526	.22942
handover_management_INTEG	19	1.00	3.00	2.1579	.76472
resource_management_QMS	18	.00	1.00	.0556	.23570
resource_management_EMS	18	.00	1.00	.0556	.23570
resource_management_SMS	18	.00	.00	.0000	.00000
resource_management_INTEG	18	1.00	3.00	1.9444	.93760
Vessel_management_QMS	19	.00	1.00	.0526	.22942
Vessel_management_EMS	19	.00	1.00	.1053	.31530
Vessel_management_SMS	19	.00	1.00	.0526	.22942
Vessel_management_INTEG	19	1.00	3.00	2.0526	.84811
operations__management_QMS	19	.00	1.00	.0526	.22942
operations__management_EMS	19	.00	1.00	.1579	.37463
operations__management_SMS	19	.00	1.00	.1053	.31530
operations__management_INTEG	19	1.00	3.00	2.0526	.77986
Risk_management_QMS	19	.00	1.00	.0526	.22942
Risk_management_EMS	19	.00	1.00	.1579	.37463
Risk_management_SMS	19	.00	1.00	.1053	.31530
Risk_management_INTEG	18	1.00	3.00	2.2222	.80845
contract_management_QMS	19	.00	1.00	.0526	.22942
contract_management_EMS	19	.00	1.00	.1053	.31530
contract_management_SMS	19	.00	.00	.0000	.00000
contract_management_INTEG	19	1.00	3.00	1.9474	.84811

Appendix U Sample of Statistical Analysis (Continue)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
commercial_management_QMS	19	.00	1.00	.0526	.22942
commercial_management_EMS	19	.00	1.00	.0526	.22942
commercial_management_SMS	19	.00	.00	.0000	.00000
commercial_management_INTEG	19	1.00	3.00	1.9474	.84811
Internal_audit_QMS	19	.00	1.00	.1579	.37463
Internal_audit_EMS	19	.00	1.00	.1579	.37463
Internal_audit_SMS	19	.00	1.00	.1053	.31530
Internal_audit_INTEG	18	1.00	3.00	2.3333	.76696
management_review_QMS	19	.00	1.00	.1579	.37463
management_review_EMS	19	.00	1.00	.1579	.37463
management_review_SMS	19	.00	1.00	.1053	.31530
management_review_INTEG	19	1.00	3.00	2.4211	.76853
Documents_management_QMS	19	.00	1.00	.1579	.37463
Documents_management_EMS	19	.00	1.00	.1579	.37463
Documents_management_SMS	19	.00	1.00	.1053	.31530
Documents_management_INTEG	19	1.00	3.00	2.5263	.69669
records_management_QMS	19	.00	1.00	.1579	.37463
records_management_EMS	19	.00	1.00	.1579	.37463
records_management_SMS	19	.00	1.00	.1053	.31530
records_management_INTEG	18	1.00	3.00	2.4444	.70479
training_management_QMS	19	.00	1.00	.0526	.22942
training_management_EMS	19	.00	1.00	.0526	.22942
training_management_SMS	19	.00	1.00	.1053	.31530
training_management_INTEG	19	1.00	3.00	2.0526	.70504
Others_please	0				
Lack_of_strategic	19	2.00	5.00	3.5789	.76853
Lack_of_management_commitment	18	1.00	5.00	3.3333	1.13759
Management_difficulties_interferences	18	1.00	5.00	3.2222	1.06027
Lack_of_internal_communication	19	2.00	5.00	3.6316	.95513
Excessive_tie_conduct_integration	19	2.00	5.00	3.3684	.95513
expectation_immediate_pssitive	19	2.00	5.00	3.4211	.83771
Lack_of_expertise_organisation	19	2.00	5.00	3.5789	.83771
lack_of_specialised_consultants	19	1.00	4.00	3.0526	.97032
lack_of_IMS_auditors	19	2.00	5.00	3.2632	.93346
insufficient_resources	19	1.00	5.00	3.3684	1.11607
lack_of_information	19	1.00	5.00	3.3158	1.10818
lack_of_support	19	2.00	5.00	3.6316	.95513
lack_technological_support	19	2.00	5.00	3.0526	.97032
lack_employee_motivation	19	2.00	5.00	3.6842	.94591
lack_certifying_support	19	1.00	5.00	3.1579	1.11869
lack_department_collaboration	19	1.00	5.00	3.5789	1.21636
unavailability_integrated_standard	19	1.00	4.00	3.1053	.99413
lack_integration_guidlines	19	1.00	5.00	3.2632	1.09758
lack_model	19	1.00	5.00	3.4211	1.21636
continually_changing	19	1.00	5.00	2.6316	1.11607
differences_scope_standards	19	1.00	5.00	2.8947	1.10024
differences_models	19	1.00	5.00	2.7368	1.09758
differences_requirements	19	1.00	5.00	2.5789	1.07061
standard_not_clear_operations	19	1.00	5.00	2.9474	1.12909
misunderstanding_concepts	19	1.00	5.00	3.2632	1.04574
individual_management_not_mature	19	1.00	4.00	2.8421	1.06787
differences_scope_integrated	19	1.00	5.00	3.2632	1.04574
different_documentation_structure	19	1.00	5.00	3.0526	1.02598
inadequate_financial_support	18	1.00	4.00	2.3333	.90749
costs_is_high_integration	18	1.00	4.00	2.4444	.85559
employees_rejection_complication	19	1.00	4.00	2.9474	1.12909
employees_resistance	19	1.00	4.00	2.9474	1.02598
employees_not_ready	18	1.00	5.00	3.1667	1.04319
reduced_flexibility_after_integration	19	1.00	5.00	2.8421	1.11869
increase_bureaucracy_intervening	19	1.00	5.00	2.8421	1.01451
require_cultural_transformation	19	1.00	5.00	3.3684	1.06513

Appendix U Sample of Statistical Analysis (Continue)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
OTHERS_SAY	0				
Better_management_decision_derived	18	2.00	5.00	4.0000	.90749
simplication_documentation_works	18	2.00	5.00	3.8889	.90025
less_procedures_paper_work	18	2.00	5.00	4.0000	.68599
Easier_to_manage_systems	18	2.00	5.00	3.9444	.72536
Better_process_work_flo	18	2.00	5.00	4.0000	.68599
better_understanding_application	18	3.00	5.00	3.9444	.53930
Better_acceptance__among_epmloyees	18	2.00	5.00	3.8333	.61835
Increase_organisation_efficiency	18	2.00	5.00	4.0556	.72536
Better_internal	18	2.00	5.00	4.0000	.68599
better_resources_utilisation	18	3.00	4.00	3.8333	.38348
Increase_employee_motivation	18	2.00	5.00	3.8333	.61835
eliminate_department_barries	18	2.00	4.00	3.6111	.69780
better_communications_employee	18	2.00	5.00	3.7222	.75190
Effective_strategic_planning	18	3.00	5.00	4.0556	.53930
Reduce_Audit_frequency	18	3.00	5.00	4.1111	.47140
Multi_functional_auditors	18	3.00	5.00	4.1667	.51450
Increase_employee_knowledge	18	3.00	5.00	4.1111	.47140
Improve_organisation_image	18	3.00	5.00	4.1667	.51450
cost_savings_reduction	18	2.00	5.00	4.0556	.63914
Others_below	0				
provide_more_awareness_training_maturity	19	3.00	5.00	4.2632	.93346
integrate_ne_management_standard_corporate	19	3.00	5.00	4.0000	.81650
improve_by_using_improvement_models	19	3.00	5.00	4.2632	.80568
develop_more_practical_approaches	19	3.00	5.00	4.3158	.82007
support_from_ISO_Reglatory_bodies	19	3.00	5.00	4.1053	.93659
availability_of_integrated_management	19	3.00	5.00	4.4737	.77233
availability_of_external_experts	19	3.00	5.00	4.2632	.87191
availability_of_applicable_models	19	3.00	5.00	4.3158	.82007
stakeholders_suchas_clients_acceptance	19	2.00	5.00	4.0000	.94281
top_management_commitment	19	3.00	5.00	4.5789	.69248
Evidence_and_proof_of_cost_reduction	19	3.00	5.00	4.3158	.82007
employees_commitment_support	19	3.00	5.00	4.5263	.77233
organisation_direction	19	2.00	5.00	4.5263	.90483
lesser_audits_frequency	19	2.00	5.00	4.0526	.97032
availability_of_internal_experts	19	3.00	5.00	4.3684	.83070
performance_level_integration	19	3.00	5.00	4.4211	.76853
Valid N (listwise)	0				

Appendix V Detailed Analysis of Phase 1 Exploratory Survey

Question 2 Management System Implementation in Your Organisation

Question 2.1 Type of Management System Implemented

All respondent companies that completed the structured survey had developed and implemented Quality Management System (QMS), Environmental Management System (EMS) and Occupational Health and Safety Management System (OHSMS) and certified according to ISO 9001 QMS, ISO 14001 EMS and OHSAS 18001 OSHMS standards as shown in Figure 1.

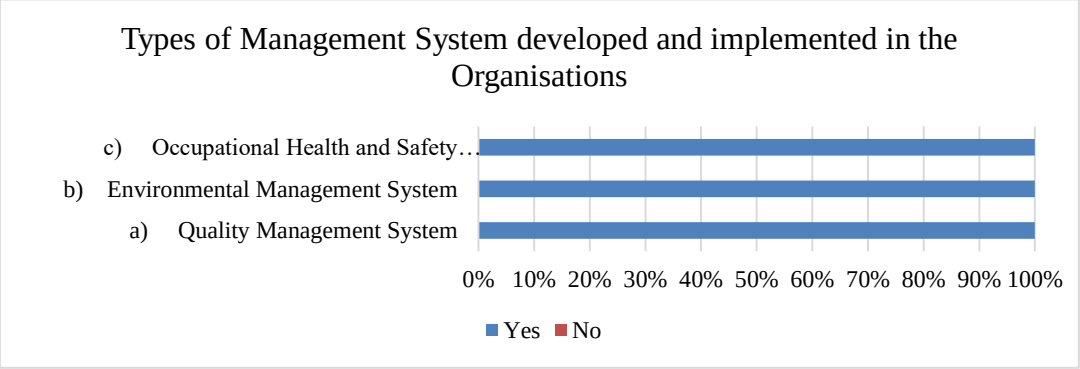


Figure 1 Types of Management System

Question 2.3 Responsible Person(s) for Managing Management System

Figure 2 showed that the Quality Manager is mainly responsible for QMS. The Health and Safety Manager is mainly responsible (75%) for OHSMS, 38% for EMS and 13% for QHSE MS. None of them are responsible for QMS. The Environmental Manager is mainly responsible for EMS and a small percentage (7%) responsible for OHSMS. None of them are responsible for QMS and QHSEMS. The HSE Manager is mainly responsible for OHSMS (75%) and EMS (44%) with a small percentage on QHSE MS (6%). The QHSE Manager is responsible for all Management Systems with 31% for QHSE MS, followed by OHSMS (15%), EMS (8%) and QMS (7%). This can be concluded that the QHSEMS (IMS) are being managed by the H&S Manager, HSE Manager or QHSE Manager whilst the Quality

Manager and Environmental Manager are responsible for their respective QMS and EMS.

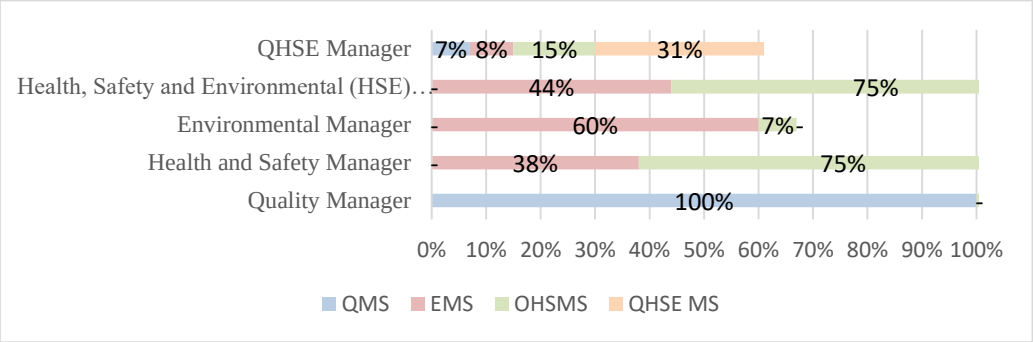


Figure 2 Responsible Person(s) for Managing the Management Systems in the Organisations

Question 2.4 Current State of the Management System

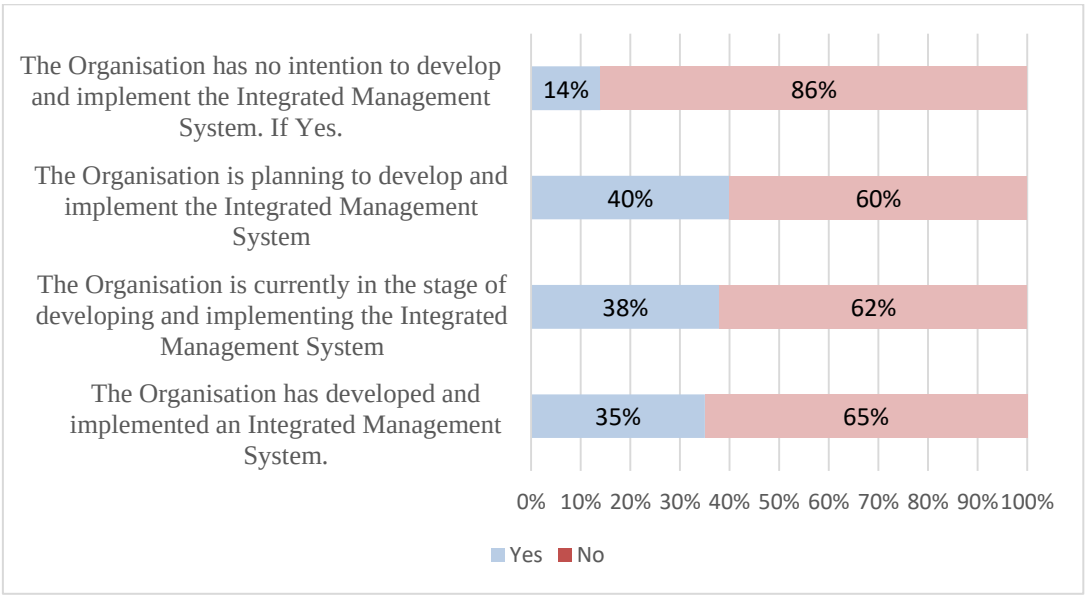


Figure 3 Status of Organisations on the IMS

35% of the respondents' organisations have developed and implemented an IMS as shown in Figure 3 above. 38% of the respondent's organisations are currently at the stage of developing and implementing the IMS. 40% of the respondent's organisations are planning to develop and implement the IMS. 86% disagreed that

their organisations have no intention to develop and implement the IMS. This shows that not all respondents' organisations have an IMS despite having implemented and certified to the three main Management System. However, most respondents' organisations stated that their organisations are working towards having the IMS.

Question 2.5 Reasons for Embarking or Not Embarking into IMS

The top five reasons for the Organisation to embark into IMS are due to improvement to the internal business process, requirement for a new initiative to be more efficient, reduction of cost, reduction of audits and easier management of Management Systems documents as shown in Figure 4 below. This shows that all respondents strongly agreed that improvement and efficiency are the main reasons for them to embark into IMS.

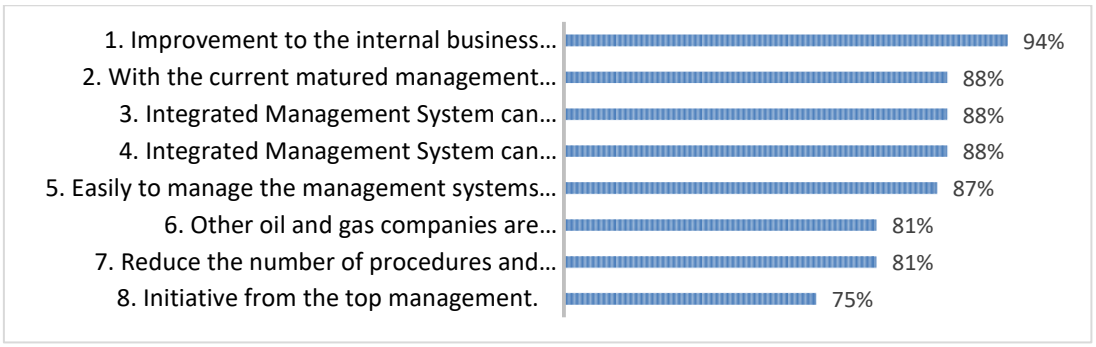


Figure 4 Reasons for Embarking into IMS in the Organisation

For respondents that have not yet integrated the IMS, Figure 5 shows that the organisations have indicated the reasons are neither due to the fact that the top management was not interested nor was their top management unaware of the integration. 42% stated that it was because IMS was not part of the organisation's strategic planning. 58% responded stating that their current individual Management System was not effectively implemented hence the organisation is not integrating the Management System. Other factors such as lack of budget (58%), extra cost (50%), lack of external expert (58%), no certification required (58%) and not many oil and gas organisations are successful in implementing IMS (75%) are not the reasons for

their organisation to not integrate the Management Systems. This shows that the main reason for a few companies not to integrate their Management Systems yet is not because of money, expertise or unsuccessful history of IMS implementation, but because the current individual Management System has not been effectively implemented. Hence, it shows that it is important to have a stable individual Management System before an integration takes place. This is in line with the fact that the Management System standards and certifications by ISO is required for the individual Management System's implementation and compliance for certifications.

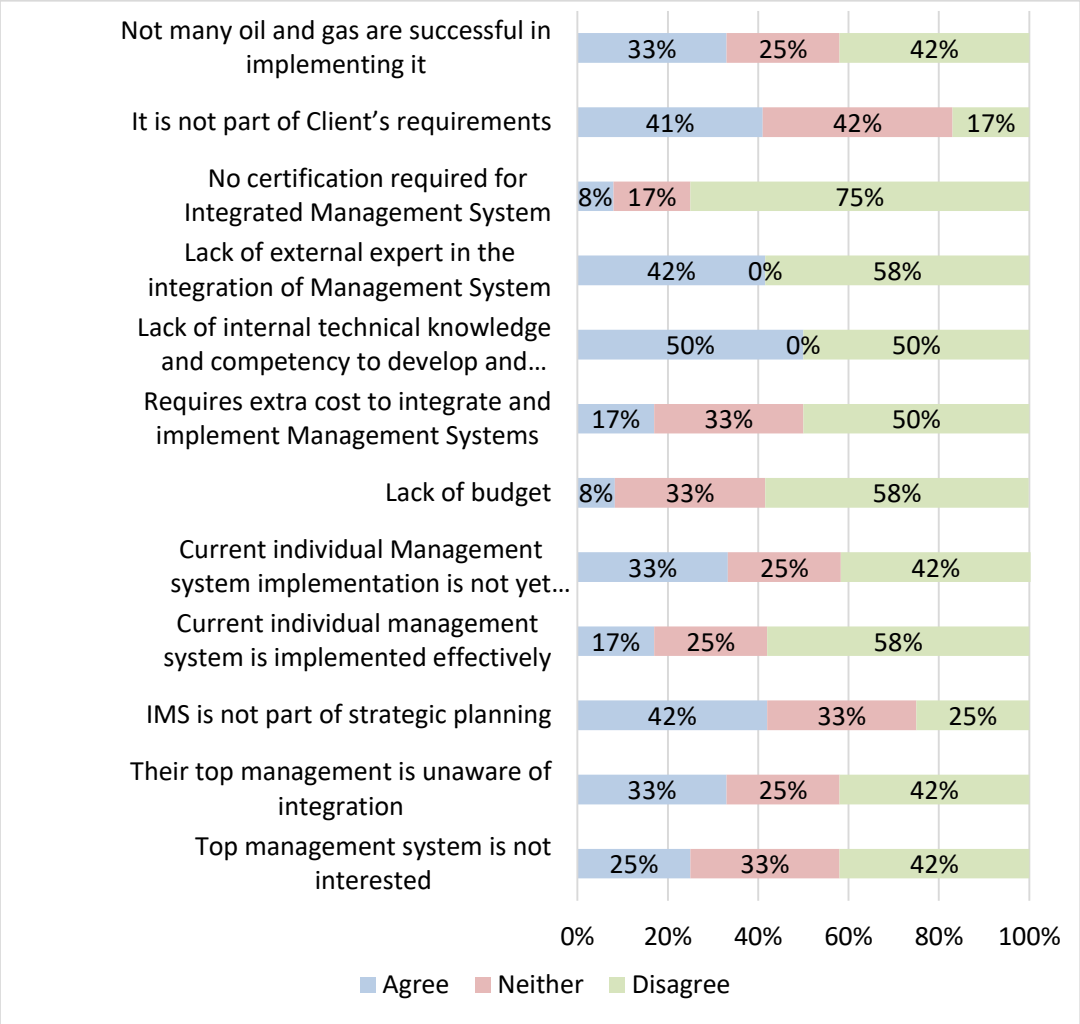


Figure 5 Reasons for not Integrating the Management Systems in the Organisation

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

Question 3 Strategy and Approach for IMS in Your Organisation

Question 3.1 Factors that Motivate the Development of IMS

The main internal factors that motivates the development of IMS in the respondents' organisation is 100% due to continual improvement, followed by process improvement (95%) and productivity improvement (90%) as shown in Figure 6. The response shows that improvement is the main reason for the development of IMS in the organisation.

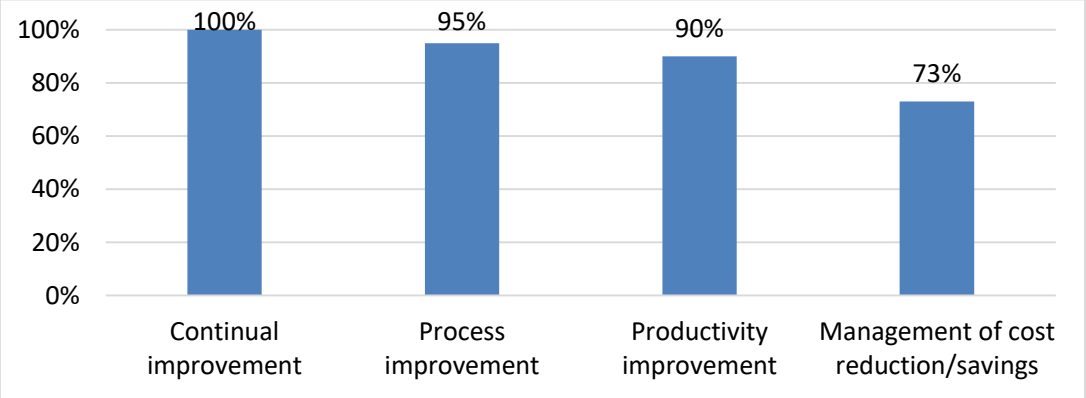


Figure 6 Internal Factors that Motivate the Development of IMS in the Organisation

Figure 7 shows that the two main external factors that motivate the development of IMS in their organisations are due to new market opportunity (91%) and image improvements (90%). The fact that the Client's requirement is one of the external factors on the IMS is as expected where combined safety and environmental requirements is a common requirement stated in tenders by the Client. Competitiveness also shows a high percentage (72%) as the companies are also trying to prove their improvement in the Management System for better opportunities to be awarded with new projects by the Client.

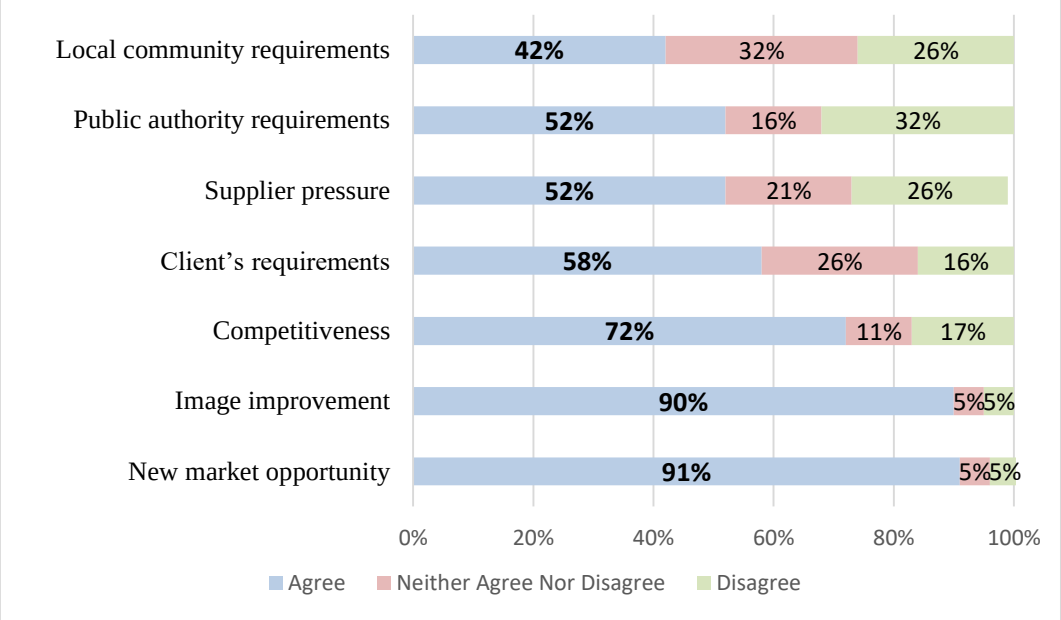


Figure 7 External Factors Motivate the Development of IMS in the Organisation

Question 3.2 Approaches Used in the Development of Integrated Management System in Your Organisation

Figure 8 shows that the favourite approach used for the development of the IMS is by assigning the QHSE Department to lead (90%), followed by setting up the steering and working committee, setting up the IMS Program/Plan, assigning budget and resources and assigning existing internal resources who has the expertise to lead (84%). 73% stated that their senior management is part of the development team and 63% assigned existing internal resources who do not have the expertise to lead but provide the necessary training for them. A few (47%) appointed external consultant with expertise to lead and recruit new employees with expertise to lead. Only 26% stated that their organisations used ad hoc approach where proper approach was considered when developing the IMS**.** Proper planning was done by the organisations for the development of IMS in terms of resources and programmes.

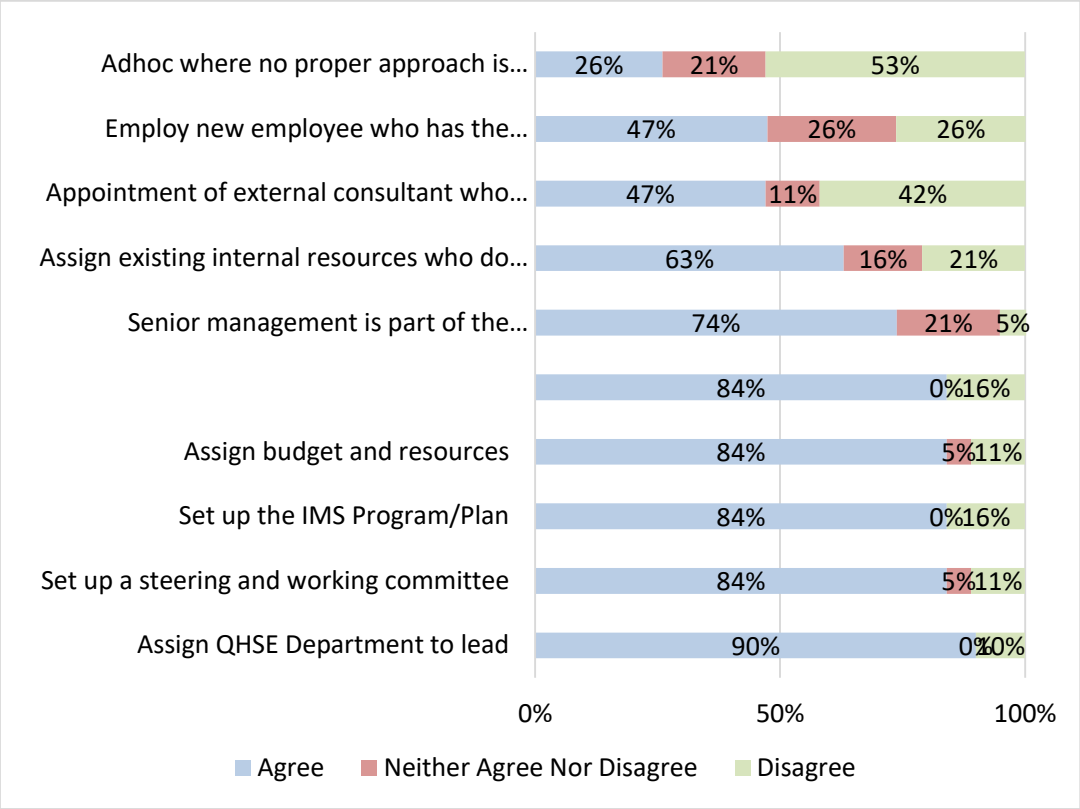


Figure 8 Approach Used for the Development of IMS in the Organisation

Question 3.3 Methods Used in the Development of Integrated Management Systems in Your organisation

Figure 9 shows that the most method used in the development of IMS in the organisation is PDCA cycle for all business processes, followed by business process mapping, analysing the common elements and developing their own model. Risk mapping method is only 59% and the lowest compared to other method. As the survey was conducted prior to the release of the ISO 9001:2015 QMS and ISO 14001:2015 standards (which emphasise on risk), it is obvious that risk is not being considered extensively then, and contributes to the reason why risk mapping is the lowest as compared to other approaches.

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

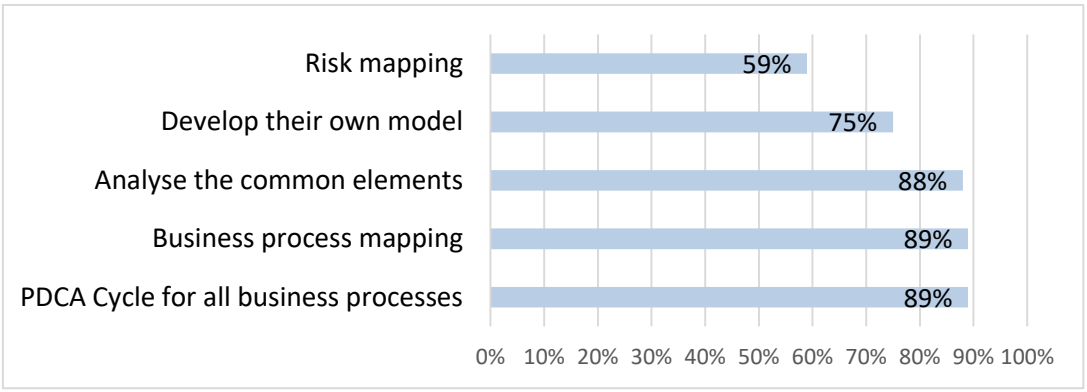


Figure 9 Methods Used in the Development of IMSs in the Organisation

Question 4 Documentation Strategy of Integrated Management System in Your Organisation

Question 4.1 Type of Management System Documents and Its Degree of Integration

Figure 10 shows that for the highest level of documentation in the Management System documentation hierarchy such as Company Policy, Company Objectives and Company Manual, it is clearly noted that full integration with QMS, EMS and OHSMS is higher than partial integration. However, for Management System procedures which is the second level hierarchy of the Management System documentation, the partial integration is higher than fully integration. A similar case is noted for the next tier of Management System documentation hierarchy such as Project Management Plans, Work Instructions, Process Maps and Forms. Full integration of the Management System means the QMS, EMS and OHSMS elements are integrated into one document whilst partial integration means that not all of their elements are integrated into one document. It is clearly noted from Figure 4.9 below that as the Management System document goes down its hierarchy, the full integration of the documents decreases but partial integration of the documents increases. The result shows however all Management System documents have a higher percentage of being integrated, either fully or partially as compared to non-integration.

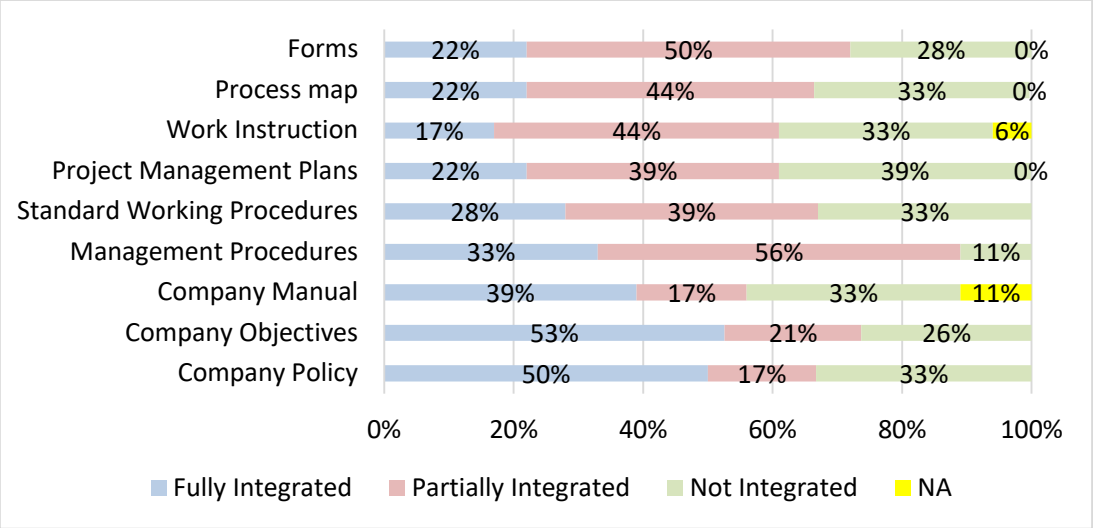


Figure 10 Degree of Integration on the Type of Management System Documents

Question 4.2 Management System Procedures at Company or Corporate Level and Its Degree of Integration

When looking at the degree of integration of the Management System procedures at Company and Corporate level, it clearly shows the common elements of the QMS. EMS and OHSMS are fully integrated in the Management Systems procedures such as management review, internal audits. control of nonconformities, corrective actions, preventive actions, document control, records control, operational control and compliance and evaluation procedures. Other procedures at Company level such as departmental specific procedures are mostly partially integrated as expected since the processes at Corporate level are led by QMS and supported by EMS due to document Management System requirements. However, the most unexpected result is when training and competency management shows a higher percentage of partial integration (61%) as compared to fully integrated (11%) even though the training and competency requirements are stated in all QMS, EMS and OSHMS. This means the training and competency management procedures should be fully integrated. Overall, the results consistently show that all Management System procedures have higher elements of integration either fully or partially as compared to non-integration. The details of which management procedures are fully and partially integrated at Company level are detailed in Figure 11.

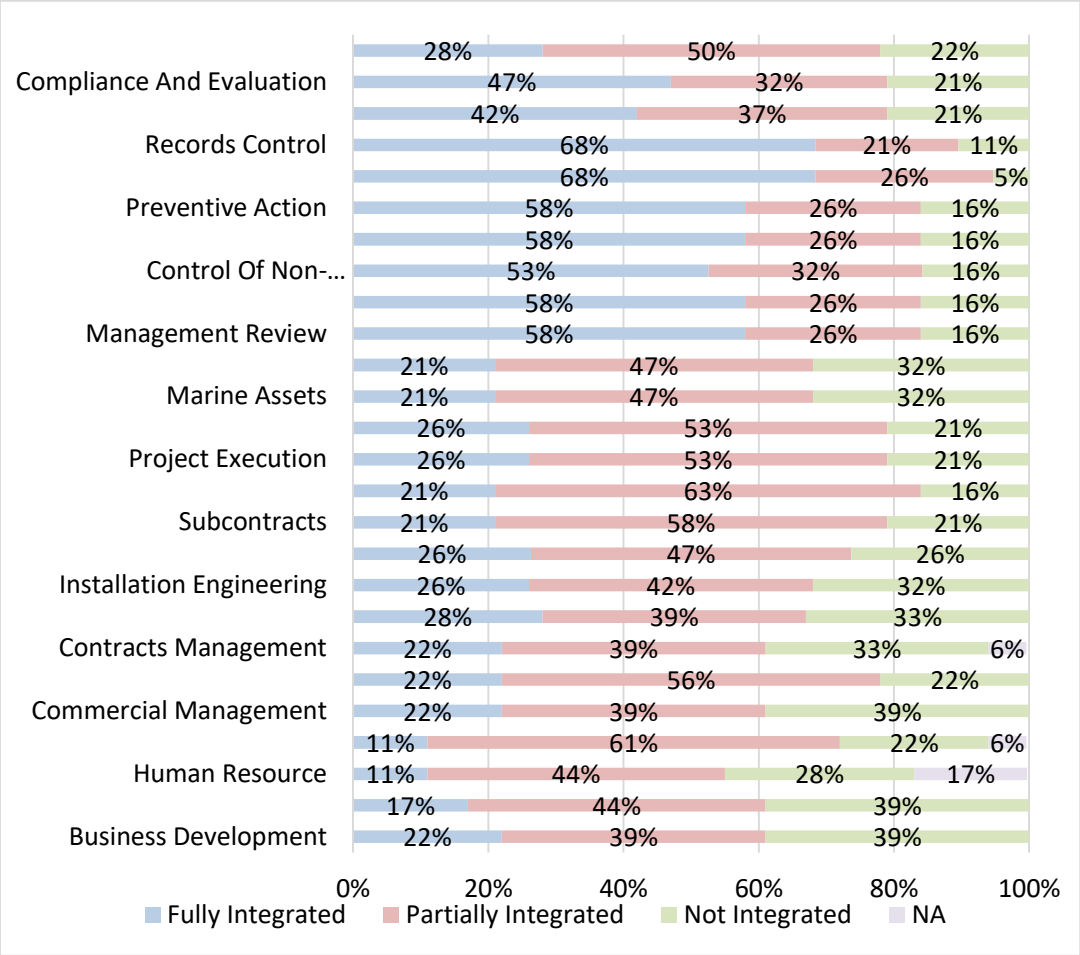


Figure 11 Degree of IMS Procedures at Company or Corporate level

Question 4.3 Project Plans/Procedures Developed at Project Level and Its Degree of Integration

When looking at the degree of integration of the Management System documentation at project level, it is clearly shown that the project plans/procedures developed are mostly partially integrated (86%). This is in line with most Clients' requirements that combine the HSE (Health, Safety and Environment) requirements and separate the Quality requirements in the contracts. The project materials management and logistics management are slightly higher in percentage of non-integration (37%) as compared to partial integration (32%). This is due the fact that materials management and logistics management are mostly covered under QMS procedures and less likely in EMS and OSHMS procedures. The most unexpected

result is the document control plan/procedures which shows the same percentage on full and partial integration despite its requirements in all QMS, EMS and OSHMS standards. Overall, the results consistently show that all Management System procedures have higher elements of integration either fully or partially as compared to non-integration as shown in Figure 12.

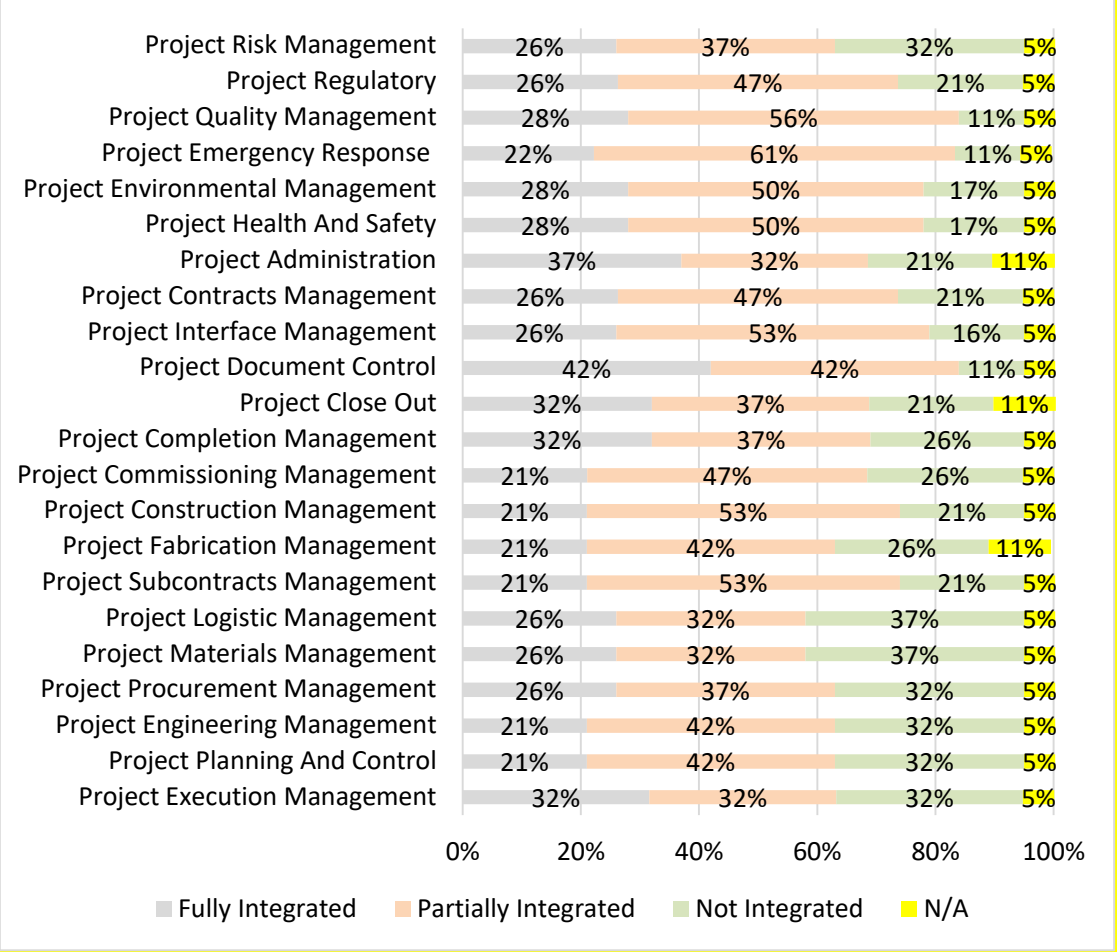


Figure 12 Degree of Integration of Project Plans/Procedures developed at Project Level

When looking at the degree of integration of the Management System on the core functions, it is clearly shown in Figure 13 below that all core functions have higher percentage of partial integration except commissioning management function. The results show that the core functions cover higher elements of integration on the Management System either fully or partially as compared to non-integration.

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

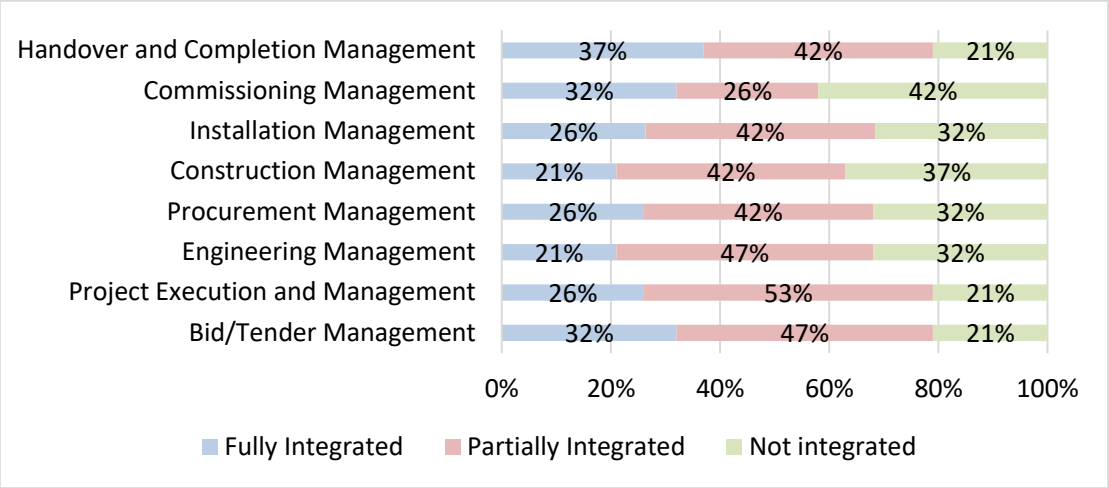


Figure 13 Degree of IMS on the Core Functions

As for support functions such as vessel management, risk management, internal audit, management review, document management and records management, they have a higher percentage of full integration on the Management System as shown in Figure 14. This is in line with the fact that their functions relate to the requirements in the elements of the QMS, EMS and OSHMS standards. The Operations management and training and competency management functions have higher partial integration as compared to full integration, which is unexpected as these elements are stated in the QMS, EMS and OSHMS standards. This may be due to the respondents' organisations' understanding that the operations management and training and competency management functions are emphasised more in OSHMS and EMS standards compared to QMS standard.

Similarly, the resource management, contracts management and commercial management functions show a higher percentage on non-integration on the Management System as the respondents' organisations understanding was emphasised more in QMS standard only. The results show that the response on degree of integration on the Management System on the core and support functions within the organisation relate to the respondents' understanding on the relationship between the functions and the elements of the QMS, EMS and OSHMS standards.

In summary, these results will not be taken into consideration as further study is required.

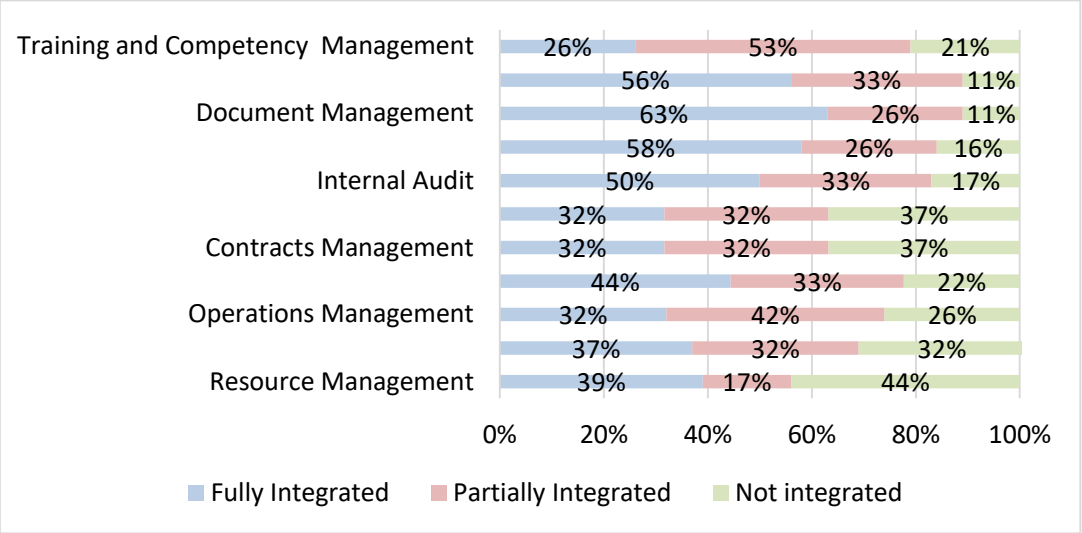


Figure 14 Degree of Integration on the Management Systems on the Support Functions

Question 5 Degree of Integration in the Implementation of Management Systems

In order to get an understanding on the degree of integration at strategic, tactical and operational levels, the questionnaire was split with objectives on a common understanding of what should be the level of integration at these levels.

Table 1 defines the strategic level, its responsible party and documentations.

Table 1 Strategic Level, Its Responsible Party and Documentations

Level	Responsible Party	Documentation
Strategic level	Senior Management	Policies, Objectives, Strategic Plans
Tactical Level	Middle Management	Management Procedures
Operational Level	Junior Management	Work Instructions, Working Procedures and Day-to-day works

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

When asked about their understanding on the degree of integration in the implementation of the Management System at strategic level, 75% agreed that full integration on the organisational objectives relate to effective management of stakeholder requirements in terms of Quality, Environment, Safety as shown in Figure 15. 75% also agreed for full integration on the organisational business plans to achieve the stated Quality, Environment and Safety goals and objectives. However, there was split opinion (50% agree-50% disagree) on an integrated policy for Quality, Environment and Safety, as a few companies have separate policies for each HSEQ.

The reason was obtained during the interview session with the VP HSSEQ who explained that the top management prefers to have separate HSEQ policies for easy reference. It was a choice of the organisation since these HSEQ policies were streamlined to each other through their elements. Hence, the document may not be seen integrated on papers, but their elements are set in an integrated approach as they relate to each other.

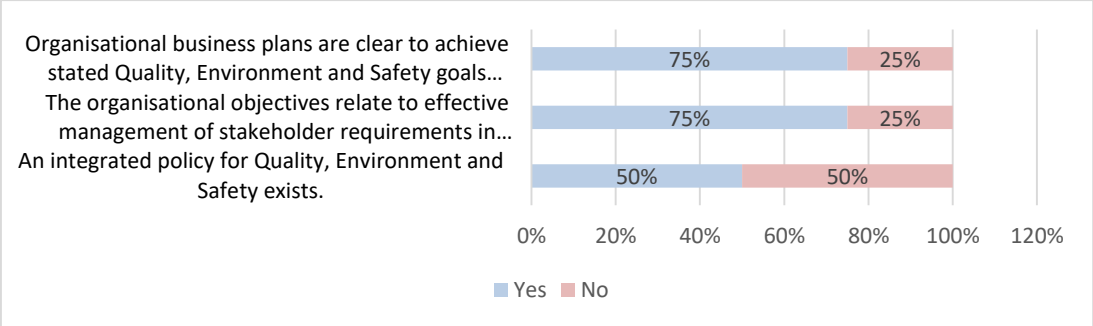


Figure 15 Strategic Level - Full Integration

The earlier statement aligns with the results for partial integration of Management System at strategic level as shown in Figure 16, where 63% agreed that Organisational Quality, Environment and Safety policy, objectives, and plans are mutually aligned to some degree.

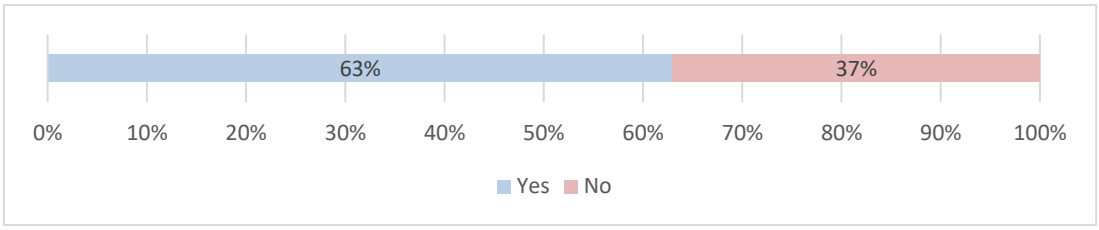


Figure 16 Strategic Level - Partial Integration

For no integration of Management System at strategic level, 70% agreed that it means the organisation has Quality, Environment and Safety policies, objectives, and plans, which are neither aligned to each other nor to the operations as shown in Figure 17.

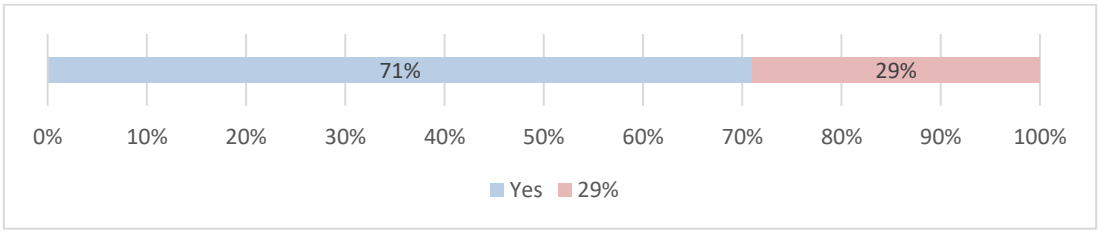


Figure 17 Strategic Level - No Integration

For full integration of Management System at tactical level, majority agreed that managers should have combined duties for quality, environment and safety functions (88%). Most of the time the managers from various functions interact, collaborate, and arrive at mutually acceptable outcomes (75%). Managers emphasise the requirement of integrated operations, documentation, records, and overall working in their directions, training, and other formal/informal means of communication and implementation (63%). Integrated audits are carried out (63%). However, the managers disagreed for the company to develop Integrated Management Manual and Procedures at tactical level for full integration of Management System implementation as shown in Figure 18.

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

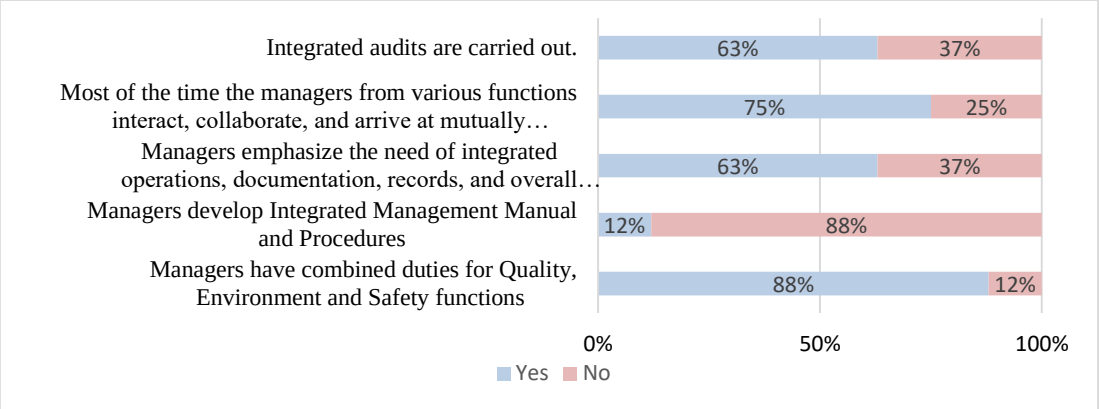


Figure 18 Tactical Level -Full Integration

Figure 19 shows that for partial integration of Management System implementation at tactical level, most of them agreed that managers are primarily concerned with getting their specific job done (88%), performance evaluation is based on getting their specific job done rather than integrated functioning (88%), only sometimes do managers interact, collaborate, and arrive at mutually acceptable outcomes (75%), audits are partially integrated for some common functions such as Document Control (75%), managers have combined responsibilities to some extent such as in Quality and Environment or Safety and Environment (63%).

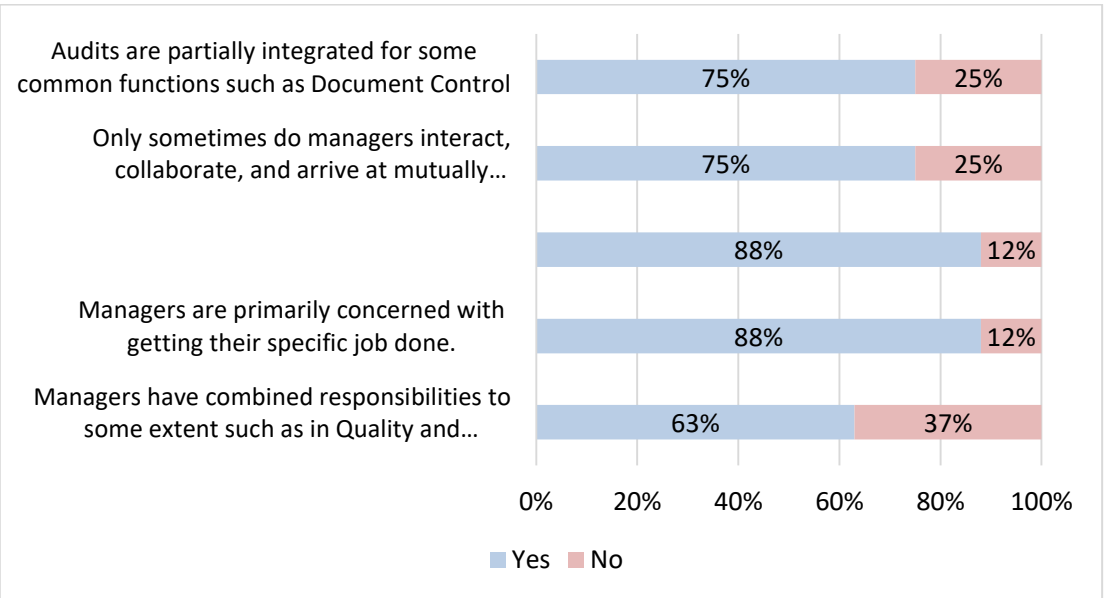


Figure 19 Tactical Level - Partial Integration

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

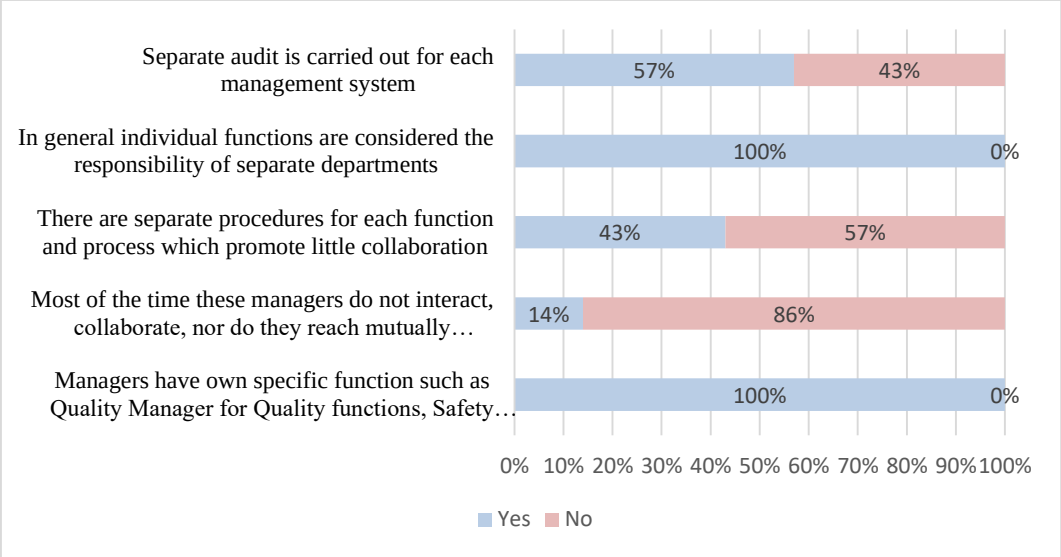


Figure 20 Tactical Level - No Integration

Figure 20 shows that for no integration of Management System implementation at tactical level, most respondents agreed that managers have their own specific functions such as Quality Manager for quality functions, Safety Manager for safety function (100%). In general, individual functions are considered the responsibility of separate departments (100%), and a separate audit is carried out for each Management System (57%).

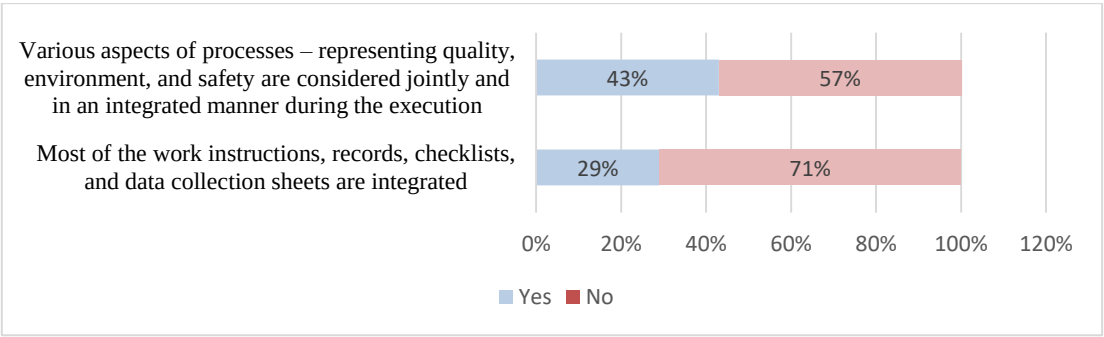


Figure 21 Operational Level - Full Integration

Figure 21 shows that for a full integration of Management System implementation at operational level, a majority disagreed that most of the work instructions, records, checklists, and data collection sheets are integrated (71%),

various aspects of processes – representing quality, environment, and safety are considered jointly and in an integrated manner during the execution (57%).

Figure 22 shows that for partial integration of the Management System implementation at operational level, there was a split opinion on some of the work instructions, records, checklists, and data collection sheets which are integrated and the execution of operational processes considers relevant stakeholder requirements in a partially integrated manner.

For no integration at operational level, 71% agreed with separate records, work instructions, checklists, and data collection sheets for various Management Systems or various aspects of processes. The Company however disagreed for no integration among various aspects of processes.

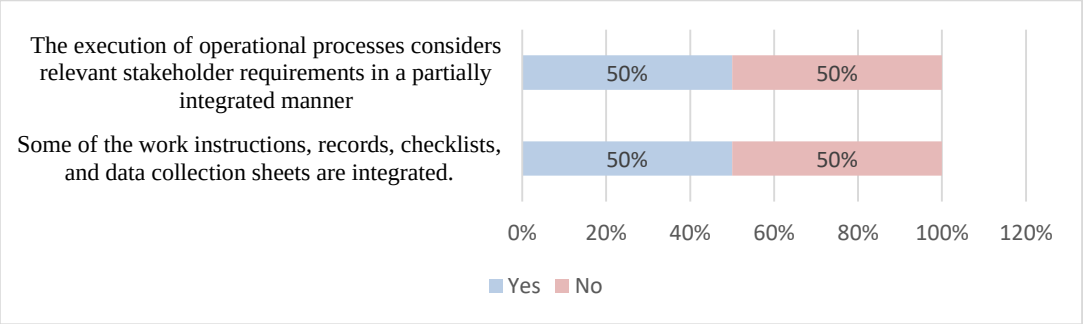


Figure 22 Operational Level - Partial Integration

Question 6 Barriers in the Integrated Management System

Table 2 shows that the top three barriers in the development and implementation of the IMS are due to lack of internal communication (74%), lack of expertise within the organisation (69%) and lack of department collaboration (69%). It follows closely by lack of specialist consultants (68%), lack of employee motivation (68%) and lack of model methodology availability for references (68%).

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

Table 2 Top 10 Barriers in the IMS

No	Barriers	Responses
1	Lack of internal communication	74%
2	Lack of expertise within the organisation	69%
3	Lack of department collaboration	69%
4	Lack of specialised consultants	68%
5	Lack of employee motivation	68%
6	Lack of model and methodology availability for references	68%
7	Lack of strategic planning	63%
8	Lack of information and knowledge	63%
9	Lack of support from everyone in the organisation	63%
10	Insufficient resources	58%

The respondents agreed as shown in Table 3 that the top three non-barriers in the development and implementation of the IMS are inadequate financial support (61%), differences in the requirements of the common elements of the standards (58%) and high cost of integration (56%). This shows that more than half agreed that money is not the main barrier in the development and implementation of the IMS. Other non-barriers as listed in Table 3 have become barriers since their percentage is lower than 50%.

The differences in the models for implemented standards, immaturity of the individual Management System, increase in bureaucracy due to intertwining processes, and reduced flexibility after integration are linked to the lack of experts within the organisation (categorised above as barrier). Hence it is important to understand the inter-relationship between the barriers and non-barriers in the development and implementation of the IMS.

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

Table 3 Non-Barriers in the development and implementation of IMS Summary

No	Non-Barriers during development and implementation of IMS	Responses
1	Inadequate financial support	61%
2	Differences in the requirements of the common elements of the standards such as internal audit, operational control	58%
3	High cost for integration	56%
4	Differences in models for implemented standards such as PDCA, process management, risk management	47%
5	Individual Management System is not matured yet	42%
6	Increase in bureaucracy due to intertwining processes	42%
7	Reduced flexibility after integration	41%

Question 7 Benefits of the Integrated Management System

The top five benefits that their organisations have obtained after implementing the IMS increase employee knowledge and competency (95%), have multifunctional auditors (94%), improve the organisation's image (94%), reduce audit frequency (94%), increase effective strategic planning (90%) and increase efficiency in terms of cost and time (90%).

Table 4 shows other benefits. The high percentage obtained in most of the criteria reflects that IMS gives more benefits to the organisation.

Table 4 Benefits of the IMS

No	Benefits	Responses
1	Increase the employee knowledge and competency	95%
2	Multifunctional auditors	94%
3	Improve the organisation's image	94%
4	Reduction of audit frequency	94%
5a	Effective strategic planning	90%

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

Table 5 Benefits of the IMS (Continue)

No	Benefits	Responses
5b	Increase efficiency in terms of cost and time	90%
7	Less procedures and paperwork	89%
8	Better internal and external audit results	89%
9	Better process work flow	89%
10	Have better understanding of the system and its application	83%
11	Better acceptance and understanding	83%
12	Easier to manage system	83%
13	Better management decision derived from a more integrated and global/holistic view of the organisation and its process	83%
14	Better resource utilisation	83%
15	Employee motivation increase	83%
16	Better communication between employee	78%
17	Simplification of documentation and paperwork	78%
18	Cost savings and reduction	74%
19	Eliminate departmental barrier	72%

Question 8 Future Direction of Integrated Management System

The future direction of the IMS depends on the organisation's direction, top management commitment and employee commitment and support. It is clearly shown that the direction of the organisation and commitment of the top management are important, however, if the employment commitment and support do not exist, the IMS will not be able to be properly implemented and will result in its failure, thus may affect the future direction of the IMS. Hence, it can be summarised that the future direction of the IMS is the combined efforts from both the top management and employees. Table 6 lists the factors for the future direction based on the highest to lowest received responses.

Appendix V Detailed Analysis of Phase 1 Exploratory Survey (Continue)

Table 6 Future Direction of IMS

No	Factors	Response
1	Organisation direction	74%
2	Top management commitment	68%
3	Employee commitment and support	68%
4	The availability of IMS standard	63%
5	Provide more awareness and training on IMS to increase maturity of its implementation	58%
6	Availability of internal experts within the organisation	58%
7	Performance level of integration	58%
8	Evidence and proof of cost reduction	53%
9	Availability of external experts in the IMS	53%
10	Availability of applicable and practical model	53%
11	Develop more practical integrated approaches suitable for the organisation	53%
12	Improve by using improvement models available in the market such as Business Excellence Model, Risk Management Model	47%
13	Have support from ISO and other regulatory bodies	47%
14	Lesser audit frequency	42%
15	Stakeholders such as the Client's acceptance on the integration concept	37%
16	Integrate new Management System standards such as corporate responsibility and energy management	32%

Appendix W Proposed IMS Framework Presented During One-on-One and Focus Group Interviews

Refer to the next pages.

(Page 1 of 8 to Page 8 of 8)

Appendix X Summary of Opinions from Responded Informants on Part 1 of Open-Ended Questions Sent to them Prior to Interviews

Questions	Mohd Khalil Yakub Corporate Risk Manager	Razali Zainal Abidin Senior Quality Engineer	Yadi Kusmayadi Project HSE Manager
Do you agree with the conclusions on the survey analysis findings?	Yes, agree with most of the conclusions	Yes, 95% agreed	Yes, agree → however the implementation of IMS by the oil and gas contractors depend on the organisation's direction and market demands, the implementation of IMS will be efficient IF there is alignment with the COMPANY (Client)'s expectations on the implementation of the Management System. Most of the contractors for the HSE Management System are project driven, as such the bridging document will always be as a directive during project execution.
Which of the survey findings (in your opinion) had an unexpected outcome?	Tactical level vs Degree of Integration - Favour for combined managerial duties/function. Unexpected outcomes since Q and HSE need different/specialists. Skill sets, experiences, and trainings also differ between these skilled personnel.	Disagree at Project Plans/Procedures developed at project level vs degree of integration. Project logistic and material management should consider the partial integration instead of having a higher % in non-integration. These departments are to consider HSE requirements e.g. lifting, dropping of items, storage, and accident possibilities etc as the integration factors.	*A third of the organisation has developed and implemented the Integrated Management System*. I assume that the organisation has a fully integrated management System and only 1 (one) ISO certification issued to cover 3 standards, this is a good benchmark to demonstrate that the efficiency of compliance to the 3 standards is obvious. *It is surprising that IMS is not part of the Organisation's Strategic Planning*, it seems that the compliance of the 3 standards or IMS is just the organisation's "cover" to the compliance process, instead of an implementation and continual improvement of the compliance. It is deemed that the System is not an integral part of the organisation's culture.
Risk is the least method used in the development of integrated QHSE Management System. In your opinion, what is	Lack of exposure, training and awareness.	People's understanding that the risk method was implemented at Company Strategic level only. The risk method is usually used by the management to prepare the business plan and during	*From my point of practicality, the risk of Integrated Management System is "the level" of acceptance from CLIENT and Market demand, as most companies do not implement the IMS in their organisation, IN FACT the IMS will minimise risks of organisation through a structured and globally recognised Management System methodology. The development of an integrated QHSE Management* →

Appendix X Summary of Opinions from Responded Informants on Part 1 of Open-Ended Questions Sent to them Prior to Interviews (Continue)

Questions	Mohd Khalil Yakub Corporate Risk Manager	Razali Zainal Abidin Senior Quality Engineer	Yadi Kusmayadi Project HSE Manager
the reason for this?		tender bidding stage, i.e. a go or no go.	*To eliminate inefficiencies and duplication and simultaneously meeting the requirements of multiple Management System standards that puts a significant strain on an organisation's resources. Instead of streamlining processes and resources, this creates unnecessary duplications of effort and budget allocation. Therefore, the balance achievement of Management System standards against the resources required to gain certification (One Certification to cover 3 - 5 standards), Integrated Management Systems (IMS) certification is a holistic approach that combines multiple aspects of an organisation's performance in order to meet the requirements of several Management System standards. These include standards such as ISO 9001 (quality management), ISO 14001 (environmental management), OHSAS 18001 (occupational health and safety), ISO 27001 (Information Security) and ISO 50001 (energy management).* *An IMS increases efficiencies through the use of simplified processes and documentation, thereby eliminating the elemental approach, lowering effort duplication, improving system performance and reducing costs.*
Do you agree that the survey outcome is a useful reference to develop the Integrated Quality and HSE Management System?	Yes. Management Systems Documents vs Degree of Integration - To determine the level of integration (for the development of IMS)	Yes. All the survey outcomes are useful	*Yes, agree. If the organisation embarks & commences to implement the IMS certification, this means that the certification for multiple Management System standards is usually evaluated in a single, comprehensive audit. Organisations will spend less time preparing for audits and responding to their findings, significantly reducing the overall investment of time and money.*

Appendix Y Summary of Opinions by the Responded Informants from Part 2 of the Open-Ended Questions Sent to them Prior to the Interviews

<table>
<tr><th colspan="2">Organisation #3</th><th colspan="2">Organisation #1</th></tr>
<tr><th>Yeo Cheng Kwan
Asset HSEQ Manager</th><th>Yadi Kusmayadi
Project HSE Manager</th><th>Mohd Khalil Yakub
Corporate Risk Manager</th><th>Razali Zainal Abidin
Senior Quality Engineer</th></tr>
<tr><td colspan="4">Integration of Health, Safety and Environment (HSE) Management System are obviously being implemented at all projects</td></tr>
<tr><td>It is possible to have a fully integrated Quality and HSE Management System at projects particularly if the company is strong enough to convince the Client that the Company has a robust integrated QHSE system.</td><td colspan="3">It is impossible to have a fully integrated Quality & HSE Management Systems at projects but more of partial integration because there has always been separate Quality and HSE Management Systems at project level as the Project QHSE contractual requirements are mostly separated between Quality & HSE sections within the contracts issued by Client</td></tr>
<tr><td>Prefer full integration</td><td>Some of the elements can be been fully integrated such as management review, risk management, incident/injury investigation, internal audits, control of non-conformities, corrective actions, preventive actions, document control, records control, operational control, compliance and evaluation but other procedures are mainly partially integrated.</td><td>Partial integration is preferable since there are elements of HSE that need to be more focused.

Hence preferable to have a combined full and partial integration for a more meaningful and practicable IMS which is aligned with the Senior Quality Engineer’s opinion.</td><td>Full integration on support function areas such as company policy, objective, vision & mission and support department, document control procedure, quality assurance, audit, human resource forms, training and partial integration on core function areas such as project procedures, construction, engineering, bidding and others.</td></tr>
</table>

Appendix Y Summary of Opinions by the Responded Informants from Part 2 of the Open-Ended Questions Sent to them Prior to the Interviews (Continue)

<table>
<tr><th colspan="2">Organisation #3</th><th colspan="2">Organisation #1</th></tr>
<tr><th>Yeo Cheng Kwan
Asset HSEQ Manager</th><th>Yadi Kusmayadi
Project HSE Manager</th><th>Mohd Khalil Yakub
Corporate Risk Manager</th><th>Razali Zainal Abidin
Senior Quality Engineer</th></tr>
<tr><td colspan="2">It is better to have full Integration with one Management System and covers all elements to avoid duplication, efficiency control & evaluation and save costs</td><td></td><td>Partial integration on core function areas such as project procedures, construction, engineering, bidding and others.</td></tr>
<tr><td>Prefer full integration</td><td colspan="2">Agreed with separated but aligned Quality and HSE Management Systems with full integration on some processes such as document control, management review, review of needs and expectations of the interested parties, context etc.</td><td>Discussions should be held in specific amongst these three (3) functions i.e. Quality, Safety and Environment to identify what procedures can be fully integrated; for example, the supporting function and partial integration on the Core function procedures.</td></tr>
<tr><td></td><td>It is practical to integrate common elements of the Quality and HSE Management Systems.</td><td></td><td></td></tr>
</table>

Appendix Z Contract Review – Samples of Input

5.3 APPENDIX 3 LIST OF APPLICABLE REGULATIONS, CODES AND STANDARDS AND SPECIFICATIONS

2.1 AMERICAN BUREAU OF SHIPPING (ABS)

ABS Rules for Building and Classing Facilities on Offshore Installation (FOI)
ABS Rules for Building and Classing Floating Production Installations (FPI)
ABS Rules for Building and Classing Mobile Offshore Drilling Units (MODU)
ABS Rules for Building and Classing Steel Vessels (SVR)
ABS Guide for Buckling and Ultimate Strength Assessment of Offshore Structures
ABS Guide for the Fatigue Assessment of Offshore Structures, 2003
ABS Guidance Notes on Fire Fighting System (2015)
ABS Guidance notes on The Application of Fibre Rope for Offshore Mooring Aug 2011 (updated March 2012)

2.2 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z358.1	Emergency Eyewash and Shower Equipment
ANSI/ISA S5.1	Instrumentation Symbols and Identification

2.3 AMERICAN PETROLEUM INSTITUTE (API)

API 14 C	Analysis, Design, Installation and Testing of Basic Surface Safety Systems for Offshore Production Platforms
API 2030	Application of Fixed Water Spray Systems for Fire Protection on the Petroleum Industry
API 2C	Specification for Offshore Pedestal Mounted Cranes
API 520	Design and Installation of Pressure Relieving System
API 521	Guide for Pressure - Relieving and Depressurizing System
API 554	Process Instrumentation & Control
API 5L	Specification for Line Pipe
API 610	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
API 613	Special Purpose Gear Units for Petroleum, Chemical and Gas Industry Services
API 614	Lubrication, Shaft-Sealing, and Control-Oil Systems and Auxiliaries for Petroleum, Chemical and Gas Industry Services
API 615	Sound Control of Mechanical Equipment for Refinery Service
API 616	Gas Turbines for Petroleum, Chemical, and Gas Industry Services
API 617	Axial, Centrifugal Compressors and Expander-compressors for Petroleum, Chemical and Gas Industry Services
API 618	Reciprocating Compressors for Petroleum, Chemical and Gas Industry Services
API 619	Rotary Type Positive Displacement Compressors for Petroleum Chemical and Gas Industry Service

Appendix AA Master Deliverables Register (MDR) –Sample Evidence for Project Management and Quality Documents

BAB DOCUMENT NUMBER	HESS DOCUMENT NUMBER	BAB DOCUMENT TITLE	DISCIPLINE	DOC TYPE
PROJECT MANAGEMENT				
PMT 1	C1T3	Capacity Curves (for Contractor and each major Subcontractor)	PMT	Deliverable
PMT 2	C1T6	Approved Vendor List	PMT	Deliverable
PMT 3	C2T1	Procurement Plan (preliminary)	PMT	Deliverable
PMT 4	C2T2, C3T7	Local Content Plan	PMT	Deliverable
PMT 5	C2T3	FPSO Charter organisation charts (preliminary) and CVs	PMT	Deliverable
PMT 6	C2T4	Execution schedule	PMT	Deliverable
PMT 7	C2T5	Interface Management Plan	PMT	Deliverable
PMT 8	C2T18	Contractor Corporate Social Responsibility ("CSR") policy and principles	PMT	Deliverable
PMT 9	C3T1	Project Execution Plan	PMT	Deliverable
PMT 10	C3T4	Project Controls Management System	PMT	Deliverable
PMT 11	C3T8	Regulatory Compliance Plan	PMT	Deliverable
PMT 12	C3T9	Level 3 Execution Schedule	PMT	Deliverable
PMT 13	C3T11	Key personnel including organisation charts	PMT	Deliverable
PMT 14	C3T14	Preliminary Master Document Register	PMT	Deliverable
PMT 15	C3T24	Documentation that Contractor has an irrevocable purchase option on the candidate hull valid for the duration of the Pricing Validity Period	PMT	Deliverable
PMT 16	C3T26	Commissioning Procedures (typical)	PMT	Deliverable
PMT 17	C3T27	Handover Requirements (Project to Operations) Report (typical)	PMT	Deliverable
PMT 18	C3T52	Ex Equipment Register (typical)	PMT	Deliverable
PMT 19	C3T59	Agreed major Subcontractor list	PMT	Deliverable
PMT 20	C1T2	EHS Statistics - Major Subcontractors & Contractor personnel	PMT	Deliverable
PMT 21	C2T6	Environmental, Health, and Safety (EHS) Management Plan (preliminary)	PMT	Deliverable
		Feed Engineering Execution Plan	PMT	Deliverable
QA				
11147-BAB-09000-QA-PL-0001	C1T7	Inspection Test Plans (ITPs)	QA	Deliverable
QA 2	C2T9	Quality Management System and most recent audit and certification certificates	QA	Deliverable
QA 3	C2T10	Flange management procedure (typical)	QA	Deliverable
QA 4	C3T10	Project Quality Plan (preliminary)	QA	Deliverable
QA 5	C3T19	Paint supplier and warranty information	QA	Deliverable
QA 6		Feed Engineering Quality Plan	QA	Deliverable
QA 7		QA/QC Requirements for Contractors	QA	Deliverable
QA 8		HSSE Requirements for Contractors	QA	Deliverable
QA 9		Inspection Coordination Procedure	QA	Deliverable
QA 10		Criticality Assessment Procedure	QA	Deliverable
QA 11		Hazardous Area Equipment Strategy	QA	Deliverable
QA 12		Criticality Assessment Report	QA	Deliverable
QA 14		Product Verification Plan	QA	Deliverable

Appendix BB Risk Identification – Sample Evidence for Engineering Scope

Review Execution Plan risks

Engineering

- Basic Engineering in KL and Singapore
  - Supporting LLE orders
  - Competency and experience
  - Technical Safety Compliance / RAM Analysis
  - Quality in Engineering

- Detailed engineering: in house, sub-contract to SCA, in yard scope
  - Resources and office space
  - Competency and experience
  - Availability of personnel in 2018
  - Schedule control
  - Engineering Software

Risk	Consequence	Existing mitigation	Additional mitigation	Responsibility
Difficulty in meeting LC requirements	Quality and Penalties Delay	JV with Cypruss for support of engagement of detailed engineering provider.		
Difficulty to ramp up engineering resource to meet front ended project schedule	Delay in ordering LLI and commencing module fabrication Overall project delay Schedule/Cost/Quality impact	Establish engineering team. Engineering Execution Methodology. Establish engineering organisation. Competent engineering organis.		
Inefficient interface and management of LC engineering	Delay in the yards Cost	Develop LCP Develop Interface Management Plan. Work with JV		
Reliance on yard engineering not familiar with BAB requirements for FPSO design	Poor quality of engineering requiring rework delay	Site Engineering Manager Package Engineers Resources to monitor yard engineering.		
Non compliance to the functional spec/ HESS safety requirements. Delay in delivery of safety studies	NCR / Rework Schedule impact Cost impact / Delay Impact on design delivery	Comply with min safety requirement Comply with safety T&Cs section Comply with func spec Gap analysis with HESS		

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Appendix CC Project Business Process Map – Engineering Process (Applicable for FEED)

No.	Activity / Process	Input(s)	RACI Matrix											Output(s)	Reference Documents / Additional Notes / Remarks
			PM	EM	Discipline Lead Engineer	Discipline Engineer	Interface Engineer	QA/QC	DC	Procurement	Package Engineer	Construction/Commissioning team	Operations	Client / Class.	
1	**Design Planning**			Start											
1.1 1.2 1.3 1.4	Develop Design Execution Plan Develop MDR for Engineering Deliverables Develop Engineering Interfaces Matrix Develop Engineering Verification Plan	a. Functional and performance requirements; b. Information derived from previous similar design and development activities; c. Statutory and regulatory requirements; d. Standards or codes of practice that the organization has committed to implement; e. Potential consequences of failure due to the nature of the products and services. f. Client & contract requirements; g. Class. requirements	A	R	C	C	C	C	I						Engineering quality plan; Engineering execution plan; Engineering KPIs & objectives; Technical specifications; Procedures; Master Deliverable Register; Schedule; Scope of works; Design verification plan; Organization chart. Risk Management; Engineering software;	
2	**Design Input**														
2.1	Identify Design Requirements	As above input in section 1.0		A	R	R									Master Document Register	
3	**Design Interfaces**														
3.1 3.2	Interfaces - Internal Interfaces - External	Interface Management Procedure		A	R	R	R	C	I						Interface Register	BAE-CBGF-INT-ENG-PRO-0003 : Interface Management Procedure
4	**Design Development & Technical Safety Studies**														
4.1 4.2 4.3 4.4 4.5	Develop Design Analysis of Design Generation of Document and Drawing Self Check of Document and Drawing Discipline Internal Review of Document and Drawing	a. Contract requirements; b. Codes and standards; c. Statutory & regulatory requirements; d. FEED documents.			R R	R R R R									Engineering key design documents, i.e: a. Heat & Material Balance (HMB). b. Process Flow Diagram (PFD) and Process and Instrument Diagram (P&IDs). c. Basis of Design (BOD). d. Design Philosophies. e. Equipment List. f. Overall General Arrangement (GA) and Equipment Layout. g. Material selection philosophy & etc	BAE-CBGF-EQP-ENG-PRO-0008 : Engineering Quality Plan BAE-CBGF-TEQ-ENG-PRO-0001 : Technical Queries Procedure BAE-CBGF-EDN-ENG-PRO-0013 : Engineering Document Numbering Procedure; BAE-CBGF-DCP-ENG-PRO-0004 : Design Control Procedure; BAE-CBGF-DIC-ENG-PRO-0006 : Discipline Internal Check (DIC) procedure; BAE-CORP-DCR-DMG-PRO-0002 : Document Control & Electronic Document Management System;
5	**Inter Discipline Check (IDC)**														
5.1 5.2 5.3 5.4	Plan IDC Process Prepare IDC Document Distribution Matrix Perform IDC within the turnaround timeframe Incorporate comments from Design review / verification and re-IDC.	a. Contract requirements; b. Codes and standards; c. Statutory & regulatory requirements; d. FEED documents.		A	C C R A	R R R		C	I						IDC design documents: a. Drawings; b. Technical specification; c. Datasheet; d. Design basis & philosophies; e. Design calculation	BAE-CBGF-EQP-ENG-PRO-0008 : Engineering Quality Plan BAE-CBGF-DCP-ENG-PRO-0004 : Design Control Procedure; BAE-CBGF-IDC-ENG-PRO-0005 : Inter Discipline Check (IDC) Procedure Checklists
6	**Design Review**														
6.1 6.2 6.3 6.4 6.5 6.6	Planning of Design Review Conduct Design Review Issue Design Review Report Follow up Actions Issue Updated Design Review Report Incorporate the Changes to Engineering documents and drawings and re-IDC.	a. Heat & Material Balance (HMB). b. Process Flow Diagram (PFD) and Process and Instrument Diagram (P&IDs). c. Basis of Design (BOD). d. Design Philosophies. e. Equipment List. f. Overall General Arrangement (GA) and Equipment Layout. g. Material selection philosophy & etc		R R A	C C A A	C C R R R R			I			I	I	Design Review report and updated design documents	BAE-CBGF-DVP-ENG-PRO-0014 : Design Verification Plan Procedure BAE-CBGF-IDC-ENG-PRO-0005 : Inter Discipline Check (IDC) Procedure

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Appendix EE Risk Register – Sample Evidence of Output in 5th Stage of IMS Application Approach

Work Activity / Process	External Issues	Internal Issues	Interested Parties		Need & Expectation of Interested Parties	Risk ID	Risk Status	Risk / Opportunity Description	Consequence	Root Cause	Controls in place / Existing Controls (what's currently in place?)
	☐ Political	☑ Organisational	☐ Vendor	☐ Community				[illegible]	Cost	Non available competent FM - ATEX resources and compliant processess, potential onboard re-work	Competent BAB supervisor in each area.
	☐ Technical	☑ Knowledge	☐ Regulator	☐ Director & Management							Vendor selection from AVL.
	☐ Environmental		☐ Financier	☐ Employee							ATEX and flange management procedure compliance will be part of TBE.
	☐ Commercial										
Engineering	☐ Economic	☑ Resources	☑ Client	☑ Partner		HES01-EN	Active	Difficulty in meeting LC requirements	Quality and Penalties Local Resources	Non compliant Vendors - Contractors	JV with Cypruss for support of engagement of detailed engineering provider.
	☐ Political	☑ Organisational	☐ Vendor	☐ Community					Delay	Non compliant Vendors - Contractors	Approved Contractors - Suppliers included in AVL
	☐ Technical	☑ Knowledge	☐ Regulator	☐ Director & Management							
	☐ Environmental		☐ Financier	☐ Employee							
	☐ Commercial										
Engineering	☐ Economic	☑ Resources	☐ Client	☐ Partner		HES01-EN	Active	Delay in Vendor AFC drg's	Delay in Schedule and Hand Over to Ops	Lack of Package Engineer resources	Established Package Engineering Team
	☐ Political	☑ Organisational	☑ Vendor	☐ Community						Failure for Vendors to deliver as per PO	Expediting and Timely approval of deliverables
	☐ Technical	☐ Knowledge	☐ Regulator	☐ Director & Management							
	☐ Environmental		☐ Financier	☐ Employee							
	☐ Commercial										

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2. Abdul Kadir, S. Sarip, S. Conroy, N. H. Nik Mahmood and M. Y. Md Daud, IMS: An insight and experience of the Oil and Gas Companies, HCKM – 1st International Conference on Human Resource and Knowledge Management By UTM, 4 Dec 2013, MALAYSIA

3. Abdul Kadir, S. Sarip, N. H. Nik Mahmood, S. Mohd Yusof, M. Z. Hassan, M. Y. Md. Daud and S. Abdul Aziz, A Review of IMS in the Offshore Oil and Gas Industry, Journal of Advanced Review on Scientific Research, ISSN (online): 2289-7887 | Vol. 12, No.1. Pages 11-25, 2015, MALAYSIA