



**PRIFYSGOL CYMRU
THE UNIVERSITY OF WALES**

**THE DEVELOPMENT OF AN INDIVIDUAL
COMPETENCE ASSURANCE FRAMEWORK AT A
MAJOR HAZARDOUS INSTALLATION**

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Thesis submitted to Cardiff School of Management in partial
fulfillment of the requirements for the degree of Doctor of Business
Administration.

28th May 2010

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Declaration

I declare that this work has not been previously accepted in substance for any degree and is not being concurrently submitted for any other degree.

I further declare that this thesis is the result of my own independent work and investigation, except where otherwise stated (a bibliography is appended).

Finally, I hereby give consent for my thesis, if accepted, to be available for photography and inter-library loan, and for the title and abstract to be made available to outside organisations.

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Professor Eleri Jones (Supervisor)

Dedication

This thesis is dedicated to my late Mother and Father, who inspired me with their exceptionally hard-working approach to life in general, but above all else, provided me with a loving and supporting environment, in order that I could excel to the full.

In addition, I would like to pay tribute to the late Professor Jon Clark, a truly inspirational and immense character, who initially guided me with his wisdom when I set off on the academic path in 1990. I felt that Jon was watching over me as I wrote each chapter.

Acknowledgements

I would like to express my sincere thanks and deep gratitude to Professor Eleri Jones and Professor David Brooksbank for their patience and unstinting help in supporting and guiding me through the process of producing a Professional Doctorate. They are both, without a shadow of doubt, exceptional Research Supervisors.

I had an inspiring time in Cardiff School of Management and leaving has left a huge void in my life, perhaps one day I may be able to return reincarnated.

I would like to say a special thank you to my Wife, two Sons and now a Grandson who provide the love and support necessary in order to undertake academic research. I promise not to embark on any more academic courses.

Abstract

In 2004 Alpha Hydrocarbon decided to build a new hydrocarbon processing plant at a Greenfield site within the United Kingdom (UK). Given that large quantities of hydrocarbon would be stored and processed by the plant, it was deemed a major hazardous installation, as defined by the Control of Major Accident Hazard Regulations 1999 (COMAH), as amended. One of the key requirements of this COMAH legislation is individual competence assurance. In 2006 it was noted by the Alpha Hydrocarbon senior management team that the development and implementation of the Competence Assurance Framework (ICAF), for all operations-based personnel, had not been executed for some unknown reason. It was evident that Alpha Hydrocarbon needed to embark on a process of planned organisation change, and the Researcher was recruited in the capacity of Management Consultant, in order to develop and implement an ICAF. A pragmatic research philosophy was adopted, this allowed for the use of knowledge to be utilized as a tool for action and change. In order to underpin this pragmatic philosophy I decided on an action research methodology, in order to achieve the desired change agenda within Alpha Hydrocarbon. This action research methodology is imbedded within the thesis structure. Drawing on the wider academic and practitioner literature the thesis examines the development and implementation of the ICAF. From an analysis of relevant literature a model was developed, which encompassed all aspects of individual competence assurance. In order to ensure the ultimate success of the ICAF it was necessary to develop and implement a wide range of learning and development interventions that in essence would underpin and support the developed ICAF. The implementation strategy focused on successfully achieving the desired change agenda in a structured, systematic and measured manner. Finally an evaluation methodology was developed and this was applied to both the development and implementation of the ICAF. The key output was to determine whether operational-based personnel had the correct degree of competence (skills, knowledge, attitude, behaviour), in order to operate a hydrocarbon processing plant facility safely, effectively and efficiently. The developed ICAF is of sufficient generalisability that it could be implemented within industry and commerce alike.

Glossary of Acronyms

ACoP	Approved Code of Practice
BSI	British Standards Institute
CIMAH	Control of Industrial Major Accident Hazard Regulations
CIPD	Chartered Institute of Personnel and Development
CMS	Competence Management System
COMAH	Control of Major Accident Hazards Regulations
DBA	Doctor of Business Administration
EC	European Commission
EEC	European Economic Community
EO	Examination of Outcomes
EU	European Union
FMEA	Failure Modes and Effects Analysis
FT	Formal Tests
HAZOP	Hazard and Operability Study
HR	Human Resources
HSE	Health and Safety Executive
HSWA	Health and Safety at Work etc Act 1974
HTA	Hierarchical Task Analysis
ICAF	Individual Competence Assurance Framework
IOSH	Institution of Occupational Safety and Health
MAH	Major Accident Hazards
MAPP	Major Accident Prevention Policy
MHSWR	Management of Health and Safety at Work Regulations 1999
MPhil	Master of Philosophy
MSc	Master of Science
NVQ	National Vocational Qualification
O	Observation
PA	Projects and Assignments
PD	Professional Discussion
PE	Photographic Evidence
PPE	Personal Protective Equipment
Q	Questioning
S	Simulation
SMART	Specific, Measurable, Achievable, Realistic and Time-bound
UK	United Kingdom
USA	United States of America
UWIC	University of Wales Institute Cardiff
VQ	Vocational Qualification
WE	Written Evidence
WS	Witness Statement

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Chapter One:

Introduction

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Chapter One:

Introduction

1.0 Background to Research

In order to meet the shortfall caused by the dwindling hydrocarbon supplies, a major change programme has been initiated within the United Kingdom (UK). One of these initiatives, Alpha Hydrocarbon (not the real name), is an organisation which has undertaken an ambitious project, in order to receive enough hydrocarbon to provide the UK, with around 20 per cent of its total output requirements. The hydrocarbon product will then be made available to the wider UK consumer market.

According to their personnel handbook, Alpha Hydrocarbon is committed to high health, safety and environmental standards and consequently they have insisted on high levels of protection by using state-of-the-art technology and stringent safety procedures. The organisation believes that it is vital that the company maintains high levels of health and safety standards - therefore staff attend regular training courses so that they are conversant with the latest technology/practices.

The company acknowledges that aspects of health, safety and environment management can always be improved, and has a policy of visiting other plants so that best practice and safety developments can be shared. Alpha Hydrocarbon provides for ongoing competence of its workforce through

assessment and training, selecting training providers on occupational competence and their recognised awarding bodies accreditation, randomly auditing the training to ensure consistency of delivery, achieved learning outcomes and quality assurance, ensuring the workforce is competent in all aspects of health, safety and the environment, maintaining a competent workforce and motivating staff through teamwork to achieve excellence.

In 2004, two people were recruited to coordinate all of the learning and development activities throughout the company; particular emphasis placed on the topic of individual competence assurance. The main reason for this was that significant quantities of hydrocarbon would be stored and distributed by the terminal installation. Consequently, the facility falls into the category of a major hazard industry, and is therefore covered by the requirements of Control of Major Accident Hazards Regulations (*COMAH, 1999; COMAH, 2005*), legislation introduced via the UK parliament and policed by the Health and Safety Executive (HSE). By the last quarter of 2006, it came to light that the task of developing an Individual Competence Assurance Framework (ICAF) had not been addressed for some unexplained reason. As a direct result of pressure exerted by the operations department because of the failure to execute the ICAF early on in the project, the two individuals concerned were asked to leave Alpha Hydrocarbon.

A meeting was convened between the Operations Director and Managing Director in order that a new course of action could be determined. As a direct result of this meeting it was decided that the two individuals would be replaced by an external

freelance consultant. The post was subsequently advertised through a national recruitment agency. In January 2007, I was contacted by the national recruitment consultancy to enquire if I was interested in the consultancy role. At first glance it appeared to be an interesting and challenging opportunity and one that might lend itself to be the focus of a Professional Doctorate project. I was asked to attend an interview with the Alpha Hydrocarbon senior management team in February 2007, where the scope of the consultancy advice required was explained. The senior team were insistent on recruiting a consultant with the following skill set, COMAH experience, a Master of Science (MSc) degree and above, corporate memberships of health and safety and learning and development institutions together with a proven track record of consultancy activities.

I was fortunate, in so much that I fitted the skill set requirements exactly, and was offered the consultancy role. During my initial assessment of what needed to be done, I found that the task of developing and implementing an ICAF, underpinned by learning and development interventions, had not been completed, not even in part. Before being able to put forward a change management solution, it was first necessary to identify the extent of the problem at Alpha Hydrocarbon. I decided that the best approach would be to first, identify and analyse any documentary sources of evidence that had been left behind by the two previous incumbents of the training role. Second, undertake a series of meetings with the Operations Director and his direct reports, in order to ascertain their perceptions of the learning and development function and to evaluate the outputs from the said function.

Preliminary findings from the analysis of the documentary evidence proved to be less fruitful than anticipated. A document entitled *Learning and Development Strategy*, proved to be nothing more than an *ad hoc* list of some training events that had previously been organised. In addition, an area on the computer, with a folder marked ‘competencies’, once again, proved to be nothing more than some general headings such as hydrocarbon risks, operating risks, etc. In essence it could not be deemed an ICAF that would be acceptable to the HSE.

The Operations Director’s perception of the learning and development function was one of being function- orientated, as opposed to being customer-orientated. By this they inferred that the learning and development function had not provided an adequate service to an internal customer, i.e. the operations department. In addition, the outputs from the learning and development function had fallen below the expectations of Managing Director and other departmental heads I spoke to at length. Clearly, the initial findings highlighted beyond question the need for organisational change at Alpha Hydrocarbon, in particular, the urgent requirement to develop and implement an ICAF, relating to the handling and processing of hydrocarbon, together with the development of learning and development initiatives to underpin the framework.

1.1 My Background

My background encompasses 38 years within engineering, training and health and safety, with particular emphasis on high-risk industries. Within the academic

arena I had completed a Master of Science (MSc) degree at the University of Southampton in 1993, and a Master of Philosophy (MPhil) degree at Aston University in 2001. I had published widely in the areas of risk management. These include two papers in the Institute of Occupational Safety and Health (IOSH) (*Raafat & Nicholas, 1999; Raafat & Nicholas, 2001*), two articles in the Health and Safety Practitioner (*Nicholas, 2000a; Nicholas, 2000b*) and a Risk Management conference paper in Orlando, Florida (*Nicholas & Raafat, 2000*). Having a strong desire to continue my academic study at doctoral level I researched a variety of academic institutions, who offered a professional doctorate programme centred on Change Management. I approached the University of Wales Institute Cardiff (UWIC), and was accepted onto the induction programme for the Doctor of Business Administration (DBA).

1.2 Research Aim

The aim of the research was to develop an ICAF at the Alpha Hydrocarbon major hazardous installation and to implement learning and development interventions to underpin the ICAF, in order to ensure that all operationally-based employees were deemed ‘competent under training’.

In order to achieve the research aim it is necessary to set out a series of five key research objectives shown in the next section.

1.3 Research Objectives

The objectives of the research were to:

1. Undertake a critical review of relevant literature regarding individual competence assurance, so as to place the research into a wider context;
2. Develop a best practice ICAF for Alpha Hydrocarbon;
3. Develop learning and development initiatives in order to underpin the ICAF at Alpha Hydrocarbon;
4. Implement the best practice ICAF and action plan to achieve the desired change agenda, in order that operationally- based trainees achieve competence under training status;
5. Evaluate the implementation of the best practice ICAF.

1.4 Planned Organisational Change

Most planned organization change is brought about by the need to respond to the requirements of the external environment (*Mullins, 1993*). This philosophy, in the case of Alpha Hydrocarbon, can be termed a truism, given the fact that the terminal did not have a robust ICAF (why this research study was initiated), underpinned by learning and development interventions to underpin it. The programme of organisational change at Alpha LNG involved three distinct phases, as outlined by Lewin (*1951*). First, it was necessary to unfreeze the current situation by eliminating those areas of the business which were the causation factors for the current problem. This was accepted as a must have in the case of Alpha Hydrocarbon, given they had removed the two previous incumbents of the training role. Second, there would be a requirement to

achieve movement via the development of a new set of ideals, in order that the implementation of change could take place. Third, a process of refreezing would be required in order that the change initiative could be reinforced to prevent a relapse scenario.

In 1990, John Kotter studied over 100 companies going through change, he concluded that the most common errors were made in the following order, being too complacent regarding the change process, failing to build a substantial coalition, not having a clear vision or direction, failing to communicate the clear vision or direction, permitting others to 'roadblock' the change vision, not planning and obtaining short term wins, in order to demonstrate a successful strategy, declaring that the change has been successful too soon, and finally not ensuring that the change has been anchored into corporate culture (*Kotter, 1990, ten Have et al, 2003*).

It was of significant importance to remember the words of Kotter (1990), when I embarked on the change programme of developing an ICAF, underpinned by learning and development interventions. By taking a systematic approach to implementing change, I was successful in achieving the objectives of the organisational change, an analysis of which will unfold through the chapters of this thesis.

According to Harding (2004) there are four key factors for success when implementing change within an organisation. First, there must be pressure for

change. The need for change has to be clearly and systematically identified and the needs communicated throughout the organisation. Senior management must be seen to be fully supportive of the change solution. Sometimes other conflicting or new priorities emerge and the momentum can be lost if there is a failure to remain fully supportive of the project. Second, it is necessary to have a clear, shared vision. For change to be effective, it needs to be implemented at all levels and has to be embedded in the culture of the organisation. Third, there must be a capacity for change. This means that resources must be made available in order to undertake the change management solution. This will include such things as financial, human resources etc. Fourth, it is necessary to obtain action and performance. Keeping up momentum is vital and to this end an action research methodology will be the guiding principle. The action research 'iterative spiral' (*Lewin, 1933*) of planning, acting, observing and reflecting was fundamental in ensuring structured and systematic organisational change within the Alpha Hydrocarbon organisation (see Chapter 2).

1.5 Structure of Thesis

The structure of the thesis will be as follows.

Chapter Two highlights the key elements of the research strategy. This includes the research objectives, design and methods applied to the Alpha Hydrocarbon research project. In deciding upon a research strategy it was vital to emphasise the need for a planned, structured and systematic approach from the onset. However, there was a requirement for this to be paired with the flexibility to

respond to unforeseen, ever-changing scenarios (*Clark & Causer, 1991*). In addition, the chapter contains an analysis of the audit findings into current learning and development practice at the Alpha Hydrocarbon installation. The results from the audit findings provided a clear indication of the need for change at Alpha Hydrocarbon.

In Chapter Three emphasis is placed on operationalising the research objectives. The chapter contains an explanation of the methodologies adopted in order that each of the research objectives could be executed successfully in practice.

Chapter Four contains the literature review. It focuses on key aspects encompassing the research aim and objectives and includes the following topic areas, COMAH, competency and competency frameworks, learning and development, defining an ICAF and finally the conceptual framework.

Chapter Five focuses on the development of a best practice ICAF for use at the Alpha Hydrocarbons installation. The literature review in Chapter 4 identified key components of a best practice ICAF. This utilized elements of a best practice competence management system, as well as other approaches to competency assessment in general. Utilising these key elements along with, for example, visits to other operating facilities both within the UK and abroad, reviewing job descriptions, undertaking a tasking analysis; I was able to develop a best practice ICAF for use at Alpha Hydrocarbon.

Chapter Six discusses the learning and development interventions, utilized at the Alpha Hydrocarbon installation, in order to underpin the ICAF. Learning, training, and development are terms that are often used interchangeably. This chapter analysed each of these terms in turn before moving on to discuss the various learning and development interventions utilized. A number of learning and development interventions were utilized these included, for example, coaching, mentoring, and formal training courses.

Chapter Seven focuses on the implementation of the newly-developed ICAF at the Alpha Hydrocarbon installation. Kotter (1990) concluded that there was a sequence of common errors being made when undertaking a change project. In response to this he developed eight key stages for successful implementation of change. This eight key stage approach was later streamlined (Kotter & Rathgeber, 2007); this was utilized as a basis for the implementation of the ICAF at Alpha Hydrocarbon.

Chapter Eight reports on the evaluation of the change management solution. I decided to use the four level Kirkpatrick training evaluation model in order to measure and analyse the success of the change initiative (Kirkpatrick, 1994; Kirkpatrick & Kirkpatrick, 2007). The key requirement of the evaluation process was to determine whether the change management solution i.e. the newly-developed ICAF, underpinned by learning and development interventions, had achieved its desired aim of 'operationally-based personnel being competent under training'.

Finally, Chapter Nine summarises the conclusions from the empirical findings and change management solution, discussed within the thesis. It focuses on the following key areas, a review of the research aim and objectives, the contributions of thesis, the limitations of the thesis, future research opportunities and finally my personal reflections.

The thesis will now move on to discuss the research strategy and audit findings.

Chapter Two:

Research Strategy

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Chapter Two:

Research Strategy

2.0 Introduction

This chapter outlines and justifies the research strategy. In deciding upon a research strategy it is of vital importance to emphasise the need for a planned, structured and systematic approach. However, there is a requirement for this to be paired with the flexibility to respond to unforeseen, ever-changing scenarios (*Clark & Causer, 1991*). According to Clark and Causer (1991), the key to successful research lies in combining flexibility of response to changing circumstances. For analytical purposes the research process has been divided into three key elements. These include the Research Aim and Objectives (highlighted in Chapter One), the Research Design and finally the Research Methods.

2.1 Research Aim and Objectives

I concluded in Chapter One that the aim of the research was to develop an ICAF at the Alpha Hydrocarbon major hazardous installation and to implement learning and development interventions to underpin the ICAF, in order to ensure that all operationally-based employees were deemed 'competent under training'. In addition, I noted that the research would be driven by five key objectives. The objectives of the research were to:

1. Undertake a critical review of relevant literature regarding individual competence assurance, so as to place the research into a wider context;
2. Develop a best practice ICAF for Alpha Hydrocarbon;
3. Develop learning and development initiatives in order to underpin the ICAF at Alpha Hydrocarbon;
4. Implement the best practice ICAF and action plan to achieve the desired change agenda, in order that operationally- based trainees achieve competence under training status;
5. Evaluate the implementation of the best practice ICAF.

The setting of objectives is of vital importance when undertaking research. In essence they guide the whole research process (*Clark & Causer, 1991*). Research in general aims to provide answers or solutions to some kind of problem. Before a problem can be solved, it has to be adequately formulated. Problem formulation or, in the words of Robert Merton (*1959*) ‘problem finding’, plays a key role in the setting of research objectives. Merton suggested that problem finding could be broken down into three main components, what do you want to know? Why do you want to know it? What do you need to investigate in order to provide answers to the questions?

Problem finding is often preceded by the identification of a broad topic area of research, for example, we do not have an ICAF in place yet. However, a topic area does not in itself make a viable research project. For this the topic area must be converted into a specific problem. According to Clark and Causer

(1991) this is one area that must be discussed with the Research Supervisor(s). Taking note of the words of Clark and Causer (1991), I duly discussed this in detail with my Research Supervisors, in order that the research aim and objectives could be properly defined.

2.2 Research Design

Having established the research objectives, the next stage was to design a project that would enable me to achieve the realisation of these objectives in practice. This is the question of research design that Bryman (1989) defined as the overall structure and direction of an investigation. Traditionally, most quantitative and qualitative research approaches go through a long programme of data collection, analysis and eventually produce a report, which researchers hoped practitioners will utilize in practice. However, this traditional approach would be inappropriate in the case of Alpha Hydrocarbon. In reality we could no longer prevaricate on the development of an ICAF, and/or the reasons why it had not been executed in practice. The development of the ICAF at Alpha Hydrocarbon was deemed to be an urgent priority, in order that the operating facility could be commissioned. To this end I decided to concentrate my efforts on an entirely pragmatic approach to the research.

2.2.1 Pragmatism

According to the pragmatism philosophy, 'knowledge is a tool for action', and as such it should be evaluated in the context of whether it serves our desired interests (Cornish & Gillespie, 2009). Pragmatism originated over a century ago

with the American philosophers Charles Sanders Peirce (1839-1910), William James (1842-1914), and John Dewey (1859-1952) (*Cornish & Gillespie, 2009*). Pragmatism does not rest upon ambitious claims about knowledge reflecting an underlying reality, for the pragmatist, it is practical activity that is the fundamental foundation and test of knowledge. Knowledge is judged according to its consequences in action. The pragmatist approach to the problem of knowledge is to change the question that we ask about knowledge. Instead of asking 'does this knowledge accurately reflect the underlying reality?' the question becomes 'is this knowledge fit for purpose?' (*Rorty, 1999*).

In more recent years, there has been a surge of interest in pragmatism, in philosophy (*Kloppenbergh, 1996*), social theory (*Baert, 2004*), law (*Posner, 2003*), medical ethics (*Hester, 2003*), education (*Biesta, 2007*) and public administration (*Shields, 2003*). However, there is little evidence regarding the use of pragmatism within an industrialised setting. Given this fundamental claim that pragmatism is a tool for action, I decided to apply this philosophy in order to generate organisational change within the Alpha Hydrocarbon organisation.

Having identified that pragmatism was a philosophy based on a knowledge tool for action, and one which could lend itself to an industrialised setting, it was next necessary to identify a suitable practical research methodology, in order to underpin this philosophy. Having examined the various options available, I decided on an action research approach, which focused on the 'iterative spiral' of **planning, acting, observing** and **reflecting**.

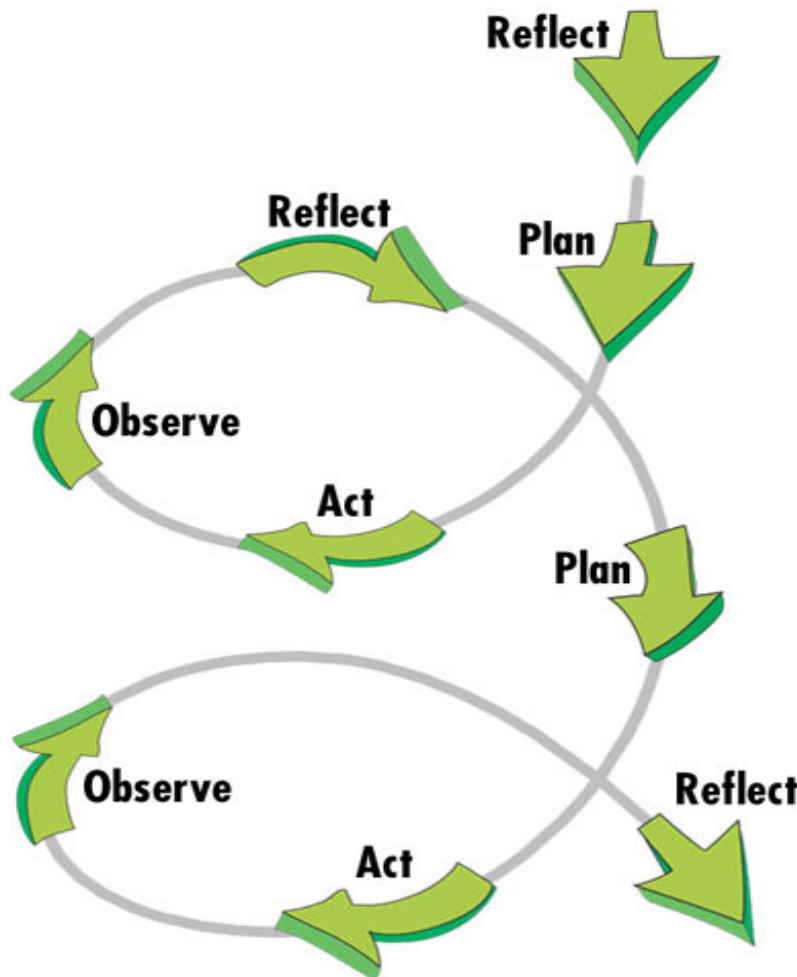
2.2.2 Action Research

Kurt Lewin (1933) is the person most often credited with the term action research, a method whereby findings are utilized immediately to develop best practice solution. Lewin grew up as a Jew in Germany, however, he moved to the United States in the 1930's. His main interest was in conflict resolution and as a result he developed the theory and practice of action research (Charles & Ward, 2007). Lewin's (1933) action research theory and practice was based on a collaborative cyclical process (iterative spiral) of diagnosing a change situation or problem. The cyclical process consisted of four phases, these included, **planning**, **acting**, **observing** and **reflecting**. This cyclical process (iterative spiral) of research directed at problem solving has become more commonly known as the action research cycle (see Figure 2.1).

According to Charles and Ward (2007) action research can be defined as an umbrella term covering a variety of approaches to research, however, it has one fundamental belief at its heart. This is that action research should be directed at achieving some form of organisational change. Action research has two key features, first, it is 'action orientated' and second, it is 'participatory' and therefore involves researchers working in collaboration with the research subjects.

Figure 2.1 Action Research Cycle

(<http://celt.ust.hk/ideas/ar/intro.htm>)



Coghlan and Bannick (2005) defined action research as an approach to research which is based on a collaborative problem-solving relationship between the researcher and the client, which aims to solve problems and generate new knowledge. Reason and Bradbury (2006) argued that there was no short answer to question of ‘what is action research?’, however; from analysis of the relevant literature on action research it is possible to conclude the following key points (Greenwood & Levin, 1998; Kemmis & McTaggart, 2003; Herr & Anderson, 2005; Reason & Bradbury, 2006).

First, action research is participatory and is undertaken by and with insiders. Second, it is collaborative and ideally should involve all those who have an interest in the research i.e. the stakeholders. Third, action research involves democratisation of research. Fourth, knowledge is co-generated by researchers and participants alike. Fifth, action research is a reflective systematic and structured process. Sixth, it is an ongoing intervention within the research setting. Seventh, it is an emergent and flexible process. Eighth, the fundamental overriding goal is a problem solving approach in order to effect change.

Having discussed the research design, I will now move on to highlight the research method adopted at this stage, in order to provide the rich qualitative data that would be necessary in order to development, implement and evaluate an ICAF.

2.3 Research Methods

The action research problem-solving approach provided early pointers to the types of research method that were most appropriate to the successful fulfilment of my research aim. Research methods such as questionnaires, case studies, self-report diaries, and quantitative data gathering were discounted as they were deemed inappropriate for use.

A qualitative research methodology was chosen for the study, due to the fact that it produces rich qualitative data. Justification for the selection of the research methodology was based both on the inappropriateness of quantitative research

and the suitability of qualitative methodologies for the research topic (*Allan, 1991*).

A semi-structured interview approach was utilized and probing questions were developed in order to interrogate topics further (see Appendix One). For example, probes such as “anything else”, “what do you mean by that”, “could you develop that idea further”, “do you have specific examples”, could be utilized to ground the data and remove potentially abstract responses.

Open questions within semi-structured interviews enable the interviewer to test the limits of knowledge, they encourage rapport and they allow the interviewer to make a true assessment of what the respondent really believes (*Jones, 1991; Horton et al, 2004*).

Trevor Lummis (*1987*) commented that the art of good interviewing lies in being able to keep most of the interview conversational while following various digressions away from the theme, but always remembering which questions the flow of information has answered and yet being prepared to question more deeply and precisely when necessary. In conducting interviews it is of vital importance to retain a critical awareness of what is being discussed. The interviewer must always be ready to explore some issues in greater depth (*Jones, 1991*). A further advantage of this approach is that interviews are familiar to people and provide an accessible mode of data collection. In general terms people are happy to share their views, opinions and ideas.

It was necessary to decide whether to tape record the interviews or to write the responses down. Tape-recorded interviews have a number of advantages; these include accurate recorded material, the ability to concentrate on the framing of the questions. The disadvantages include, the time required transcribing the tapes, background noise which will be detected by the tape recorder and participants objections to being tape-recorded (*Clark & Causer, 1991*).

Note-taking on the other hand is time consuming and can prevent follow-up questions and probes. Some participants find it flattering to have so much attention paid to them and most people enjoy talking about their work. They appear familiar with interviews as a communication method, whether to share enthusiasm or to air complaints, particularly if the interviewer is an outsider. Above all else the interview process helps them clarify their thoughts. This was the chosen method.

It was decided, in consultation with the Managing Director, to undertake a management review, in order to ascertain what had occurred in practice over the previous two years of the operation, and to gauge perceptions of the learning and development function as a whole. A semi-structured interview approach was chosen as it would provide rich qualitative data. The semi-structured interviews were utilized to identify the gaps between where Alpha Hydrocarbon was, in relation to where it must be, in order to comply with its legislative responsibilities. The semi-structured interviews would allow the interviewees a degree of freedom in order to explain their inner-most thoughts (*Horton et al, 2004*).

According to Skinner (1991) in order to evaluate any proposed research design it is useful to visualize all stages of the research flow from the design through to analysis and finally presentation. It was necessary to apply a number of tests to the field-based research in order to ensure the trustworthiness of the outputs. Trustworthiness refers to the truth-value of a piece of qualitative research. It is a measure of how much the research reflects the reality and the ideas of the participants who constitute the research sample. Although many critics are reluctant to accept the trustworthiness of qualitative research, frameworks for ensuring rigour in this form of work have been in existence for many years. The trustworthiness of qualitative research generally is often questioned by positivists, perhaps because their concepts of validity and reliability cannot be addressed in the same way in naturalistic work. Many naturalistic authors have, however, preferred to use different terminology to distance themselves from the positivist paradigm. Guba (1981) highlighted a four stage criteria that should be considered by qualitative researchers in pursuit of a trustworthy goal. Guba's constructs correspond to the criteria employed by the positivist fraternity. The four stage criteria comprised of, credibility (in preference to internal validity); transferability (in preference to external validity/generalisability); dependability (in preference to reliability); and finally, confirmability (in preference to objectivity).

One of the key criteria addressed by positivist researchers is that of internal validity, in which they seek to ensure that their study measures the original design intention. According to Merriam (1998), the qualitative investigator's

equivalent concept, i.e. credibility, deals with the question, “How congruent are the findings with the reality?” Lincoln and Guba (1985) argued that ensuring credibility is one of most important factors in establishing trustworthiness. Credibility means that there is evidence to suggest that the inputs of the research study has had a direct bearing on the outputs observed. This in no way confirms that what you wanted to happen has happened in practice. Consequently, it is necessary to adopt a series of cross-checking measures, in order to counter this problem. From an analysis of data provided by the management team, it appeared that the semi-structured interviews were achieving their intended design intentions. In addition, I was able to compare the semi-structured interview data with existing documentary evidence that had been produced/not been produced previously. Finally, by assessing and analyzing the quality of the raw data, provided by the senior management team, on areas such as the perception of the learning and development function, the outputs from the said function etc, I was able to confirm that the semi-structured interviews were achieving their desired outputs.

Merriam (1998) concluded that external validity concerns itself with the extent that the research findings are generalisable beyond the current study.

Previously within this section I noted that Guba (1981) highlighted transferability in preference to external validity/generalisability. In positivist work, the concern often lies in demonstrating that the results of the research undertaking can be applied to a wider population. Since the findings of a qualitative research project are specific to a particular organisation, it is impossible to demonstrate that the

findings and conclusions are applicable to other situations. This is a truism in the case of Alpha Hydrocarbon, given that the research is confined to the new Greenfield site development and not to other hazardous installations across the organisation as a whole.

The third element of Guba's (1981) criteria, highlighted dependability in preference to reliability. According to Shenton (2004) in order to address the dependability issue more directly, the processes within a particular research study should be analysed and reported in detail. This will ensure that a future researcher will be able to repeat the project and obtain the same or similar results. In this context the research design may be viewed as a "prototype model". Such in-depth coverage also allows the reader to assess the extent to which proper research practices have been followed. Given the extensive preparatory work I undertook regarding both research design and methodology, I am extremely confident regarding the dependability of my research findings.

The final element of Guba's (1981) four stage criteria, highlighted confirmability in preference to objectivity. Here steps must be taken to help ensure as far as possible that the work's findings are the result of the experiences and ideas of the research sample, rather than the views/beliefs of the researcher. I ensured throughout that I did not subject the Alpha management team to any bias on my part. My overriding concern was to obtain true and accurate data, in order that I could move on to the next stage of development in a timely and professional manner.

2.4 Audit of Current Practice

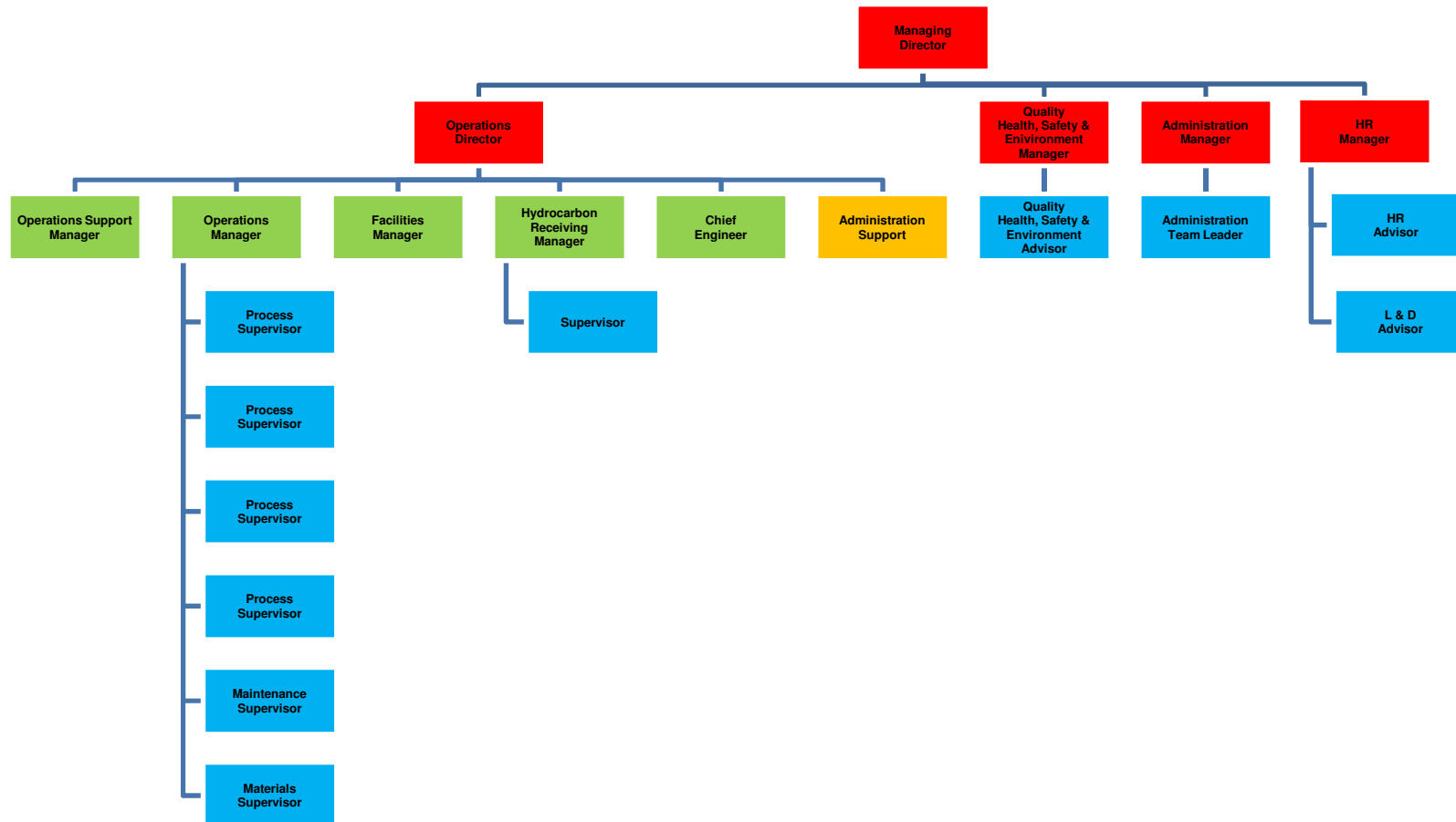
The theme of this section was to report on the findings of the audit of current practice of competency development at Alpha Hydrocarbon, in order to identify gaps between where the organisation was in relation to where it wanted and needed to be in order to comply with its legislative and moral responsibilities.

The Semi-structured interviews took place at the Alpha Hydrocarbon facility and took place during normal working hours. An analysis of Figure 2.2 reveals that the operations management team can be stratified under three distinct headings. These were:

1. Senior management team five in total (signified in red in Figure 2.2);
2. Managers five in total (signified in green in Figure 2.2);
3. Supervisors eleven in total (signified in blue in Figure 2.2);
4. The operations administration support function (signified in yellow) did not have any managers or supervisors; consequently they did not take part in the audit. In essence they were purely a support function

Interviews varied in length according to the individual being interviewed. The interview notes were transcribed during the interview.

Organisation Chart Figure 2.2



2.5 Analysis of Audit

The group of interviewees were asked to describe how the learning and development function had operated over the last two years. In 20 (95.23%) instances interviewees stated that they deemed the learning and development function to be totally unacceptable in terms of its operation and outputs. Typical comments included that they were “function oriented instead of being customer driven”. Customer driven in this sense referred to the fact that the function as a whole had no understanding of the internal customer supplier relationship, in the sense of providing a quality service to line manager and supervisors. Others commented that ‘the function tended to work in a vacuum’. This meant that training events were initiated, without discussing the programme, with the various departments, as to whether or not there was a legitimate need or whether the timing of the event was appropriate. For example, permit to work training was planned by the learning and development function, even though there was no policy, procedure or work instruction in place with which to train personnel. Consequently, £150K was spent on training that would have to be rescheduled at a later date, thereby expending additional costs and resources, once the policy, procedure and work instruction had been written. What became apparent as the interviews progressed was that the previous incumbents of the learning and development function tended to only use one preferred supplier from the north of England. No attempt had been made to forge links with training providers in the local community.

One senior manager commented that he became so frustrated with the outputs from the learning and development function that he had “decided to go it alone”, as this was the only way he was able to fulfil the training needs of his department. One could argue therefore, that the senior manager concerned was correct to proceed with a quality training provider, in the absence of input and output from the learning and development function. This particular training provider was subsequently awarded a further contract in order to provide training to ‘start up’ teams, who had been seconded to the project, until a state of operational steadiness had been achieved.

One of the senior management team thought the learning and development department had operated efficiently and effectively over the previous two years. Upon analysis, however, it transpired that this particular senior manager (Administration) had been responsible for the learning and development function during this two-year period, prior to the recruitment and selection of the HR department.

Interviewees were then asked in their opinion how successfully the learning and development function had operated in their department as a whole. In 20 (95.23%) instances interviewees stated that they could only describe learning and development as ad-hoc. Upon analysis, it became evident that each department had operated independently of one another, in reality there was no central cohesive driving force provided by the learning and development

function as a whole. It transpired that the learning and development function considered their way of doing things as the only viable option.

The next question the research group were asked was, what, if anything, would you change in the learning and development function and why? In 20 (95.23%) instances interviewees agreed that they would initiate changes within the function as a whole. Key comments included that it was necessary to have someone within the function that had a substantial experience of major hazard installations, individual competence development and managing a learning and development function with particular emphasis on COMAH.

Upon analysis of the comments it became evident that the vast majority of interviewees had come from a major hazard installation background. Consequently, their knowledge of major hazard industry requirements and legislation was at a very high standard.

Similarly, in 20 (95.23%) instances interviewees concluded that it was vital for the learning and development function to either operate under the operations or HR umbrella. Leaving the function to operate under non-recognised functions was a potential recipe for disaster. Once again, one senior manager (Administration) thought that leaving the learning and development function under his direct responsibility was a good idea. It is of particular interest to the content of the thesis that I am able to report that he has subsequently changed their mind. Extreme pressure was placed upon the senior manager responsible

for the learning and development function, by an audit team from one of the major shareholders. The audit team's findings were so critical of the learning and development function, that the senior manager concerned subsequently relinquished overall responsibility for the function. Learning and development now falls under the umbrella of HR. The Administration Manager decided to leave the company shortly after my audit findings.

Interviewees were then asked what job competencies they had been given in their specific roles. None of the respondents were able to provide evidence highlighting written individual competencies. In addition, a search of relevant files revealed that no individual competencies were in existence. All of the respondents commented that they had seen a variety of competencies in previous jobs. This clearly demonstrated that all management was aware of the requirement for individual competency development; the question therefore must be why this was not delivered in practice. Two reasons for non-compliance spring to mind. Firstly, were the previous incumbents of the learning and development function incapable of delivering such an entity, and/or secondly, did they choose to ignore the requirement for such a framework as they just could not be bothered. Given that it was not possible to interview the previous incumbents of the role, then it was impossible to determine the real reason. In reality, the key requirement was to develop an ICAF without delay, rather than prevaricate on the reason(s) for non-compliance.

The research group were then asked to describe how their training/learning needs had been identified in the previous two years. In all instances (100%) interviewees concluded that the identification of training/learning needs had been undertaken in a totally ad-hoc fashion. No one was able to describe a structured and systematic approach to the identification of training/learning needs. The learning and development function tended to initiate events purely by guesswork or instinct, rather than developing and implementing a training/learning development strategy. Consequently, both the timing and content of the event was inappropriate and was not in keeping with the ethos of the project as a whole. None of the respondents were able to recollect individual training plans; neither could any documentary evidence of individual training plans be found. Consequently, training/learning, in the sense of need identification, planning and course attendance could only be described as a 'hit or miss affair'.

Interviewees were then asked to describe how their training was validated and evaluated. All of the respondents confirmed that they had filled in course 'happy sheets' at some point. However, no evidence could be found that linked individual training and learning to overall business needs and objectives.

From an analysis of the empirical research findings it was possible to conclude that only the reactions of students were tested by the use of course 'happy sheets'. Learning, behaviour and results had not been analysed, consequently,

it was impossible to determine whether or not the training/learning events fulfilled their intended aims and objectives.

Finally, interviewees were asked to rank the outputs from the learning and development function as a whole. In 20 (95.23%) instances interviewees concluded that they would rank the function as very poor (the lowest possible ranking). This ranking was clearly based on the lack of internal customer satisfaction, measured by the less than satisfactory outputs from the function over the previous two years.

One of the senior management team ranked the learning and development function as good. Once again, upon analysis, however, this particular senior manager was responsible for the learning and development function during this time. I could only conclude that this particular individual had difficulty in accepting that the performance, of aspects of their department, fell below an acceptable standard.

2.6 Conclusions

This chapter has reported on the research strategy. In deciding upon the research strategy it was vital to emphasise the need for a planned, structured and systematic approach and for this to be paired with the flexibility to respond to unforeseen, ever-changing scenarios. I concluded that the aim of the research was to develop an ICAF at the Alpha Hydrocarbon Major Hazardous Installation and to implement learning and development interventions to

underpin the ICAF. In addition, this research aim has encompassed five key objectives.

Having established the research objectives, the next stage was to design a project that would enable me to achieve the realisation of these objectives in practice. I concluded that traditionally, most quantitative and qualitative research approaches went through a long programme of data collection, analysis and eventually producing a report, which researchers hoped practitioners would utilize in practice. However, this traditional approach was inappropriate in the case of Alpha Hydrocarbon given the urgency of the development of the ICAF. I decided on a pragmatic action research approach, a method whereby findings were utilized immediately to develop best practice solutions.

In consultation with other key members of the Alpha Hydrocarbon management team I concluded that it would be advisable to undertake a management review (audit), in order to ascertain what had occurred in practice over the previous two years of the operation, and to gauge perceptions of the learning and development function as a whole. The rich qualitative data produced by the semi-structured interviews was utilized to identify the gaps between where Alpha Hydrocarbon was, in relation to where it wanted and had to be, in order to comply with its legislative responsibilities.

From an analysis of the audit findings it was possible to conclude that Alpha Hydrocarbon was suffering from a poorly managed learning and development function, whose lack of outputs had damaged its credibility beyond repair. The perception of the learning and development function was one of being function orientated, as opposed to being customer orientated. Clearly, this approach had damaged the internal and external customer supplier relationship. Internal customers were damning in their criticisms of the function. In addition, comments submitted by the HSE (an external customer) suggested they were disappointed that a competence assurance framework was not in place for review. In addition, the outputs from the learning and development function fell below the expectations of Managing Director and departmental heads operating the Alpha Hydrocarbon facility. Adverse comments included, for example, not affording the development and implementation of an ICAF a number one priority, not developing an overall learning and development strategy, arranging training at inappropriate stages of the project, not ensuring the content of the training was linked to company procedures and work instructions.

Clearly, the empirical findings confirmed beyond question the need for organisational change at Alpha Hydrocarbon, in particular, the urgent requirement to develop and implement an ICAF relating to the handling and processing of hydrocarbon, together with the development of learning and development initiatives to underpin the framework.

The thesis will now move on to undertake a critical review of relevant literature regarding individual competency assurance, so as to place the research into a wider context.

Chapter Three:

Operationalising Research Objectives

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Chapter Three:

Operationalising Research Objectives

3.0 Introduction

The theme of this chapter is to report on the operationalising of the five research objectives. Previously in Chapter Two, I noted that I had decided on an action research methodology due to, for example, its practical, collaborative and problem solving nature. This action research approach was utilized in order to achieve the desired change agenda within Alpha Hydrocarbon. My approach was based on Lewin's (1933) cyclical (iterative spiral) process, which consisted of four distinct phases, these included, planning, acting, observing and reflecting. These four phases were applied to operationalising each of the five research objectives, highlighted in Chapter Two. Examples of these four distinct phases are shown in each of the operationalised sections below.

3.1 Operationalising Research Objectives

3.1.1 Operationalising Research Objective One

Objective One was operationalised by undertaking a thorough literature review on key aspects appertaining to individual competence development. From an analysis of the literature review I was able to define aspects of a best practice ICAF for use at the Alpha Hydrocarbon installation. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the literature review. This included for example, **planning** –

deciding on the literature review topic areas, **acting** – obtaining the literature from various documentary sources, **observing** – ensuring the literature was up-to-date and from reliable sources that would stand the test of academic rigour, and finally, **reflecting** – ensuring the literature dealt with all aspects of the ICAF topic area.

3.1.2 Operationalising Research Objective Two

I operationalised Objective Two by developing the best practice ICAF, defined within the literature review. In discussions with both the Managing Director and Operations Director, it became apparent that they did not want to ‘pirate’ existing models; however, they did not want to ‘reinvent the wheel’ either. In other words they required an ICAF that was specific to the needs of the organisation, building wherever possible on best practice from other organisations. From a legal perspective there is only a requirement to develop a competence assurance framework only for safety critical tasks and I suggested that it would be beneficial to develop an ICAF for the whole of the Alpha Hydrocarbon organisation, however, my suggestion was declined due to organisational pressures.

At subsequent meetings with the Managing Director and Operations Director, a roadmap for the development of the ICAF was agreed. This included five key aspects for development. First, I undertook a document analysis of HSE publications on the topic area of individual competence assurance. Second, I initiated key word searches on the World Wide Web (WWW), in order to

determine whether any ICAFs were within the public domain. In addition key word searches were made in the areas of competence, competencies, core and functional competence, competence development, learning and development. Third, visits were undertaken abroad to three hydrocarbon operating facilities, on the advice of the Operations Director. The stakeholder companies of Alpha Hydrocarbon currently have a number of hydrocarbon processing facilities, throughout the world. I visited hydrocarbon processing facilities in the Persian Gulf and the Iberian Peninsula. Fourth, visits were undertaken with regard to two hydrocarbon processing installations, within the UK. Through consultancy contacts I was able to gain access to these facilities. Fifth, I reviewed job descriptions. These job descriptions had previously been written, before my arrival on site. A job description can be defined as a summary report of information relating to specific roles within the organisation. In the case of Alpha Hydrocarbon these were confined to purely operational roles. Job descriptions are normally derived from a process of job analysis. Job analysis is the process of collecting and analysing information regarding the scope of tasks, responsibilities, skills, knowledge etc, required to undertake a particular role within an organisation. Sixth, I undertook a task analysis of operational activities, in order to identify competencies and work activity areas. Task analysis covers a range of techniques used by ergonomists, designers, operators and assessors to describe, and in some cases evaluate the human-machine and human-human interactions in systems. Task analysis can be defined as a study of what personnel are required to do, in terms of actions and/or cognitive processes, to achieve a system goal (*Kirwan & Ainsworth,*

1992). Task analysis methods can also document the information and control facilities used to carry out the task. Task analysis is therefore a methodology which is supported by a vast array of techniques to help the analyst collect information, organise it and then use the information provided to make various judgements and/or design decisions solutions. The application of task analysis provides the user with an effective 'blueprint' of human involvement and interaction. Such structured and systematic information can then be utilized to ensure that there is compatibility between system goals and human capabilities (Kirwan & Ainsworth, 1992). The four action research phases of planning, acting, observing and reflecting (Lewin, 1933), were applied to each stage of the ICAF development. This included for example, **planning** – deciding how the ICAF could be developed, **acting** – discussions with the Operations Director and visits to other hydrocarbon installations, **observing** – how competence was developed and assessed within other hydrocarbon installations, and finally, **reflecting** – ensuring that the task analysis had encompassed all hydrocarbon tasks.

3.1.3 Operationalising Research Objective Three

Objective Three was operationalised via a learning and development needs analysis, in order to identify suitable learning and development initiatives that underpinned the ICAF. Learning and development needs analysis involves the systematic gathering of data to find out where there are gaps in the existing skills, knowledge and attitudes of employees. It involves the gathering of data about employees' capabilities and organisational demands for skills, and the

analysis of the implications of new and changed roles for changes in capability. It often flows from the business strategy, as the aim of identifying needs is to be able to build a plan to offer appropriate learning and development opportunities to fill the gaps identified and ensure that there is sufficient capability for the organisation to meet its business aims, objectives and/or key performance indicators.

Careful analysis of learning and development needs is important because unless the right quality of employee is present organisations may struggle to implement strategies and achieve targets. Analysing the areas where capability needs to be enhanced allows organisations to create a human capital investment strategy to support business objectives. In addition, providing learning opportunities to staff enables them to develop and achieve personal and career goals. Furthermore, well-planned training is an effective retention strategy, particularly for ambitious and externally-mobile employees.

Additionally, all training provisions should be designed to meet previously-identified learning needs in order to be cost-effective. If an initial assessment using the correct assumptions is made about who needs to learn what, then it is likely that effective training or learning provision will result. Finally, having a clear idea of what needs to be learned and the outcomes expected provides a foundation for training and learning professionals to evaluate the effectiveness of implementation of the learning strategy.

A structured and systematic approach to the identification of learning and development needs ensured that training was targeted at both the needs of the organisation and the individual employee, and ensured that the best possible use would be made of the resources available.

Learning and development needs can be categorised into three levels, those at organisational level, those at job and departmental level, and finally the individual.

In order for the organisation to know where to focus its training effort, the following factors needed to be taken into account. First, the impact of the future plans of the organisation on the need for different skills and knowledge in the workforce. Second, the skills and knowledge that employees need to do their job as effectively as possible, and how their current levels match up to this. This allows the 'gap' or skills / knowledge deficit to be identified. Third, those employees earmarked for career development/enhancement.

The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to the learning and development needs analysis and the development of suitable and sufficient learning and development initiatives. This included for example, **planning** – deciding on the most appropriate method in order to undertake the learning and development needs analysis, **acting** – discussions with various learning and development providers, **observing** – the delivery of formal training courses to verify quality of delivery,

and finally, **reflecting** – ensuring the learning and development needs analysis and the learning and development interventions encompassed all hydrocarbon topic areas.

3.1.4 Operationalising Research Objective Four

The operationalising of Objective Four was achieved via the implementation of the ICAF, in order to achieve the desired change agenda. In Chapter One, I noted that Kotter (1990) studied over 100 companies going through change; he concluded that a series of common errors were being made, for example, being too complacent, regarding the change process, failing to build a substantial coalition. In other words, not having a strong enough team to ward off countervailing forces, not ensuring that the change has been anchored into corporate culture.

John Kotter made it his business to study both success and failure of change initiatives within organisations. He concluded that the most general lesson to be learned from the more successful cases is that the change process goes through a series of eight key phases (*ten Have et al, 2003*). Skipping steps creates only the illusion of speed and never produces satisfactory results. In addition, making critical mistakes in any of the phases can have a devastating impact on the desired change agenda. The eight key requirements for successful change management developed by Kotter (1990) and streamlined by Kotter and Rathgeber (2007), was utilized as an implementation model. The eight phases include, first, creating a sense of urgency. Talk of change typically

begins with some people noticing vulnerability in the organisation. The threat of losing ground in some way sparks these people into action, and they in turn try to communicate that sense of urgency to others. Clearly this was the case in point in the case of Alpha Hydrocarbon, given the abysmal failure to develop an ICAF. In the words of the Operations Director “business as usual is no longer an acceptable plan, we must move forward”.

Second, there is a requirement to pull together the guiding team. Change efforts often start with just one or two people, and should grow continually to include more and more who believe the changes are necessary. In the case of Alpha Hydrocarbon, the key initiators of change were the Managing Director and the Operations Director. Regardless of size of organization, the "guiding coalition" for change needed to have three to five people leading the effort. This group, in turn, would help bringing others on board with new ideas. The building of this coalition, their sense of urgency, their sense of what is happening and what is required is crucial to overall success. The key members of the coalition within Alpha Hydrocarbon included the Managing Director, the Operations Director, the Operations Manager, the builder of the ICAF and the third party contractor responsible for the implementation of the ICAF. A third contractor was chosen due to time constraints and lack of internal manpower resources.

Third, it is necessary to develop the change vision and strategy. Successful transformation rests on a picture of the future that is relatively easy to communicate and appeals to stakeholders and employees i.e. a clear shared

vision and direction for change. In addition, it is necessary to develop strategies in order to realise this vision. In the case of Alpha Hydrocarbon this will be the developed best practice ICAF that will bring about the required change agenda. In constructing the ICAF I ensured that it was possible to explain the ICAF vision under five key headings. These included, core competencies, functional competencies, activity impact areas, competency descriptors and hydrocarbon process plant training (VQ accredited).

Fourth, we need to communicate for understanding and buy in. Leaders should estimate how much communication of the vision is needed, and then multiply that effort by a factor of ten. It is necessary to utilize every possible way to communicate the new vision and accompanying strategies. It is necessary for the guiding coalition to become role models for the rest of the organisation. The best practice ICAF was communicated to the operations department via a series of meetings. I presented the newly developed best practice ICAF. I highlighted the requirement for significant learning and development interventions in order to underpin the ICAF.

Fifth, there is a need to empower others to act. This entails several different actions, for example, allowing personnel to start living out the new ways and to make changes in their areas of involvement, allocating suitable and sufficient resources to the new change initiative. From the onset of the requirement for change within Alpha Hydrocarbon, it became clear that there were no significant obstacles that would hinder change momentum. This was a brand new

hydrocarbon processing facility and the need to move forward to commissioning and operation was paramount in everyone's mind.

Sixth, it is vital to produce short-term wins. Real transformation takes time; the loss of momentum and the onset of disappointment are real factors. Most people will not embrace change unless they begin to see compelling evidence that their efforts are bearing fruit. The ICAF was constructed in such a way as to allow for short term wins, these include, for example, a ten stage core modular learning and development programme applicable to Hydrocarbons process operations. Each stage was assessed independently of the other, allowing for the candidate to be awarded a full unit of competence.

Seventh, it is essential not to let up. Changes must sink deeply into an organisations culture. A premature declaration of victory kills momentum, allowing the powerful forces of tradition to regain ground. All Improvements within Alpha will be consolidated at each stage. The key will be the short term wins I mentioned above.

Eighth, create a new culture. In the final analysis, change sticks when it becomes an accepted norm. Two factors are particularly important for doing this. First, a conscious attempt to show people how the new approaches, behaviours, and attitudes have helped improve the organisation and set it back on track. Second, is to ensure that the next generation of leaders believe in and embody the new ways. Given that the Alpha Hydrocarbon processing facility is

a brand new operation, then clearly ensuring the success of the change management initiative was vital. Success sent a clear signal to everyone within the organisation that after an abysmal start, things were now well and truly back on track.

The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to the implementation of the ICAF. This included for example, **planning** – deciding on the most appropriate change management model, **acting** – identifying the change management coalition/guiding team, **observing** – identifying blockages to the change management process, and finally, **reflecting** – evidence of a culture change.

3.1.5 Operationalising Research Objective Five

Operationalising Objective Five involved evaluating the implementation of the best practice ICAF. In the case of Alpha Hydrocarbon, the key fundamental requirement was for the development and implementation of an ICAF, which would ensure that operational personnel had the correct degree of competence (skills, knowledge, attitude, behaviour), in order to operate a hydrocarbon processing facility safely, effectively and efficiently. The purpose of the evaluation is to determine whether this fundamental requirement has been achieved in reality. One way to consider the importance of evaluation is to recognise the feedback it provides.

Various kinds of evaluation provides feedback to different people, these include, employees, learning and development providers, supervisors and managers and the organisation as a whole regarding a return on investment regarding the ICAF, in particular competence development activities.

The idea of evaluation being applied specifically to learning and development was first initiated by Donald L Kirkpatrick at the University of Wisconsin (*Kirkpatrick, 1994; Kirkpatrick, 1996*). He has published widely on training evaluation, more recently with his similarly inclined son James (*Kirkpatrick & Kirkpatrick, 2007*).

According to Kirkpatrick (1996) evaluation revolves around a four level process. At 'Level One' it is necessary to evaluate the reaction of trainees, in essence, what they thought and felt about the learning and development intervention they attended. 'Level Two' evaluation is designed to examine the extent to which learning and development has taken place, in other words, the increase in skill, knowledge and capability (competence). The focus at 'Level Three' is on evaluating the extent of the trainee's behaviour and capability improvement and on their ability to implement and apply the newly learnt skill and knowledge. Finally, at 'Level Four' the emphasis is on evaluating results. This is achieved by analysing the impact the learning and development interventions had on the trainee and on the organisation as a whole. Level Four evaluation is more commonly known as a measure of return on investment.

In terms of the selection of a particular evaluation model or level of evaluation, the literature and practice suggests that the approach to evaluation should depend on a number of different variables (*Tamkin et al, 2002*). Nickols (2000) summarised the overall evaluation debate succinctly by concluding there is no one recipe book approach. To properly evaluate, requires one to think through the purpose of the learning and development intervention, the purpose of the evaluation, the audiences for the results of the evaluation, the points at which measurements will be taken, the time perspective and the overall framework in use (*Tamkin et al, 2002*).

One of the fundamental criticisms of the Kirkpatrick (1994) model relates to the measurement of training, learning or development after the event has occurred. Therefore it cannot fully take into account the design and development of the event, why the event has been initiated in the first place, abilities of learning and development providers etc. Given this fundamental criticism of the Kirkpatrick (1996) model, I will rectify these concerns, by applying the process of evaluation to other elements, for example, evaluating past performance of learning and development providers, evaluating senior manager reactions to the newly developed ICAF.

The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to the evaluation of the ICAF. This included for example, **planning** – deciding on the most appropriate evaluation methodology, **acting** – implementing the process of evaluation to the various stages of

learning and development, **observing** – the delivery of formal courses in order to validate quality of delivery and finally, **reflecting** – on the evaluation data provided in order to identify the requirements for corrective actions.

3.2 Conclusions

This chapter has reported on the operationalising of the five research objectives. Each of the research objectives was operationalised via an action research methodology, which was based on Lewin's (1933) cyclical (iterative spiral) process. This consisted of four distinct phases that included, planning, acting, observing and reflecting. Examples of this cyclical (iterative spiral) process were highlighted within each of the operationalising research objective sections.

Research Objective One was operationalised via a thorough literature review regarding key aspects appertaining to individual competence development. From an analysis of the literature review it was possible for me to define aspects of a best practice ICAF for use at the Alpha Hydrocarbon installation. I operationalised Objective Two by developing the best practice ICAF, defined within the literature review. This was achieved through the application of a six point development plan that included a review of key HSE documentation, searches of the WWW, visits to hydrocarbon processing facilities both within the UK and abroad, a review of job descriptions and finally undertaking a task analysis of all operational job activities. Research Objective Three was operationalised via a learning and development needs analysis, in order to

identify suitable learning and development interventions that underpinned the ICAF. Suitable learning and development interventions were identified at organisational, job/departmental and individual levels. I operationalised Research Objective Four by implementing the ICAF according to the eight point plans developed by Kotter (1990) and streamlined by Kotter and Rathgeber (2007). This included, for example, establishing a sense of urgency, pulling together the guiding team. Finally, Research Objective Five was operationalised via a detailed evaluation of the implemented ICAF. The four level Kirkpatrick (1996) training evaluation model was used to measure the effectiveness of the design and development of the ICAF both in individual and organisation performance terms, for example, the results impacting on the business as a whole.

The thesis will now move on to undertake a critical review of relevant literature regarding individual competency assurance, so as to place the research into a wider context.

Chapter Four:

Literature Review

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Chapter Four:

Literature Review

4.0 Introduction

This chapter contains an examination and analysis of current academic and practitioner literature. The literature review contains the following sections:

1. The Control of Major Accident Regulations (COMAH);
2. Competence and competency frameworks;
3. Learning, training and development;
4. Defining an Individual Competence Assurance Framework (ICAF);
5. Conceptual framework and key concepts.

In Chapter Two, I noted that my action research approach was based on Lewin's (1933) cyclical (iterative spiral) process. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the literature review. This included for example, **planning** – deciding on the literature review topic areas, **acting** – obtaining the literature from various documentary sources, **observing** – ensuring the literature was up-to-date and from reliable sources that would stand the test of academic rigour, and finally, **reflecting** – ensuring the literature dealt with all aspects of the ICAF topic area.

4.1 Control of Major Accidents Regulations

The need for regulatory action regarding major hazardous installations was prompted by a number of serious accidents within the member states of the European Union (EU) (*Norman, 1999*). These included, for example, the Seveso dioxin release that occurred in 1976 within the Lombardi region of Italy, the Flixborough disaster that occurred in 1974 within the UK that resulted in a substantial release of cyclohexane and a subsequent explosion.

The first European directive concerned with accidents and incidents at major hazard installations was adopted in 1982. Known as the Seveso I Directive (82/501/EEC), it was incorporated into UK law as the Control of Industrial Major Accident Hazard Regulations (CIMAH) 1984 (*Norman, 1999*). In 1976, Seveso an Italian town 25kms north of Milan, suffered the highest ever exposure level to an accidental release of dioxin, a poisonous and carcinogenic by-product of an uncontrolled exothermic reaction (*Norman, 1999*). The Seveso accident occurred at a chemical plant manufacturing pesticides and herbicides. A dense vapour cloud containing what is commonly termed a dioxin was released from a reactor. Although no immediate fatalities were reported, kilogramme quantities of the substance lethal to man even in microgram doses were widely dispersed and resulted in immediate contamination of some ten square miles of land and vegetation. More than 600 people had to be evacuated from their homes and as many as 2000 were treated for dioxin poisoning (*Norman, 1999*).

The Seveso I Directive (82/501/EEC) aimed to control major accident hazards by identifying hazardous installations, prevention hazards from occurring and mitigating the effects if a hazard was realised (*Seveso I, 1982*). CIMAH (1984) defined a major accident as an accident presenting serious danger to personnel and the environment, involving dangerous substances, and resulting from uncontrolled developments. Uncontrolled in this sense meant any situation getting out of hand and not lack of control of a system in general. The requirements of CIMAH were defined in terms of processing and the storage of dangerous substances. An installation was classified as a CIMAH site if the process involved alkylation, distillation, reaction, and if the activity could be classified as a toxic, flammable, or explosive nature and if the inventory of isolated storage exceeded predetermined quantities (*CIMAH, 1984*). There were two levels of control identified for CIMAH sites, the first was called top tier, the second lower tier. Lower tier site had to comply with the following, demonstrating general care in handling hazardous materials, demonstrating the safe operation of processes and the reporting of all incidents to the HSE (*CIMAH, 1984*).

The top tier site had additional responsibilities placed on them, over and above the requirements of lower tier site, these included, for example, the development of a safety case highlighting such things as control measures, consultation with the HSE regarding new and modification to existing plants, emergency planning etc (*CIMAH, 1984*). Upon analysis I noted that the Seveso Directive was amended twice, first, in 1987 by *Directive 87/216/EEC of 19*

March 1987 and secondly, in 1988 by Directive 88/610/EEC. Both amendments were aimed at broadening the scope of the original Seveso 1 Directive, in particular to include the storage of dangerous substances.

On 9 December 1996, Council Directive 96/82/EC on the control of major-accident hazards the so-called Seveso II Directive was adopted. EU member states had up to two years to bring into force their national laws, regulations and administrative provisions to comply with this new directive. From 3 February 1999, the obligations of the directive become mandatory for industry, as well as the public authorities of the all EU member states. The Seveso II Directive has fully replaced its predecessor, the Seveso I Directive. Important changes were made and new concepts were introduced in the Seveso II Directive. These included a revision and extension of the scope, the introduction of new requirements relating to safety management systems, emergency planning and land-use planning and a reinforcement of the provisions on inspections to be carried out by member states. The broadening of scope included a far wider range of chemicals hazardous to both people and the environment (*Seveso II, 1996*).

In response to this new directive the UK government implemented the Control of Major Accident Hazards Regulations 1999 (*COMAH, 1999*). The general requirements of COMAH (1999) are that every facility shall take measures to prevent major accidents and mitigate their consequences to both people and the environment. The main overriding aim of Seveso II was to improve the

effectiveness and efficiency of Seveso I. The main changes included, for example, the emphasis on management factors and not just technical safety, the concept of a Major Accident Prevention Policy (MAPP), now applicable to both tier operations and the domino effects of incidents on other plants.

Between 2001 and 2004 a series of major accidents were reported to the European Commission (EC). Two of the incidents reported involved plants in Wales (*HSE, 2003a*). The first incident involved a road tanker of waste alkali (approximately 20 tonnes) that had been transferred to a treatment tank. The tank had no lid and when a chemical reaction occurred; it resulted in the escape of the toxic gas from the tank (*HSE, 2003a*). There was one fatality from asphyxiation and three other injuries to employees who were all taken to hospital suffering from the effects of exposure to hydrogen sulphide gas. The gas left the site and its pungent smell was detected in the vicinity. There was no evacuation and no damage to the environment.

The second incident in 2001, involved a major fire and explosion within a Blast Furnace. The explosion destroyed the integrity of the furnace and allowed an unknown quantity of extremely flammable and toxic blast furnace gas (mainly carbon monoxide) to be released (*HSE, 2003a*). The incident resulted in three fatalities and 17 other injuries (five of whom were detained in hospital in intensive care, critically ill from burns and lung damage (*HSE, 2003a*).

As a direct result of these accidents and others reported, further changes were announced by the UK Government, this resulted in the Control of Major Accidents Hazard (Amendment) Regulations 2005 (*COMAH, 2005; HSE, 2005*). These included aggregation rule changes for certain chemicals. In addition, there were minor amendments to the terminology used in the context of the MAPP. This included a minor amendment ascertaining to organisation and personnel. COMAH 2005 now required all personnel working at major hazardous installations to be involved in arrangements to manage Major Accident Hazards (MAH). COMAH 1999 only made reference to employees and sub-contractors. In addition, there was a similar amendment dealing with planning for emergencies within the context of the safety management system. All COMAH sites are now required to provide specific training for all personnel working at the plant (not just employees), regarding the procedures to be followed in emergencies, for example, contractors, sub-contractors (*HSE, 2005*).

In 2008 additional minor changes were announced by the UK Government, this resulted in the Control of Major Accidents Hazard (Amendment) Regulations 2008 (*COMAH, 2008*). The amendment corrected errors in terminology; this included the words 'installation' and 'safety case' being changed to 'establishment' and 'safety report'. In addition COMAH 2008 now allows the HSE to recover fees for the enforcement of general health and safety functions at certain establishments that require a safety report (*COMAH, 2008*).

One of the key requirements of COMAH 1999, as amended, is that of employee competence, in order to help minimise the potential for human error for safety critical tasks. In the context of COMAH 1999, as amended, a safety critical task is any task or job whereby sub-standard performance and/or failure, could contribute to a major accident. Indeed, the emphasis is placed on major accident prevention, as opposed to general occupational health and safety accidents, such as personal injury, which are the remit of other workplace legislative requirements, for example, the Management of Health and Safety at Work Regulations 1999 (MHSWR). Competence will be considered in more detail in the next section of this literature review.

4.2 Competence and Competency Frameworks

According to the Chartered Institute of Personnel and Development (CIPD) competencies emerged in the 1980s as a response to organisational changes and to wider changes in society (*CIPD, 2007*). One of the first academics to take a keen interest in competencies was Richard Boyatzis, who was born and based in the United States of America (USA) (*Boyatzis, 1982*). His book written in 1982, and entitled 'The Competent Manager: A Model for Effective Performance', proved to have considerable influence on the profession and, over the following two decades, competency frameworks, became an increasingly accepted part of modern Human Resources (HR) practice.

Although in the 1980s and 1990s HR professionals drew a distinction between 'competencies' and 'competences', now the two terms are often used

interchangeably. (*CIPD, 2007*) 'Competency' is more precisely defined as the behaviours that employees must have, or must acquire, to input into a situation in order to achieve high levels of performance, these are more commonly termed 'soft' skills and include such things as communication, problem solving. While "competence" on the other hand relates to a system of minimum standards or is demonstrated by performance and outputs, these are commonly referred to as hard skills as they include such things as operation, maintenance (*CIPD, 2007*).

Upon analysis of the work undertaken by the CIPD it was possible to conclude that competencies are a signal from the organisation to the individual of the expected areas and levels of performance. They provide the individual with a map or indication of the behaviours that will be valued, recognised and in some organisations rewarded. Competencies can be understood to represent the language of performance in an organisation, articulating both the expected outcomes of an individual's efforts and the manner in which these activities are carried out.

According to the CIPD (*2007*), care should be taken in designing a framework to include only measurable components. It is important to restrict the number and complexity of competencies, typically aiming for no more than 12 for any particular role (preferably less), and arranging them into clusters to make the framework more accessible to the users. The framework should contain definitions and/or examples of each competency. A critical aspect of all

competency frameworks is the degree of detail. If a framework is too general i.e. containing only general statements, it will not provide enough guidance either to employees as to what is expected of them or to managers who have to assess their staff against these terms. If, on the other hand, it is too detailed, the entire process becomes excessively bureaucratic and time-consuming and may lose credibility.

An analysis of the work undertaken by the CIPD (2007) suggested that most popular names found in employer competency frameworks included, for example, communication skills, people management, team skills, results-orientation, problem solving. In addition, the analysis revealed that the application of competency frameworks can, first, assist in underpinning performance management systems in general. Second, provide for greater employee effectiveness and efficiency. Third, improve overall organisational effectiveness and efficiency. Fourth, assist in identifying learning and development needs. Fifth, ensure more effective and efficient career management.

It is possible to develop competency frameworks in a number of ways. Firstly, it is possible to draw on the competency lists produced in support of occupational standards and the framework of a National Vocational Qualification (NVQ) Frameworks developed in this way are often linked with progression towards recognised qualifications. Secondly, competency lists are available on the World Wide Web (WWW) and these will come from a variety of sources.

However, one thing which cannot be accessed in this way is a completed ICAF. All that exists in reality are summaries regarding elements of competence assurance frameworks in practice, mainly within major hazard industries.

Fletcher (1991) emphasises the use of the NVQ system as a means of assessing the competence of individuals to carry out tasks. In particular the literature states that NVQs have systems for practically demonstrating competence to carry out particular tasks, as well as the process of defining objectives, gathering evidence, comparing the evidence with objectives, and finally making a judgement on competence. Upon analysis, there are examples of the NVQ framework being effectively used to set standards for maintenance staff and to facilitate their assessment. In these examples the standards tend to focus on the technical knowledge and skills required to maintain plant (in a safe state). This would include knowledge of safety procedures and how to maintain equipment with safety functions, such as pressure relief valves (*Wright et al, 2003*).

However, in practice some companies do not try to follow the NVQ format as there is no way of specifying the hazards related to the tasks that are being assessed. Other companies found that the NVQ system did not cover assessment for competence of all tasks, omitting tasks that individuals would be required to do. Thus, although there were examples where NVQs were seen in a positive light, such as for maintenance staff, there is clearly recognition in industry of some of the drawbacks in using NVQs, and companies are

questioning the methods they are using to assess the competence of individuals to carry out safety related tasks (*Fletcher, 1991; Wright et al, 2003*).

According to the CIPD (2007) many organisations develop their competency frameworks through an internal research programme, sometimes aided by advisers from an external consultancy. Methods of developing a framework range from importing existing competencies, through to developing the entire thing from scratch. The best solution usually lies between these two extremes, namely internally generating a framework that builds in business relevance, as well as adapting existing models that have already been widely used and have proved successful.

The HSE consider the area of competence assessment as vital, and in 2003 they commissioned a report entitled ‘Competence assessment for hazardous industries’. It concluded that past major incidents were directly attributable to the lack of skill and knowledge; in essence some form of human error failing (*Wright et al, 2003*). According to the HSE (2007), competence can be defined as a combination of practical skills, knowledge, thinking and experience. It also includes the ability to undertake work activities to a required standard, on a regular and continual basis. All of these attributes are derived through the application of ongoing quality assured training and development.

An ICAF on the other hand, should enable all personnel to fulfil responsibilities and to perform activities to a recognised and acceptable standard of competence

on an ongoing basis. The purpose of such a system is to control, in a logical sequence and integrated manner, all work tasks within an organisation that are considered safety critical (*HSE, 2007*). It is no longer acceptable to make untested assumptions regarding personnel competence (*Wright et al, 2003*).

Competence assurance is essential for ensuring that adequate levels of competence of all personnel who have an impact on safety are provided and maintained. Managers and employees need to have the necessary knowledge, skills and experience to be able to meet their responsibilities for the control of major accident hazards. The safety report should show that people having key roles in the control of major accident hazards are competent in relation to their responsibilities (*Wright et al, 2003*). An analysis of the new requirements under COMAH 1999, as amended, confirms that it is inadvisable to assume personnel are competent simply by virtue of their exposure to training and experience; therefore, there is a requirement to proactively and systematically assess the competence of staff. Competence assessment is intended to improve accident prevention in the following ways, for example, the assessment of individuals should identify gaps and weaknesses in individual's competence before they contribute to an incident, the setting of competence standards should reveal where unrealistic performance expectations exist for staff, such as expectations to respond to alarms on a remote control panel within a minute despite it taking (say) five minutes to reach a hydrocarbon pump.

4.2.1 Review of Competency Management Systems

As I have already noted competence plays a very important role in controlling operational health and safety risks. Risk control systems rely on a complex mix of hardware, software, human factors and safety management systems. The role of people in controlling risks is central to the HSE's requirements. Whilst the role of people is very important in normal operations, it is vital in degraded, abnormal and emergency operations when it is the ability of the individual to return the system to normal operation that is so important. It is only the competent individual who will be able to undertake such recovery, and this is why competent operation is so important. Where competent performance is not maintained accidents, incidents and injuries may result (*HSE, 2002*).

The purpose of a Competence Management System (CMS) is to control in a logical and integrated manner a cycle of activities within the company that will assure competent performance in work. The aim is to ensure that individuals are clear about the performance that is expected of them, that they have received appropriate training, development and assessment, and that they maintain or improve their competence over time. Learning and development seeks to create a level of competence for the individual or team, sufficient to allow individuals or teams to undertake the operation at a basic level. Initially, this will be under direct supervision which over time becomes less direct. Over time as practical experience grows, operations can be carried out at a more complex level. Such an approach will also increase the confidence of the individual or team to deliver competent performance, while making them aware

of their limitations. Assessment (and reassessment) are how judgements are made that the learning and development inputs have been understood sufficiently to deliver outputs defined in terms of competent performance and outcomes i.e. the safe operation of plant/process (*HSE, 2002*).

In addition to being responsible for their own staff the client company remains responsible for operational health and safety of its contractors and sub-contractors, irrespective of where its resources came from. All of these categories of worker must be competent to control relevant major hazardous processing risks (*HSE, 2002*). There are two options for client companies employing contract and subcontract personnel, agency and the self-employed. First, include such personnel in a competence management system that uses the same or equivalent standards as the client company uses. The client company should be able to verify and audit the competence management system and keep copies of certification showing individuals have been assessed as competent, Second, regard these people as the client company's own staff and take them into the client company's own competence management system, with periodical reassessments, learning and development and keeping suitable records (*HSE, 2002*).

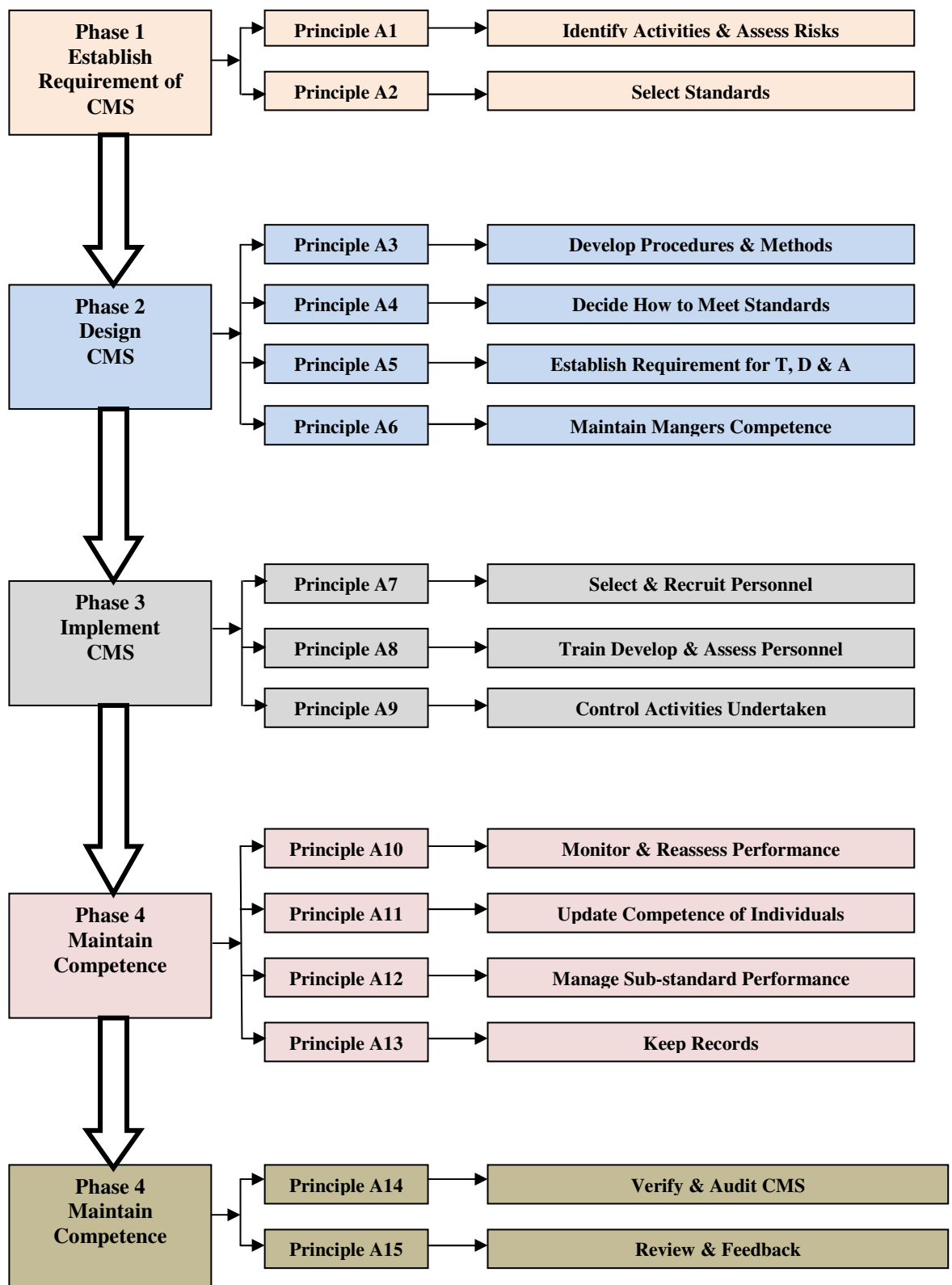
4.2.2 Developing and Maintaining Competence

Prior to the report 'Competence assessment for hazardous industries', other research was being undertaken by the HSE in the area of developing and maintaining staff competence (*HSE, 2002*). The guide 'Developing and

Maintaining Staff Competence' was written for the railway sector, however, it applies equally well to areas such as hazardous installations. Upon analysis of the HSE's approach I determined that a CMS can be viewed as a cycle defined by 15 principles linked in five phases (*HSE, 2002*). This cyclic process should lead to continued improvement in competence. When setting up a new competence management system the starting point is likely to be to establish the requirements for the system. Moving around the cycle the next action is to design the system, and then implement it, and so on. The audit and review provide the results which can be used to update the requirements for the system, and return to the starting point. A summary of the 15 principles of a CMS are shown in Figure 4.1.

The five phases are (*HSE, 2002*):

1. Phase 1 Establish Requirement for CMS – The requirements for the system are established in Phase 1, starting with the identification of activities that may affect operational safety and occupational health and safety (Principle A1) The risk assessment, with control measures, identifies those activities where the competence of people to control risks is important This leads to defining and selecting the competence standards for individuals to enable them to control risks consistently (Principle A2);

Figure 4.1 The HSE's 15 Key Principles (*HSE, 2002*)

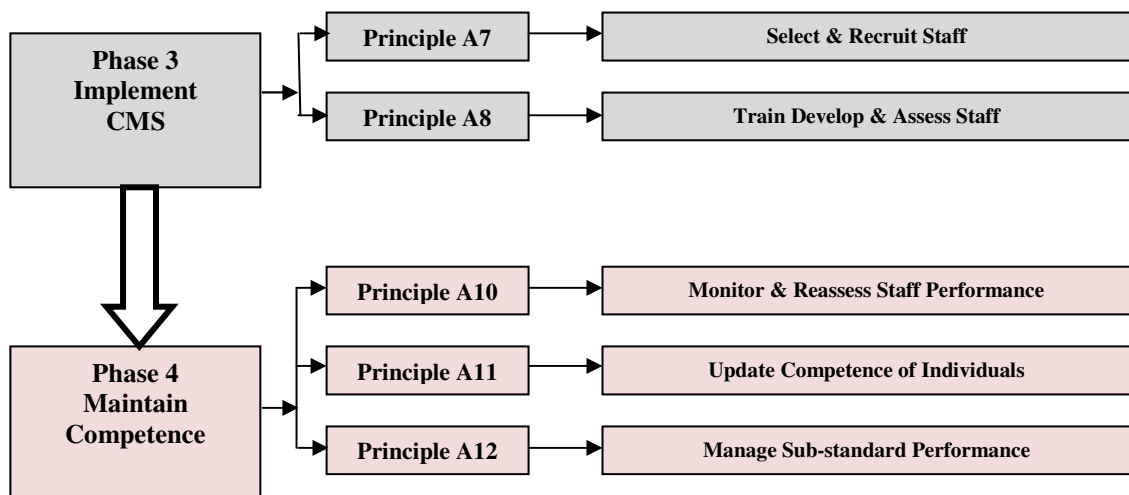
2. Phase 2 Design the CMS – The procedures, methods and work instructions for operating the system are developed to achieve consistency (Principle A3). How each competence standard is met and assessed is then established (Principle A4). The extent of the training, development and assessment requirements is established (Principle A5). The competencies and responsibilities of those managing and operating the system are established (Principle A6);
3. Phase 3 Implement the CMS – Personnel are selected (Principle A7) and recruited against a predetermined criteria selected previously, and trained, developed and assessed (Principle A8) against the competence standards and methods already selected (Principles A2 and A4). Control processes should be established to ensure that staff and contractors only undertake work for which they are competent (Principle A9);
4. Phase 4 Maintain Competence – Monitoring and reassessment of the personnel ensures that performance is being consistently maintained (Principle A10), and that the competence of individuals is updated (Principle A11) in response to relevant changes including changes in legislation, standards and equipment. In particular, systems are required to identify sub-standard performance and restore the competence of individuals (Principle A12). Records must be maintained and made available when requested (Principle A13);
5. Phase 5 Audit and Review the CMS – The verification and audit of the system (Principle A14) checks on the competence assessments and the assessment process. Company management should review the whole

system and feedback, using the information from verification and audit (Principle A15), to update the requirements for the - competence management system which returns the system to Phase 1 and 2, leading to changes or modifications to system design.

4.2.3 Developing & Maintaining Individual Competence

Upon analysis of the HSE's 15 key principles of a CMS (Figure 3.3) it was possible to determine which of these principles applies to the development and maintenance of individual competence. The key principles are shown in figure 4.2 (HSE, 2002).

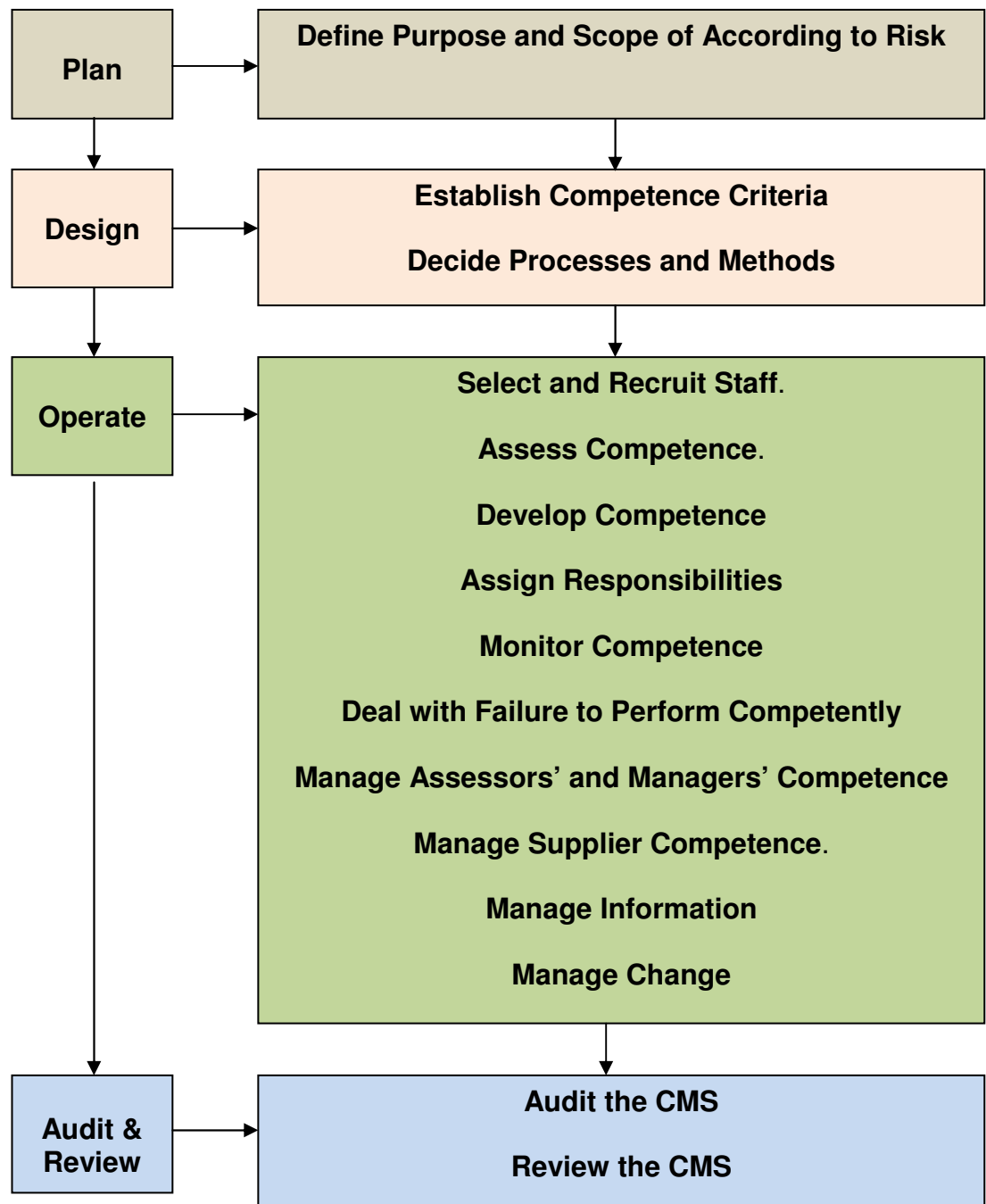
Figure 4.2 Developing and Maintaining Individual Competence



4.2.4 Managing Competence for Safety Related Systems

In 2007, the HSE published a new document relating to competence entitled, 'Managing Competence for Safety Related Systems. This guidance on competence applied to everyone, in all industry sectors, whose decisions and work with safety-related systems could impact on health and safety in some way. The fundamental aim of the publication was for all personnel within scope to be suitably qualified and experienced for their own work activities, roles and responsibilities. A safety-related system according to this guidance document is a system whose correct operation is necessary for ensuring or maintaining safety. A safety-related system can use a variety of electrical, electronic, and/or programmable electronic technologies and may include software and people. In general, safety-related systems can be classified as protection systems or control systems. The latest competency development model defined by the HSE (2007) in this new publication is shown in Figure 4.3.

The form of this guidance is based on the railway-specific HSE publication discussed previously in this chapter, Developing and Maintaining Staff Competence. The scope of this new document, however, differs significantly and it does not replace the railway publication. HSE Inspectors must take into account the principles of this document when judging the adequacy of a duty holder's arrangements for competence management. This will take into account additional legislation and regulatory practice where applicable. Upon analysis of the new publication it is possible to note that it places the topic of competence assurance into a much sharper focus.

Figure 4.3 Managing Competence for Safety-Related Systems

The document and model put forward is highlighted in a clear, concise and succinct manner, and in my view is an improvement on the original work of the HSE within the railway sector. The document is published in a more user-friendly format (*HSE, 2007*).

An analysis of the model developed by the HSE (*2007*) reveals that there are four phases and fifteen key principles, these include:

1. Phase 1 – Plan

Principle 1: Define Purpose and Scope According to Risk – Specify all work activities to be included in the competency framework, based on the risk associated with those activities.

2. Phase 2 Design

Principle 2: Establish Competency Criteria – Select/ develop a suite of competence criteria that covers all activities within the scope of the competency framework and gives sufficient confidence that all personnel that meet particular criteria are competent to perform the related work activity.

Principle 3: Decide Processes and Methods – Establish efficient and consistently repeatable processes, procedures and methods that implement the requirements of the principles in this guidance.

3. Phase 3 Operate

Principle 4: Select and Recruit Staff – Select internally, and recruit externally, personnel that have an appropriate and demonstrable competence profile.

Principle 5: Assess Competence – Determine the extent to which personnel currently meet the established competence criteria.

Principle 6: Develop Competence – Extend and maintain the competence of personnel so that they are able to meet relevant competence criteria.

Principle 7: Assign Responsibilities – Ensure that personnel and suppliers undertake only work for which they have been assessed as competent.

Principle 8: Monitor Competence – Monitor whether or not staff assessed as competent are continuing to perform competently and to initiate corrective action where appropriate.

Principle 9: Deal with Failure to Perform Competently – Respond to failures to perform competently so that the impact on safety is minimised, including initiating actions to restore the competence of individuals.

Principle 10: Manage Assessors/Managers Competence – Ensure that senior managers, managers of the competency framework and assessors are competent to support and fulfil the requirements.

Principle 11: Manage Suppliers Competence – Ensure that all relevant work activities of suppliers are always performed by competent personnel.

Principle 12: Manage Information – Maintain accurate information from the operation of the competency framework, in sufficient detail to enable efficient operation and to demonstrate that its requirements are being met.

Principle 13: Manage Change – Monitor changes in the internal operation of the organisation and its external environment, to determine implications for individuals, teams and the competency framework and to initiate changes as appropriate.

4. Phase 4 – Audit and Review

Principle 14: Audit – Audit the competency framework with sufficient frequency to give confidence that it is meeting its objectives and operating as intended, and to initiate improvement action where appropriate.

Principle 15: Review – Review identified changes and the combined evidence on the operation of the competency framework generated from dealing with competence failures and from audits, and to initiate improvements to the competency framework as appropriate.

The latest competence model identified by the HSE (2007), sets out the relationships between the concepts used, in particular the relationships between roles, work activities and competence criteria. Each role is broken down into a set of work activity area, each of which requires particular technical skills, behavioural skills and knowledge. Each role has its own set of competence criteria, derived from the work activities that make up the role. An individual's role is specified in terms of the work activities that they must be able to undertake. The associated competence criteria specify the knowledge, skills, experience and behaviour that is necessary for the individual to be considered competent for the role. To determine if an individual is competent to carry out

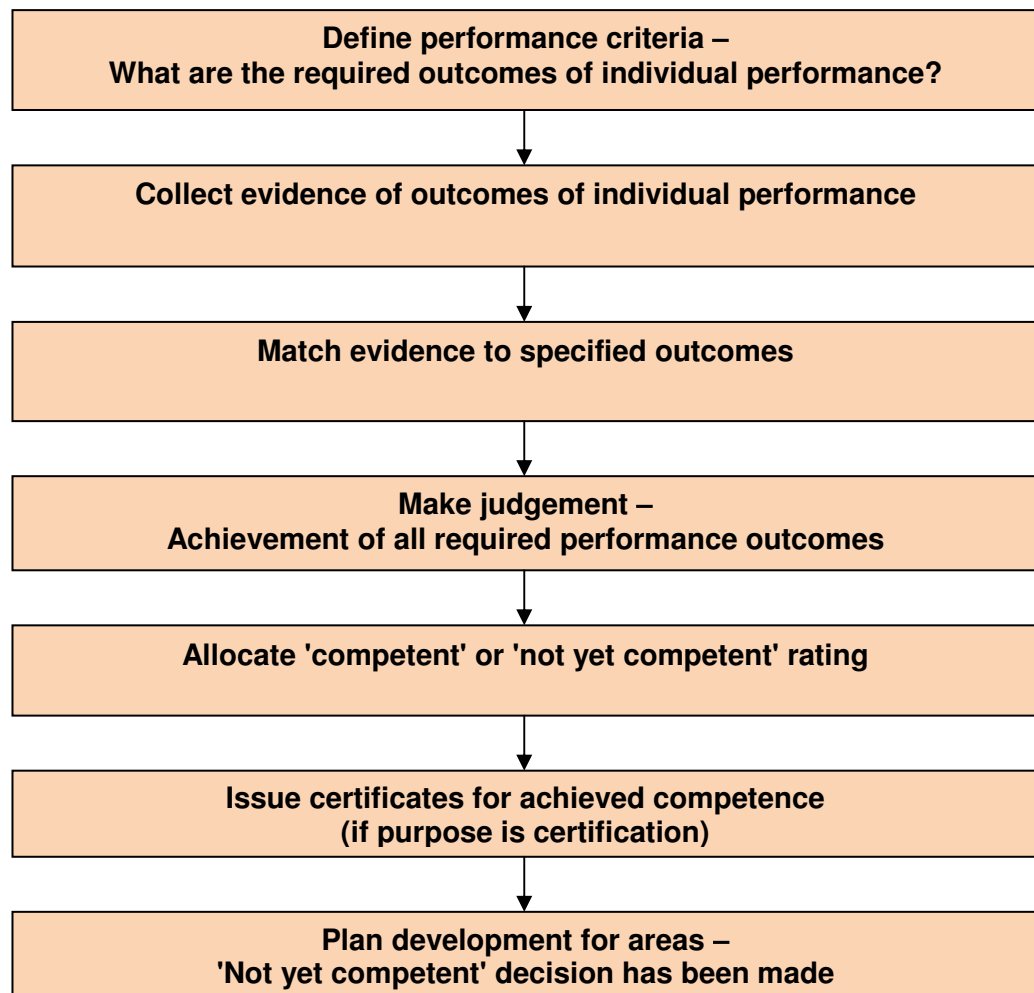
their role, they are assessed against the predetermined competence criteria. The person is deemed competent for the role if their evidence demonstrates that the competence criteria for the role have been met. If the assessment discovers minor shortfalls in competence, it may be possible for the individual to perform a very similar role with the addition of well-defined precautionary measures such as increased supervision.

4.2.5 Approach to Competence Assessment

In 2000, Fletcher outlined the standard approach to competence assessment, (see Figure 4.4). He concluded that it is important to determine the answers to the following questions. First, what is it we want to assess? Assessment can be looking at someone's ability to learn, or their progress within a development programme, or their on-the-job performance. Second, why are we assessing?

The reasons for carrying out competence assessment can be to identify gaps, appraise performance, carry out a skills audit etc. Third, is certification required? In terms of competence assessment certification requires more than having attended a training course, i.e. it requires assessment of whether the person can perform to a certain standard. Fourth, decide how to assess? For example, do you require a one-off demonstration of performance or do you want to know that people can perform to a specified standard over a period of time? Ideally competence should be based on the outcomes of performance and the assessment of individuals over a continuous period. It is vital to include enough contextual information to make the action credible.

**Figure 4.4 Standard Approaches to Competence Assessment
(Fletcher, 2000)**



In addition, it is important to consider who will assess competence, particularly in the context of work place assessment. Whilst it is vital that the assessor understands the tasks and functions, it is equally important that they understand the process of assessment and can provide an impartial opinion. This is a vital component of NVQ type assessment. Accordingly, it is advised that assessors, including line managers, are instructed in assessment and that, in some cases, an independent person contributes to the assessment (Fletcher, 2000).

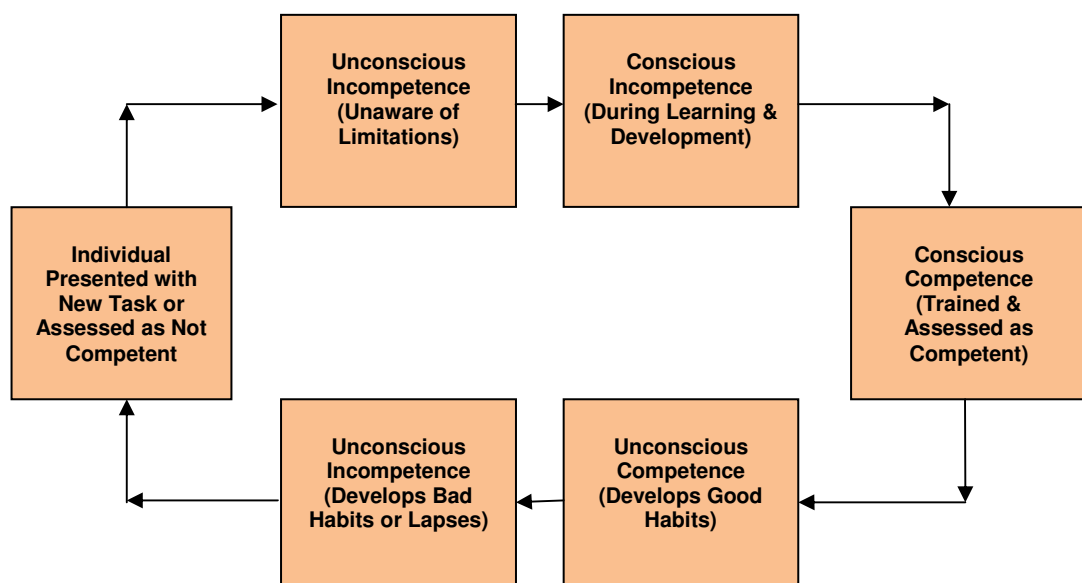
The assessment method must provide a valid and sensitive measure of the type of competence required. For example, observation of a person carrying out a procedure may demonstrate their ability to recall and follow procedures, but it may not test whether they understand the consequences of deviating from the procedure. An analysis of the various assessment methods include, for example, physical / sensory-motor type competences, the ability to carry out a prescribed procedure of work, cognitive skills, knowledge of plant and processes, interpersonal skills, team management skills, safety behaviours and attitudes (*Fletcher, 2000*).

4.2.6 Stages of Competence

Competence plays a very important role in ensuring functional health and safety. For a person to be deemed competent, they need qualifications, experience, and qualities appropriate to their duties (*HSE, 2007*). These include, first, suitable and sufficient training to ensure the acquisition of the necessary knowledge of the field for the tasks that they are required to perform. Second, they require adequate knowledge of the hazards and failures of the machinery, work equipment and processes for which they are ultimately responsible. Third, a knowledge and understanding of the working practices used are a pre-requisite. Fourth, there must be an ability to communicate effectively with other personnel. Fifth, they must have an appreciation and understanding of their own limitations and constraints, and a willingness to point these out.

To assure an effective and consistent standard of competence all personnel require a process of continuous improvement. When personnel begin to acquire competence for a new task, or begin progressing to a higher level of competence, they will be unaware, at least to some extent, of what they can and cannot do. Through a process of training and development initiatives, they will first become aware of their limitations and then overcome those limitations to become competent. Gradually, their work becomes second nature, and they become well practised even in situations that they encounter less often. In effect, people reach a level of almost automatic performance to a high standard. One of the fundamental problems is that associated with ‘competence decay’, without realising, personnel can again become unaware of their limitations. This could be because of external developments, for example, new technologies or because of a drift to bad habits in routine work (*HSE, 2002; HSE, 2007*). An overview of the competence stages is shown in Figure 4.5.

Figure 4.5 Stages of Competence



Before embarking on specific learning and development initiatives aimed at improving competence, organisations need to ensure that skills and knowledge outputs are measured in an effective and robust manner. No matter what new skills and knowledge we decide to learn there are four distinct learning stages that everyone must travel through. Being aware of these stages helps us improve the acceptance that learning is a slow and sometimes painful progressive process (*Adams, 2004*). The four stages are unconscious incompetence, conscious incompetence, conscious competence and unconscious competence. At the unconscious incompetence stage the trainee is not aware of the existence or relevance of the skill/ability area. They are not aware that they have a particular deficiency in the area concerned. They must become conscious of their incompetence before development of the new skill or learning can begin. The aim for the trainee is to move into the 'conscious incompetence' stage, by demonstrating the skill or ability and the benefit that it will bring.

At the conscious incompetence stage the trainee becomes aware of the existence and relevance of the skill and ability. They are also aware of their deficiencies within this area. They realise that by improving their skill or ability their effectiveness will improve. The person has a measure of the extent of their deficiency and a measure of what is required to demonstrate competence. They ideally make a commitment to learn and practice the new skill/ability, and to move to the 'conscious competence' stage.

Moving on the trainee achieves a 'conscious competence' in a skill/ability when they can perform it reliably and readily. They will need to concentrate and think, however, they can perform it without assistance. The trainee will not reliably perform unless thinking about it, the skill/ability has not yet become 'second nature'. They should be able to demonstrate the skill to others; however, it is unlikely they will be able to teach the skill. It will be necessary to continue to practise the new skill, and commit to becoming 'unconsciously competent'. Practicing will allow the trainee to progress further.

Finally, at the unconscious competence stage the skill becomes so practised that it enters the unconscious parts of the brain, it becomes 'second nature'. Common examples include driving, sports activities, computing. It becomes possible for certain skills to be performed while doing something else, for example, crafting while watching TV. This is often referred to as the ability to 'multi-task'. The person might now be able to teach others in the skill concerned, although after some time of being unconsciously competent the person might actually have difficulty in explaining exactly how they do it, in effect the tasks they perform are invariably undertaken through instinct alone. Consequently there is a requirement, particularly with hazardous industries, for long-standing unconscious; competence individuals to be checked periodically against existing/new standards.

The main danger is that without realising it personnel can regress and become 'unconsciously incompetent' (competence decay) again. In order to avoid this

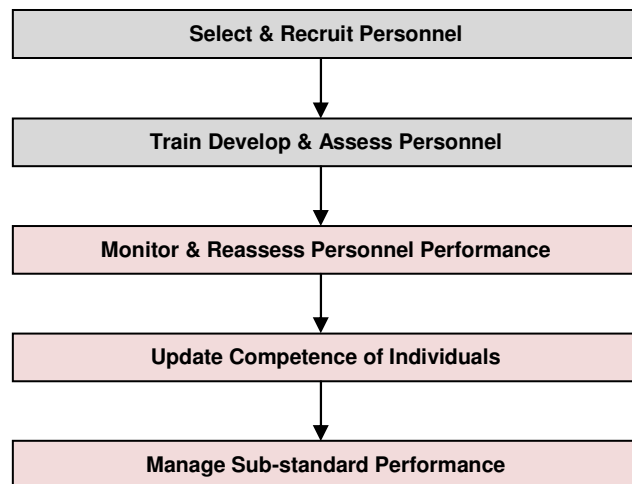
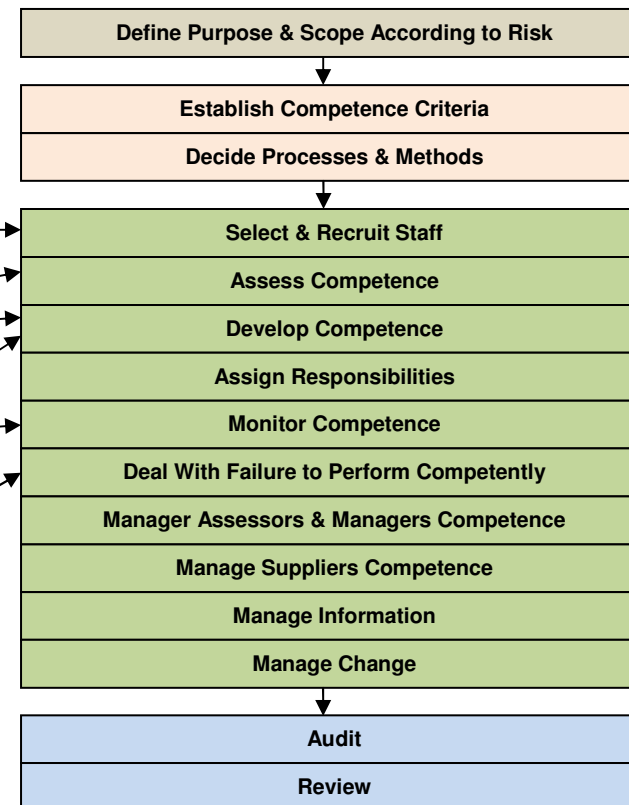
monitoring and reassessment of performance must be undertaken at the individual level, and verification, audit and review must take place at a management system level (*HSE, 2002; HSE, 2007*).

While personnel may be currently competent, they do not necessarily retain a satisfactory level of competence over time. The level and nature of the competence of personnel in a company will be continually changing. The purpose of the CMS is to provide checks and guidance to help organisations meet their legislative duty to provide adequate resources with a sufficient level of competence to ensure health, safety and welfare is consistent so far as is reasonably practicable (*HSE, 2002*).

4.2.7 Defining Individual Competence

From an analysis of the latest competence management model put forward by the HSE (*2007*) (Figure 4.3 Managing Competence for Safety-Related Systems), it was possible to conclude that no attempt was made to define individual competence, unlike its similar counterpart, Developing and Maintaining Staff Competence (Figure 4.2) (*HSE, 2002*). Consequently, in order to define individual competence in the context of both documents I decided, in consultation with my Research Supervisors, to undertake a comparison of the two approaches in order to identify common themes. This would aid my ultimate goal of defining a best practice ICAF. The results of the comparison are shown in Figure 4.6.

Figure 4.6 Individual Competence Comparisons

Developing and Maintaining Individual Competence (*HSE, 2002*)Managing Competence for Safety Related Systems (*HSE, 2007*)

An analysis of Figure 4.6 reveals that the common themes of the two approaches identified by the HSE (2002; 2007) (be it five years apart) are select and recruit personnel / select and recruit staff, train develop and assess personnel / assess competence and develop competence, monitor and reassess personnel performance / monitor competence, update competence of individuals / develop competence and manage sub-standard performance / deal with failure to perform competently. From a personal perspective I believed that other elements should be contained within the overall approach to individual competence assurance. These include, defining both purpose and scope of the individual competence assurance framework and not just the overall competence management system. Establishing a competence criterion, this forms part of the overall competency management system, however, it is vital to assessing and maintaining individual competence to define the criteria from the onset. Assessing competence at the recruitment and selection stage and after the delivery of learning and development interventions is vital. Unless we know what the individual level of competence is from the onset, then it would be impossible to determine the most appropriate level of competence development initiatives. Finally, each stage of developing and maintaining individual competence must be audited and reviewed in order to measure the impact on overall organisational effectiveness. Where non-conformance is identified corrective action must be taken, where appropriate.

4.3 Learning, Training and Development

‘Learning’, ‘training’, and ‘development’ are terms that are often used interchangeably. Consequently, this has led to some confusion, especially as the way the terms are used has changed gradually over the years (*CIPD, 2007b*). Since the mid-1990s, there has been a gradual shift in the techniques and terminology used to describe the steps to help employees perform their jobs more effectively. Until recent times, ‘training’ would have been the word most frequently employed whether to describe a development technique, for example, a classroom-based event. Now ‘learning’, often linked with ‘development’, is the key term (*CIPD, 2007b*).

Learning is a process leading to increased adaptive capacity (*CIPD, 2007b*), in other words, an arena where individuals learn and acquire the capabilities that enable them to add value to their organisations. The term ‘development’ is usually used in a wider context than either ‘learning’ or ‘training’ and encompasses the two of these. It tends to refer to, for example, acquiring skills or knowledge that may include a number of elements such as training, coaching. It can be structured or created as a personal plan, for example, management development.

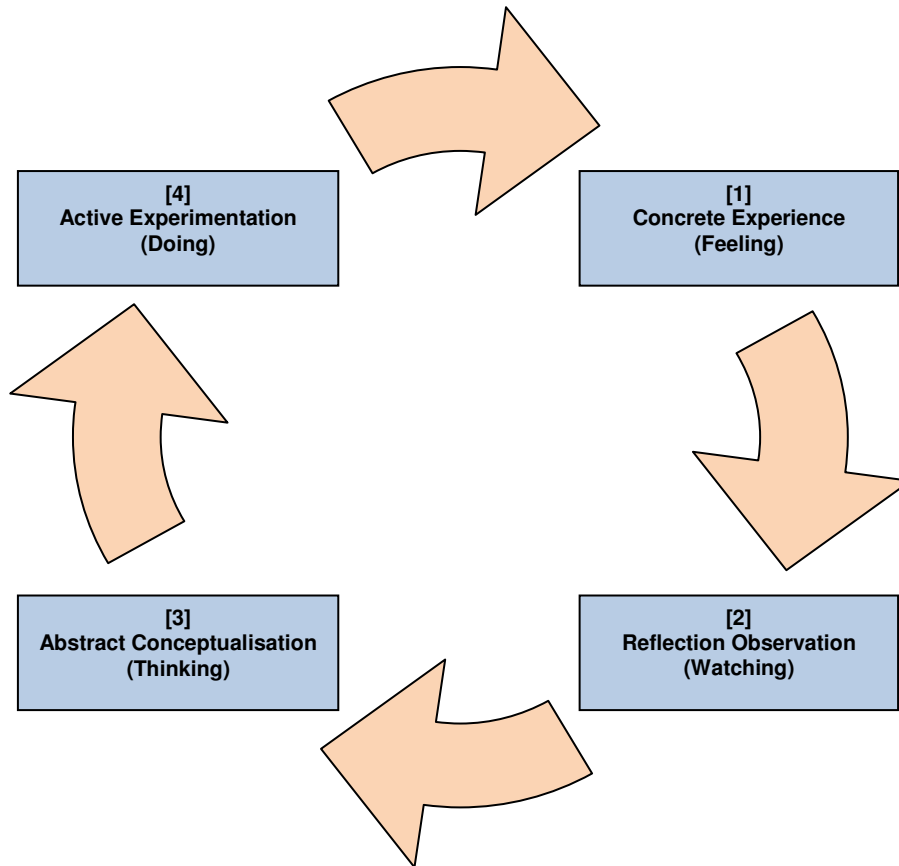
Training is defined by the CIPD (*2007b*) as an instructor-led, content-based intervention leading to desired changes in behaviour, and which, unless it is ‘on-the-job’ training, involves time away from the workplace in a classroom or equivalent. In reality it implies teaching specified skills by practice. Until

relatively recently, the implicit assumption was that most, if not all, development of employees would be of this nature. Clearly, training is one way of making learning happen; however, in reality there is no one 'cookbook' approach to learning.

4.3.1 Kolb's Experiential Learning Theory

David Kolb, with his colleague Roger Fry, developed the theory which is known today as 'experiential learning' (*Kolb & Fry, 1975*). They concluded that all learning consists of four distinct cyclical elements. These include (Figure 4.7), concrete experience, observation and reflection, forming abstract concepts and testing in new situations. In essence the learning cycle can begin at any one of the four points and that it should be approached as a continuous learning and development cycle (*Kolb & Kolb 2001*). It is suggested, however, that the learning process often begins with a person undertaking a particular action and then seeing how their action(s) affect the situation concerned. They then need to understand these effects in the particular instance, in order that, they can replicate that same action in the same situation.

From a personal perspective, whilst I subscribe to the theory that learning and development can commence at any point on the cyclical scale, it is vital that the implementation of new learning is managed and controlled, particularly within a hazardous environment. For example, if an employee formed an abstract concept and then decided to test that concept at a hydrocarbon installation, then the end result could be catastrophic.

Figure 4.7 Kolb's Experiential Learning Theory

Many writers have commented that experiential learning can be split into two distinct facets. Firstly, the term can be used to describe the sort of learning undertaken by people who are given the chance to acquire and apply knowledge, skills and feelings in an immediate, relevant and appropriate setting. Experiential learning in this sense involves a 'direct encounter' with the topic being studied. Secondly, the term can also be used to describe 'the education' that occurs as a direct result of the participation process. Learning in this context is sponsored by the people themselves; in so much as they learn by reflecting on their exposure experience as whole (*Houle, 1980; Brookfield, 1983*). This is commonly referred to as reflective practice (*Schön, 1983*).

4.4 Conceptual Framework and Key Concepts

A conceptual framework can be defined as a map or research travel plan. At the start of the research process, it is important to consider the relevant theory underpinning the research phenomenon. By evaluating this theory the researcher can begin to develop a loosely structured conceptual framework to guide them (*Slevin & Basford, 1999; Sinclair, 2007*). The following questions have been adapted from Sinclair (*2007*):

1. “What do I know about the phenomenon that I want to study?”
2. “What types of knowledge are available to me?”
3. “What theory will best guide my practice?”
4. “Is this theory proven through proven linked research?”
5. “What other theories are relevant to this practice?”
6. “How can I apply these theories and findings in practice?” (*Sinclair, 2007, p.39*).

According to Clark and Causer (*1991*) all researchers need to identify key concepts in their research, to show an awareness of, and to examine critically, the most important definitions of the concepts in current literature, and either to adopt the existing definitions or develop an original definition because it is best suited to the research question under investigation. The development of the conceptual framework and the definition of key concepts are matters which are deemed continual ‘work in progress’, throughout the thesis (*Clark & Causer, 1991*). An important aspect of this process will be a critical analysis of existing literature in the chosen topic area, using it as a means of clarifying conceptual

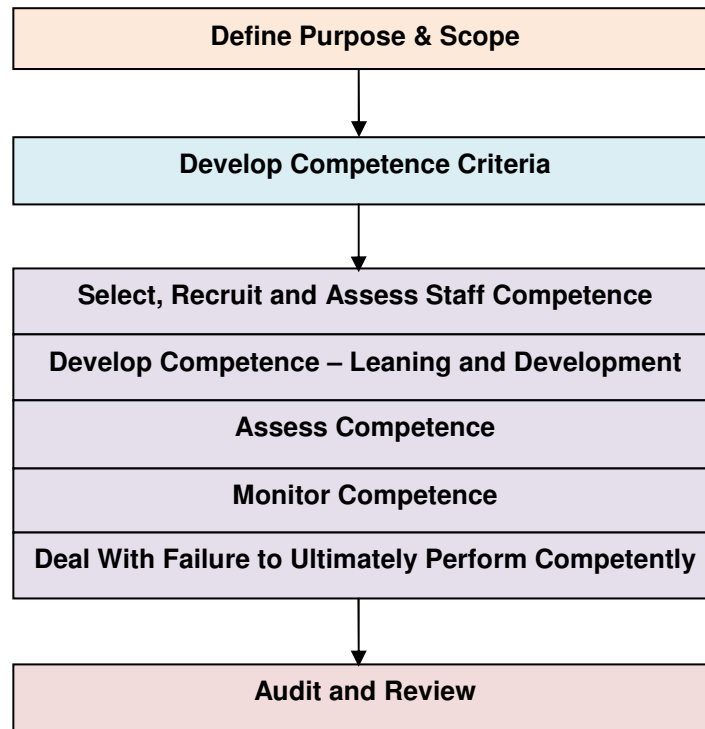
questions and as a benchmark of existing knowledge. By identifying the relevant literature to which the research will contribute and showing a satisfactory knowledge of the context and background of the research is one of the main criteria which will be applied to assessing the merits of the Professional Doctorate thesis.

From an analysis of the literature review it was possible for me to determine key elements of a best practice ICAF, in essence my conceptual framework (see Figure 4.8). These included:

1. Define purpose and scope of individual competency assurance framework;
2. Develop an all encompassing competence criteria;
3. Select, recruit and assess staff capable of operating a Hydrocarbon facility, including pre-assessment of competence, to ensure that the learning and development initiatives are appropriate;
4. Develop competence – implementation of learning and development initiatives;
5. Assess competence;
6. Monitor competence to ensure continuance of skill, knowledge etc;
7. Deal with failure to ultimately perform competently, this may result in applying additional learning and development initiatives, re-deployment to other areas or dismissal from the hazardous installation;

8. Audit and review the overall effectiveness and efficiency of the individual competency development framework in organisational performance terms.

Figure 4.8 Conceptual Framework



I felt it of importance to define the purpose and scope of the ICAF from the onset. The types of competence that the organisation requires in order to undertake its role in the community professionally and without undue risk can be wide ranging. For example, if an organisation has to comply with COMAH 1999, as amended, then the control of safety critical tasks is paramount. In essence clearly defining the purpose and scope of the individual competency assurance framework from the onset will provide a clear focus on overall direction and purposeful development.

Developing a competence criterion is of vital importance. As I noted earlier in this thesis the activities of personnel can impact significantly both inside and outside an organisation. The quality of the competence criterion has a bearing on the overall effectiveness and efficiency of the ICAF. It is necessary to address the range of competence that is required within the organisation as a whole, for example, technical skills, behavioural skills, underpinning knowledge and understanding. It was necessary to show how the criterion relates to roles within the organisation, in particular, how they match the management and team structures.

Selecting, recruiting and assessing staff competence encompasses a wide range of possibilities, to include, for example, transferring personnel within the organisation, recruiting personnel from outside the organisation and employing interim/freelance personnel to undertake specific tasks/roles for a specified timescale. According to the HSE (2007), integrating recruitment and selection into the overall ICAF is considered to be best practice. Assessment of skills, knowledge, understanding, and behaviour can be determined through the process of a competence based in-depth interviews, whereby it is possible to extrapolate evidence of competence undertaken by the candidate in a previous life.

One of the keys to developing competence is through the application of learning and development, discussed in detail, previously in this chapter. For each individual it is deemed necessary to create, implement and maintain an

individual learning and development plan. This should ultimately be geared to the outcome of the section and recruitment process. The plan should include, for example, the following learning and development initiatives, induction, core training modules, external courses, structured development activities, refresher training.

In assessing competence it is necessary, in consultation with the individual, to define the following from the onset. First, when each assessment will take place. Second, the objectives and implications for the individual(s) concerned. Third, the competence criteria the individual will be assessed against. Fourth, deciding which assessment criteria will be utilized, for example, written test, questioning, demonstration. Fifth, the context in which the criterion will be applied, for example, emergency response can only realistically be undertaken using simulation and simulators. It is necessary to collect evidence of performance and make a judgement as to whether or not the competence criteria has been met or exceeded.

It is vital to monitor the competence of all personnel within the scope of the ICAF, proactive mechanisms must be established. These include, for example, self assessment, observations by supervisors, managers, their peer group, appraisals of performance, the recognition of 'skill decay' repeated mistakes, constant failure to perform correctly, a perceived lack of commitment brought on by low morale, motivation, illness. For all of the above deemed as non-conformance, then it is necessary to develop an individual action plan in order

that remedial improvement, back to the require competence standard, can be achieved once again.

It is necessary to determine the root causes for failure to perform competently. Reasons for inadequate performance can include, for example, ineffective and inefficient learning and development, organisational culture, time and/or commercial pressures leading to the need to cut as many corners a possible, team relationship, such as, poor/ineffective leadership, abysmal communications, inadequate inter personal relationships, failure of the individual competence assurance framework such as personnel undertaking tasks for which they have not been deemed competent, failure to reassess and develop competence. In some instances it may be deemed appropriate to redeploy or terminate the employment of personnel who persistently fail to perform competently. Termination must only be considered a viable option where competence development measures have failed to achieve desired outcomes.

Finally, it is necessary to audit and review the ICAF. The key purpose of developing and implementing such a framework is to ensure that the individual competency requirements of COMAH are met in full. The key requirement of the audit and review stage is to provide confidence that the ICAF is meeting and/or exceeding its intended purpose. Where it is not meeting its intended purpose then a planned programme of corrective action must be planned.

4.5 Conclusions

This chapter has undertaken an examination and analysis of current academic and practitioner literature, regarding the topic of individual competency assurance. The review began with an in-depth search for suitable material appertaining to the research aim. An action research approach based on Lewin's (1933) cyclical (iterative spiral) process was applied to the literature review. Examples of the four phases of planning, acting, observing and reflecting were provided within the introduction section of the literature review.

Reviews and analysis were undertaken of major accident regulations, competence and competency frameworks as well as learning, training and development. I noted that the need for regulatory action, regarding major accident sources, was prompted as a direct result of a number of serious accidents within the member states of the EU (Norman, 1999). These included, for example, Seveso, Italy, 1976 a large dioxin release from a chemical plant. The outcome from this accident at Seveso, as well as other similar accidents within the EU resulted in the first European directive concerned with accidents and incidents at major hazard installations. Known as the Seveso I Directive (82/501/EEC), it was incorporated into UK law as CIMA 1984 (Norman, 1999). I noted that the Seveso Directive was amended twice, first, in 1987 by *Directive 87/216/EEC of 19 March 1987* and secondly, in 1988 by *Directive 88/610/EEC*. Both amendments were aimed at broadening the scope of the original Seveso I Directive. On 9 December 1996, Council Directive 96/82/EC on the control of major-accident hazards the so-called Seveso II Directive was adopted. EU

member states had up to two years to bring into force their national laws, regulations and administrative provisions to comply with this new directive (*Norman, 1999*). In response to this new directive the UK government implemented COMAH 1999. The main overriding aim of Seveso II was to improve the effectiveness and efficiency of Seveso I. As a direct result of a continuance of accidents and incidents at major hazardous installations, further changes were announced by the UK Government, this resulted in COMAH 2005 (*HSE, 2005*). One of the key requirements of COMAH is that of employee competence, in order to help minimise the potential for human error for safety critical tasks (*COMAH, 2005*). In 2008, it was noted that minor amendments were made to terminology (*COMAH, 2008*).

From an analysis of the work undertaken by the CIPD (*2007*) it was possible for me to conclude that 'competency' is more precisely defined as the behaviours that employees must have, or must acquire, to input into a situation in order to achieve high levels of performance, these are more commonly termed 'soft' skills and include such things as communication, problem solving. While 'competence' on the other hand relates to a system of minimum standards or is demonstrated by performance and outputs, these are commonly referred to as hard skills as they include such things as operation, maintenance.

Upon analysis of the work undertaken by the CIPD it was possible to conclude that competencies are a signal from the organisation to the individual of the expected areas and levels of performance. They provide the individual with a

map or indication of the behaviours that will be valued, recognised and in some organisations rewarded. Competencies can be understood to represent the language of performance in an organisation, articulating both the expected outcomes of an individual's efforts and the manner in which these activities are carried out (*CIPD, 2007*). I noted that it is possible to develop competency frameworks in a number of ways. Firstly, it is possible to draw on the competency lists produced in support of occupational standards and the framework of a NVQ. Secondly, competency lists are available on the World Wide Web (WWW) and these will come from a variety of sources. However, one thing which cannot be accessed in this way is a completed ICAF. Fletcher (*1991*) emphasised the use of the NVQ system as a means of assessing the competence of individuals to carry out tasks. However, I noted that in practice some companies do not try to follow the NVQ format as there is no way of specifying the hazards related to the tasks that are being assessed. In addition, some companies found that the NVQ system did not cover assessment for competence for all tasks; consequently they are questioning the methods used to assess the competence of individuals to carry out safety related tasks consistently and effectively (*Fletcher, 1991; Wright et al, 2003*). I noted that the HSE consider the area of competence assessment as vital, and in 2003 they commissioned a report entitled 'Competence assessment for hazardous industries'. It concluded that past major incidents were directly attributable to the lack of skill and knowledge, which has resulted in some form of human error failing (*Wright et al, 2003*). According to the HSE (*2007*), competence can be defined as a combination of practical skills, knowledge, thinking and experience. It also

includes the ability to undertake work activities to a required standard, on a regular and continual basis. I concluded that an ICAF on the other hand, should enable all personnel to fulfil responsibilities and to perform activities to a recognised and acceptable standard of competence on an ongoing basis. The purpose of such a system is to control, in a logical sequence and integrated manner, all work tasks within an organisation that are considered safety critical as it is no longer acceptable to make untested assumptions about staff competence (*Wright et al, 2003*).

I noted that prior to the report 'Competence assessment for hazardous industries', other research was being undertaken by the HSE in the area of developing and maintaining staff competence (*HSE, 2002*). The guide 'Developing and Maintaining Staff Competence' was written for the railway sector, however, it applies equally well to areas such as hazardous installations. Upon analysis of the HSE's approach I determined that a CMS can be viewed as a cycle defined by 15 principles linked in five phases (*HSE, 2002*). Upon analysis of the HSE's 15 key principles of a CMS it was possible to determine which of these principles applies to the development and maintenance of individual competence. Further analysis revealed that in 2007, the HSE published a new document relating to competence entitled, 'Managing Competence for Safety Related Systems. This guidance on competence applied to everyone, in all industry sectors, whose decisions and work with safety-related systems could impact on health and safety in some way. The fundamental aim of the publication was for all personnel within scope to be suitably qualified and

experienced for their own work activities, roles and responsibilities. I noted that unlike the 2002 document for the railway sector no attempt was made by the HSE to define individual competence within their 2007 document.

Consequently, in order to define individual competence in the context of both documents I decided to undertake a comparison of the two approaches in order to identify common themes. This aided my ultimate goal of defining a best practice ICAF.

‘Learning’, ‘training’, and ‘development’ are terms that are often used interchangeably. Consequently, this has lead to some confusion, especially as the way the terms are used has changed gradually over the years (*CIPD, 2007b*). Since the mid-1990s, there has been a gradual shift in the techniques and language used to describe the steps taken by employers to help employees perform their jobs more effectively. Until recent times, ‘training’ would have been the word most frequently employed whether to describe a development technique for example, a classroom-based event. Now ‘learning’, often linked with ‘development’, is the key term (*CIPD, 2007b*).

A review and analysis of learning, training and development concluded that learning is a process leading to increased adaptive capacity (*CIPD, 2007b*). Development on the other hand is usually used in a wider context than either ‘learning’ or ‘training’ and covers both of these. It tends to refer to a longer process of learning, acquiring skills or knowledge that may include a number of elements such as training, coaching, formal and informal interventions,

education or planned experience. Training was defined as an instructor-led, content-based intervention leading to desired changes in behaviour, and which, unless it is 'on-the-job' training, involves time away from the workplace in a classroom or equivalent. I noted that Kolb and Fry (1975) concluded that the learning cycle can begin at any one of the four points and that it should be approached as a continuous cycle for example, concrete experience, testing in new situations. From a personal perspective I concluded that learning can commence at any point on the cyclical scale, however, this must be managed within a hazardous environment, due to the dire consequences of uncontrolled activities. Consequently, I concluded that the learning cycle must begin at point number one in order that learning and development can progress in a safe and controlled manner.

A conceptual framework was defined as a map or research travel plan. At the start of the research process, I noted that it was important to consider the relevant theory underpinning the research phenomenon. By evaluating this theory the researcher can begin to develop a loosely structured conceptual framework to guide them (*Sinclair, 2007*). By identifying the relevant literature to which the research contributes and showing a satisfactory knowledge of the context and background of the research, I concluded that this was one of the main criteria which would be applied to assessing the merits of my Professional Doctorate thesis. I was able to demonstrate how the literature identified and critically reviewed within this chapter was intrinsically linked to the conceptual framework and key concepts of the research.

From an analysis of the relevant literature it was possible for me to define the component parts of individual competency development. This was determined as a result of a comparison of key documents published by the HSE entitled *Developing and Maintaining Staff Competence (2002)*, as well as, *Managing Competence for Safety Related Systems (2007)*. As a result of additional analysis I was able to define key aspects of a best practice ICAF, which contained eight key stages. This ultimately defined the structure of my conceptual framework.

The thesis will now move on to report on the development of this best practice framework.

Chapter Five:

The Development of a Best Practice ICAF

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Chapter Five

The Development of a Best Practice ICAF

5.0 Introduction

The theme of this chapter is the development of a best practice ICAF for use at the Alpha Hydrocarbon installation. In Chapter Four, I identified the key components of a best practice ICAF; utilising elements of a best practice CMS, as well as the approach to competency assessment in general.

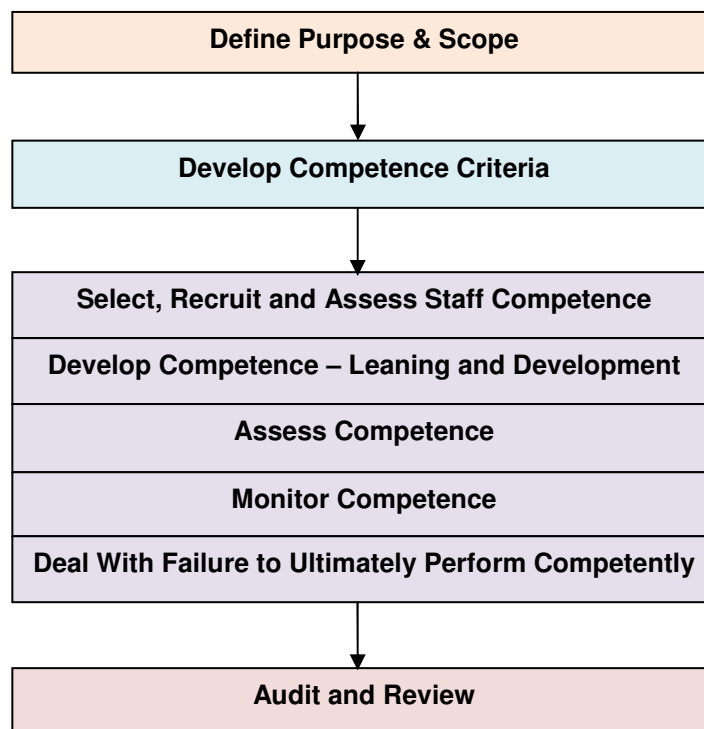
Previously within this thesis, I noted that my action research approach was based on Lewin's (1933) cyclical (iterative spiral) process. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the development of the best practice ICAF. This included for example, **planning** – deciding how the ICAF could be developed, **acting** – discussions with the Operations Director and visits to other hydrocarbon installations, **observing** – how competence was developed and assessed within other hydrocarbon installations, and finally, **reflecting** – ensuring that the task analysis had encompassed all hydrocarbon tasks.

I concluded that a best practice ICAF would encompass the following (see Figure 5.1):

1. Define purpose and scope of individual competency assurance framework;
2. Develop competence criteria;

3. Select, recruit and assess personnel capable of operating an hydrocarbon facility (after competence development), including pre-assessment of competence, to ensure that the learning and development initiatives are appropriate;
4. Develop competence – implementation of learning and development initiatives;
5. Assess competence;
6. Monitor competence to ensure continuance of skill, knowledge etc;

Figure 5.1 Defining a Best Practice ICAF



7. Deal with failure to ultimately perform competently, this may result in applying additional learning and development initiatives, re-deployment to other areas or dismissal from the hazardous installation;
8. Audit and review the overall effectiveness and efficiency of the individual competency development framework in organisational performance terms.

The chapter will now move on to develop each of these areas in turn.

5.1 Define Purpose and Scope of ICAF

In the case of Alpha Hydrocarbon the types of competence that the organisation required in order to undertake its role in the community professionally was wide ranging. Earlier within this thesis I identified that the Alpha site fell under the COMAH umbrella, given that large quantities of hydrocarbons would be stored and introduced into the UK's national grid gas infrastructure. In consultation with the Managing Director and Operations Manager, it was decided that the focus of my consultancy aide was to develop an ICAF, which encompassed only those under the operational umbrella. Staff such as finance, commercial, office based administration would not form part of the ICAF, however, would come under a scheme of future development. In essence the focus was on those personnel who performed safety critical tasks as defined by the COMAH requirements.

5.2 Develop Competence Criteria

The development of the competence criteria, outlined below, was derived through the following. First, I analysed three key HSE documents on the topic area of individual competence assurance. These included, 'Competence Assessment for Hazardous Industries', 'Developing and Maintaining Staff Competence' and 'Managing Competence for Safety Related Systems, the contents of which were described in Chapter Four. Second, I undertook a key word search of the World Wide Web, in order to determine whether any ICAF's were within the public domain. Third, I visited three other hydrocarbon operating facilities, owned by the stakeholder companies. This included visits to the Persian Gulf and Iberian Peninsula. Fourth, I visited two hydrocarbon installations, within the UK and was able to gain access to them through known consultancy contacts. Fifth, I reviewed job descriptions. Sixth, I undertook a task analysis of operational activities, in order to identify competencies and work activity areas.

The full scope of the document is shown in Appendix Two and describes the core and functional competencies, together with the activity impact areas for staff at the Alpha Hydrocarbon processing installation. It is also a guide to help identify ways of further developing potential, building strengths and developing skills and knowledge. This document was used as a reference guide for developing staff on the job or as part of an agreed development planning process. I will now focus on each of my competence development activities in turn.

5.2.1 Search of World Wide Web

I undertook a key word search utilising the Google search engine, in order to determine whether any ICAF's were within the public domain. In addition key word searches were made in the areas of competence, competencies, core and functional competence, competence development, learning and development. This approach proved fruitless by virtue of the fact that ICAF's do not appear to be in the public domain for subsequent analysis.

5.2.2 Visits to Stakeholder Companies

Visits were undertaken abroad to three hydrocarbon operating facilities, owned by the stakeholder companies, on the advice of the Operations Director. The stakeholder companies currently have a number of hydrocarbon operating facilities, throughout the world. I visited hydrocarbon operating facilities in the Persian Gulf and the Iberian Peninsula. Outside of being able to develop an insight into hydrocarbon process plant operations, this in reality proved a fruitless exercise, as it appeared there ICAF's are a closely guarded secret, by virtue of the fact that they are supposed to provide an organisation with a competitive edge.

5.2.3 Visits to Other UK Hydrocarbon Operating Facilities

Through my consultancy contacts I was able to arrange visits to two hydrocarbon operating facilities within the UK. The first hydrocarbon facility was one of the first to be commissioned within the UK and had no jetty type facility. The second was a relatively new hydrocarbon operation; consequently, I was

able to evaluate both old and new over a two day period. Something I was not able to examine in either facility was the ICAF's for the reason noted above. However, one of the key outcomes from this visit was that I was able to identify core hydrocarbon process activities that I subsequently utilized as a basis for developing the hydrocarbon core learning and development interventions. These are described in the next chapter of the thesis.

5.2.4 Review of Job Descriptions

A review was undertaken of the job descriptions that had previously been written, before my arrival on site. A job description is defined as a summary report of information relating to specific roles within the organisation. In the case of Alpha Hydrocarbon these were confined to purely operational roles. Job descriptions are normally derived from a process of job analysis. Job analysis is the process of collecting and analysing information regarding the scope of tasks, responsibilities, skills, knowledge etc, required to undertake a particular role within an organisation. From an analysis of the job descriptions, I concluded that they were inadequate in many ways, in so much, that they did not encompass all of the plant, machinery and work equipment of the new facility. In addition, the job descriptions highlighted tasks that were not a requirement of the role they encompassed. Upon further investigation it transpired that the job descriptions were copies of those of another facility belonging to the parent company. For these reasons I deemed them lacking in reliability, I therefore decided to explore other options in the pursuit of reliable and credible information.

5.2.5 Task Analysis

Task analysis encompasses a wide diversity of techniques utilized to describe and evaluate the human-machine and human-human interactions within the workplace (*Kirwan & Ainsworth, 1992*). According to Kirwan and Ainsworth (1992) task analysis can be defined as a study of what personnel are required to do, in terms of actions and/or cognitive processes, in order to execute their daily work activities. Task analysis methods can also document the information and control facilities used to carry out the task. Task analysis is therefore a methodology which is supported by a vast array of techniques to help collect information, organise it and then use the information provided to make various judgements and/or solutions. The application of task analysis provides the user with an effective 'blueprint' of personnel involvement and interaction (*Kirwan & Ainsworth, 1992*).

Task analysis is one of the most effective and efficient techniques in use today. Rather than select competencies in an ad-hoc fashion, and or plagiarise them from an internet web site, it was decided to utilize task analysis as a methodology for use at Alpha Hydrocarbon. Using this task analysis approach ensured that all activities at the terminal were analysed in a structured and systematic manner. There is a vast array of task analysis techniques available to an analyst; however, one of the more useful is Hierarchical Task Analysis (HTA). This is a broad approach to task analysis, which prompts the analyst to establish the conditions when various subtasks should be undertaken in order to achieve operational outputs. HTA produces a hierarchy of operations; in

essence these are the different tasks which must be undertaken by operating and maintenance personnel as part of day-to-day routine activities. Since the resultant task description is hierarchical, the analysis can be developed in as little, or as much detail, as is necessary. HTA provides an effective means of stating how work should be organized in order to meet process plant operational requirements. HTA can be used to deal with specific issues, such as, for example, the development of operator manuals, learning and development interventions (*Kirwan & Ainsworth, 1992*).

An example of the task analysis worksheet is shown in Table 5.1.

Table 5.1 Example of Task Analysis Worksheet

Activity Matrix for Telecommunication	Undertake Commissioning of System	Undertake Site Acceptance Tests	Prepare and Review Maintenance Schedules	Undertake Maintenance and Fault Resolution	Coordination of Third Parties	Undertake System Design Specification	Provide Input into Procurement Process	Plan Installation Moves and Changes	Verify Requirements Against Deliverables	Manage Spares	Update System Documentation	Ongoing Development and Management
Public Access Branch Exchange (PABX)												
Telephone Systems												
Public Address/ General Alarm												
Closed Circuit TV												
Security System/ Access Control												
Building Management System												
UHF/VHF												
Fibre Optic/ CAT 6 Cabling												
Ships Telecoms Services												
Power Supplies/ UPS												
Audio/ Visual Equipment												
Telecoms Test Equipment												

5.2.6 Aspects of ICAF

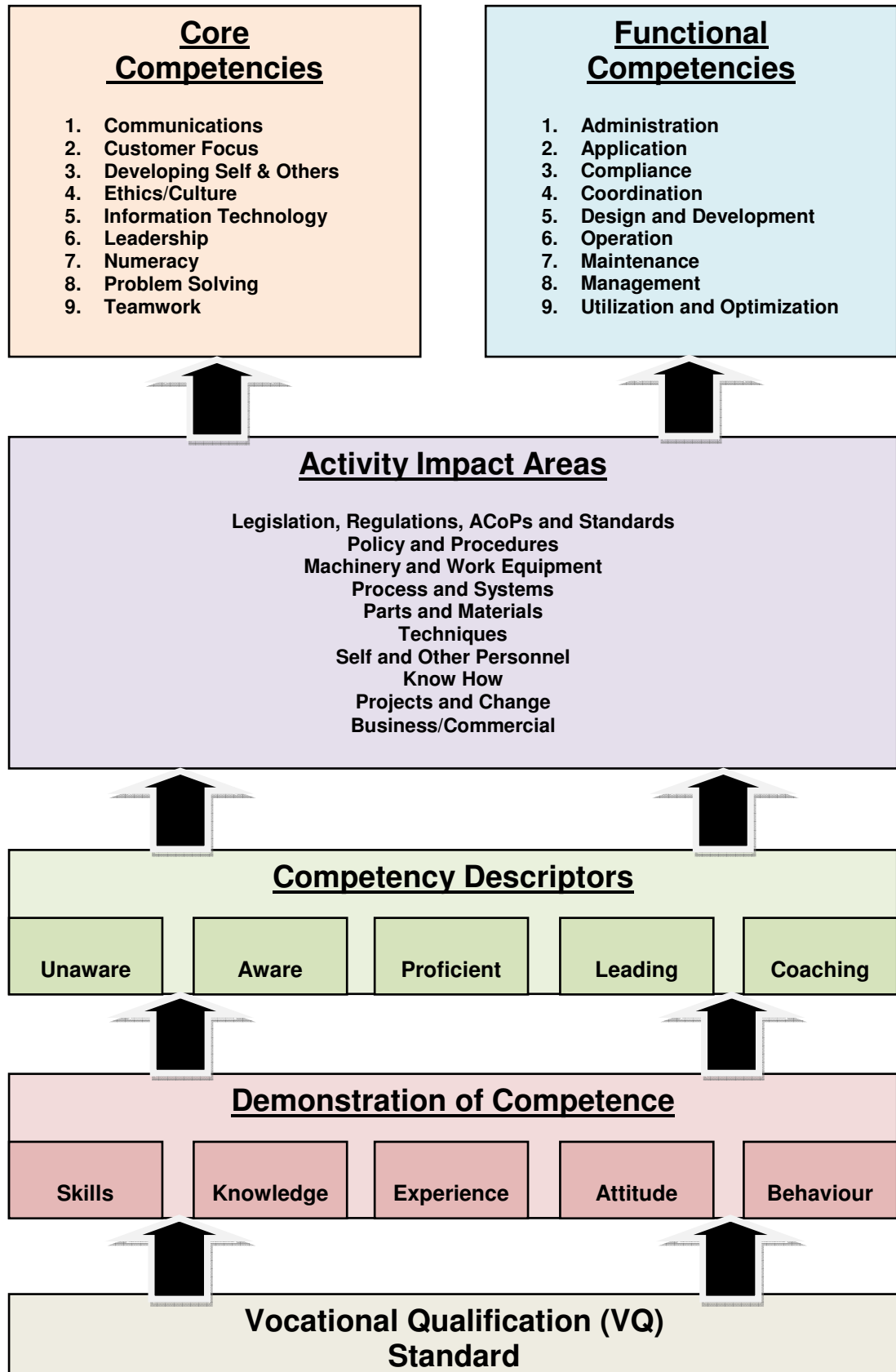
The visit to the hydrocarbon operating facilities and the subsequent task analysis proved to be very useful as it allowed me to examine all of the operating elements of a hydrocarbon facility. Consequently, I was able to identify the following core operations:

1. Hydrocarbon basic introduction to include Hydrocarbon awareness;
2. Shutting down and making safe;
3. Operation of ancillary plant and boil off gas disposal;
4. Natural gas liquefaction;
5. Hydrocarbon export;
6. Power generation;
7. Environmental awareness;
8. Hydrocarbon jetty operations;
9. Risk assessment;
10. Permit to work.

From an analysis of the five key areas of investigation discussed above, I was able to identify aspects of a competence criterion. These included, core competencies, functional competencies, activity impact areas as well as competency descriptors.

An overview of the ICAF is shown in Figure 5.2.

Figure 5.2 Overview of ICAF



The Alpha Hydrocarbon competencies provided an integrated approach to support multiple applications and initiatives, and yet still allow for comparability of results. Each competency was underpinned by a series of competency descriptors, for example, unaware, aware, proficient, leading and coaching, this will be explained in more detail in the section on competency assessment.

From an analysis of competency and competencies definitions, discussed previously within this thesis, I was able to conclude my own interpretation of a working definition. Competencies can be defined as a range of outcomes which are essential to perform a job, or more importantly, differentiate superior performers. In addition, they incorporate a range of skills, knowledge, experience, attitude, behaviour and other relevant personal qualities, for example, unaware, aware, proficient, leading and coaching.

From the analysis undertaken I was able to identify the following, nine core competencies (those that apply to all job functions) and nine role specific competencies (those that may apply within specific job functions). In addition, I identified ten core activity impact areas; in essence these were areas of the Alpha Hydrocarbon business where the core and functional competencies would impact. Each definition was defined and refined in consultation with the Operations Director.

5.2.7 Core Competencies

The nine core competencies identified will now be discussed in detail.

Communication – is the process of transferring information from a sender to a receiver with the use of a medium in which the communicated information is understood by both. It is a process that allows us to exchange information by several methods, for example, speaking, tone of voice, physical means, such as body language, eye contact.

Customer focus – means understanding and meeting or exceeding client/customer requirements. These are those groups or individuals, internal or external (stakeholders) who use the organisation's products and/or services and will encompass the internal customer i.e. another work colleague.

Developing self and others – refers to a proposed strategy for influencing the order in which developments are made, for example, employee development, self development, the act of improving by expanding or enlarging or refining.

Ethics and culture – ethics are the accepted principles of right or wrong governing the conduct of the business and people. Culture refers to the attitudes and behaviour that are characteristic the organisation.

Information technology – includes all matters concerned with the furtherance of computer science and technology and with the design, development, installation, and implementation of information systems and applications.

Leadership – this refers to influencing and directing the performance of individuals and groups towards the achievement of organisational goals.

Numeracy – numeracy is a proficiency which is developed mainly in mathematics but also in other subjects. It is more than an ability to do basic arithmetic. It involves developing confidence and competence with numbers and measures. Numeracy also demands understanding of the ways in which data are gathered by counting and measuring, and presented in graphs, diagrams, charts and tables.

Problem solving – forms part of the most complex of all intellectual functions. Problem solving has been defined as the higher-order thinking (cognitive) process that requires the modulation and control of more routine or fundamental skills. It is part of the larger problem process that includes problem finding and problem shaping.

Teamwork – is the concept of people working together cooperatively. Projects often require that people work together to accomplish a common goal; therefore, teamwork is an important factor in most organisations. Effective collaborative skills are necessary to work well in a team environment.

5.2.8 Functional Competencies

I will now move on to discuss the detail of the nine core competencies identified:

Administration – this includes work/duties undertaken in an administrative capacity, for example, completion of documentation, shift log, permit to work.

Application – this can be defined as diligent effort, the work of applying something, the act of bringing something to bear; using it for a particular purpose, for example, the application of legislative requirements and standards, policies and procedures, application of know how.

Compliance – is the act of adhering to, and demonstrating adherence, for example, compliance with legislative requirements and standards, policies procedures.

Coordination – this refers to making different people or other resources work together for a goal, affect or purpose, for example, coordination of contractors, process, and systems.

Design and development – design refers to the process of originating and developing a plan for example, design of a new process. Development refers to a proposed strategy for influencing the order in which developments are made, the act of improving by expanding or enlarging or refining, for example, employee development, organisation development, business development.

Operation – is an area of business that is concerned with the operation of various aspects of the business, for example, operating process plant and equipment.

Maintenance – this refers to retaining or restoring an item in or to a state in which it can perform its required intended function, for example, maintenance of machinery, plant and work equipment, policies and procedures.

Management – means the act of getting people together to accomplish desired goals. Management comprises of planning, organising, resourcing, leading, directing, controlling etc an organisation (a group of one or more people or entities) or effort for the purpose of accomplishing a goal.

Utilization and Optimization – utilize refers to putting into service; make work or employing (something) for a particular purpose or for its inherent or natural purpose. Optimize can be defined as modifying to achieve maximum efficiency, time or cost, in other words to make optimal; get the most out of; use best, for example, optimising a hydrocarbon process.

5.2.9 Activity Impact Areas

Earlier in this chapter I concluded that ten core activity impact areas had been identified; in essence these were areas of the Alpha Hydrocarbon business where the core and functional competencies would impact. I will now discuss each of these activity impact areas in turn.

Legislation, regulations, approved codes of practice (ACoP) and standards – legislation (statute law) are laws which have been enacted by a legislature or other governing body. Under the current UK legislative system, an item of legislation is known as an Act of Parliament after enactment, for example, The Health and Safety at Work etc Act (HSWA) 1974. Subordinate legislation is referred to as a 'Regulation', for example, The Management of Health and Safety at Work Regulations 1999. From time to time EC Directives will emanate from the European Parliament in Brussels. These directives are adopted by the UK Government and converted into UK style legislation under the Westminster system. The HSWA 1974 allows for the development and approval of statements of preferred work practice, known as ACoP. These are the recommended means of compliance with the requirements of the legislation and have been developed after consultation with the industry or industries concerned. An ACoP does not have the same legal force as an act or regulation, and failure to comply with is not, of itself, an offence. However, observance of a relevant ACoP may be considered as evidence of good practice in a court. Technical Standards are an established norm or requirement. They are usually a formal document that establishes uniform engineering or technical criteria, methods, processes and practices. They emanate from standards bodies, for example, British Standards Institute (BSI).

Policy and procedures – a policy is a deliberate plan of action to guide decisions and achieve rational outcome(s), for example, a health and safety policy. A procedure is a document containing a series of actions, acts or operations

which have to be executed in the same manner in order to always obtain the same result in the same circumstances, for example, emergency response procedure.

Machinery and work equipment – machinery can be defined as an assembly of linked parts or components, at least one of which moves including, the appropriate actuators, control and power circuits, joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material. Work equipment is more broadly defined and covers a very wide range of equipment, both power-operated and manually-operated, for example, generators and hand-tools.

Processes and systems – a process can be defined as a series of actions, changes, or functions bringing about a result, for example, recruitment and selection process. In addition, the definition can encompass the following a series of operations performed in the making or treatment of a product, for example, re-gasification process of a hydrocarbon. A system can be defined as a group of interacting, interrelated, or interdependent elements forming a complex whole, for example, a safe system of work.

Parts and materials – a part can be defined as a portion, division, piece, or segment of a whole, in reality, this means a component that can be separated from or attached to a system; a detachable piece, for example, spare parts for a compressor. Material is defined as a substance or substances out of which a

thing is or can be made. In addition, it can mean something, such as an idea or information that is to be refined and made or incorporated into a finished effort, for example, information to develop a company policy/procedure.

Techniques – a technique is the systematic procedure by which a task is accomplished, in reality, this means the manner and skill with which Alpha Hydrocarbon personnel employ their tools and materials to achieve a predetermined effect.

Self and other personnel – self refers to Alpha Hydrocarbon and contract personnel, for example, you may work alongside an Alpha colleague or a contractor, or a combination of both.

Know how – this can be defined as familiarity, awareness, or understanding gained through experience or study, in reality, it is the sum or range of what has been perceived, discovered, or learned. Every employee/contractor brings with them their own particularly style of know how. The key is to tap into this vast array of skill, knowledge and experience.

Projects and change – a project, as defined in the field of overall project management and consists of an endeavour undertaken to create a product, service etc. Most planned organisation change is brought about by the need to respond to the requirements of both the internal and external working environment, for example, the development and implementation of the ICAF.

Business and commercial – business means the overall organisation set up to supply hydrocarbon to the UK market. The term commercial refers to all business activities.

Vision – means to be a leading Hydrocarbon processing facility, for example, efficiency, reliability.

Values – this refers to valuing its employees, shareholders, customers, suppliers, community and the environment.

5.2.10 Competency Descriptors

Having identified the core and functional competencies, it was next necessary to decide on a series of words that would act as competency descriptors.

Previously within this thesis I noted that Fletcher (2000) confirmed that it was necessary to define a situation where an individual was deemed either competent or not yet competent. In consultation with the Senior Consultant and the Operations Director, it was decided to confirm a range of competency descriptors across a broader spectrum than those defined by Fletcher (2000).

As a result of those discussions the following competency descriptors were agreed:

1. Unaware – those who had not reached the require standard;
2. Aware – those who had reached the required standard with constant supervision;

3. Proficient – individuals who had reached the required standard without constant supervision;
4. Leading – those who had reached and exceeded the required standard and were able to lead the thinking in this area;
5. Coaching – those who had reached and exceeded the required standard and were able to lead the thinking in this area, as well as being able to coach others in the require field.

An example of the competencies, activity impact areas and the required level of competency description, for a competent Hydrocarbon process operator, are shown in Table 5.2.

An example, of the full explanation of competency descriptors is shown in Table 5.3, with all of the competency descriptors for operational staff being shown in Appendix Two.

Table 5.2 Competent Process Operator

Activity Matrix for: Process Operator (Plant)	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	3	3	3	3	3	3			3	3
Apply	3	3		3		3		3	3	3
Comply	3	3		3					3	3
Coordinate			3	3	3	3	3		3	3
Design and Develop		4		3		3			3	3
Operate			3	3		3				
Maintain		3	3	3						3
Manage	3	3	3	3		3	3	3		
Utilize and Optimize		4	3	4	3	3	3	3	3	3

Table 5.3 Example of Competency Descriptors

GENERIC ACTIVITIES AND DESCRIPTORS FOR HYDROCARBON TERMINAL OPERATIONS STAFF					
COMPETENCY	DESCRIPTORS				
	1. UNAWARE	2. AWARE	3. PROFICIENT	4. LEADING	5. COACHING
Administration <i>Has the skills, knowledge and experience (relative to job) necessary to be able to undertake administrative activities.</i>	Unaware does not understand relevant administrative activities. Skill, knowledge and experience are less than adequate to effectively execute the job.	Has awareness and understanding of administration activities within a closely defined area and limited experience of practical application.	Demonstrates comprehensive working knowledge and practical application of all administrative activities.	Demonstrates wide-ranging knowledge of all administrative activities. Knowledge and experience in this area is beyond the level required for the current post.	Demonstrates wide-ranging knowledge of all administrative activities at the level required for the post. Has a full appreciation of how these activities interact beyond the post.
Application <i>Has the skills, knowledge and experience relating to the effective and efficient application.</i>	Unaware cannot demonstrate any practical application. Skill, knowledge and experience are less than adequate to effectively execute the job.	Has awareness and understanding within a closely defined area and limited experience of practical application. Possesses knowledge and experience but applies inadequately to effectively execute the job.	Demonstrates comprehensive working knowledge and practical application(s) relevant to the post. Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.	Demonstrates wide-ranging skills, knowledge and application(s). Knowledge and experience in this area is beyond the level required for the current post. Application enables development of the role.	Demonstrates wide-ranging skill, knowledge and application(s) at the level required for the post. Knowledge and experience in this area is beyond the level required for the current post. Level of knowledge and experience and application enables development of the role and business processes.

5.3 Select, Recruit and Assess Competence

Previously within this thesis, I noted recruitment and selection can encompass a wide range of possibilities, to include, for example, transferring personnel within the organisation, recruiting personnel from outside the organisation, employing interim/freelance personnel to undertake specific tasks/roles for a specified timescale (*CIPD, 2007a*).

According to the HSE (*2007*), integrating recruitment and selection into the overall competency framework, is considered a best practice approach.

Through the process of a competence based in-depth interview, it is possible to extrapolate evidence of competence undertaken by the candidate in a previous life. All personnel were recruited via a competence based in-depth interview. The competence criteria identified in the previous section of this chapter was used to gauge the calibre of personnel being interviewed.

Competence based interviews are based on a format where each question is designed to test specific skills, knowledge, understanding, behaviour etc. The answers provided by the interviewee are then matched against a pre-described criterion and are subsequently marked accordingly. For example, the interviewers may want to probe a candidate's ability to respond under stress i.e. in a Hydrocarbon emergency situation etc. Competence based interviews are systematic in their approach as each question is targeted at particular facets of a person's skill, knowledge, understanding behaviour etc. Candidates are asked probing questions relating to specific circumstances, which they then need to

confirm with concrete, viable answers. The interviewers should then explore further to test the validity that response to a real life scenario (*CIPD, 2007a*).

Having identified a range of core and functional competencies, together with activity impact areas in the previous section, then it was possible to utilize these as a basis for the competency based interview. For example, questions on teamwork include, describe a situation in which you were a member of team, what did you do to positively contribute to it, tell us about a situation where you played an important role in a project as a member of the team (not as a leader), how do you ensure that every member of the team is allowed to participate, give an example of a time when you had to deal with a conflict within your team? What did you do to help resolve the situation and how do you build relationships with other members of your team.

Before the interviews took place it was first necessary to determine which type of response would score positive points and which types of responses would score negative points. Marks were then allocated accordingly to the responses given. All negative responses received a score of nought, whilst all positive responses were scored on a predetermined numeric scale. An ideal predetermined score was concluded from the onset. This also considered trainability i.e. being able to develop a candidate to the required standard. Table 5.4 below provides an example of an interview marking schedule.

Table 5.4 Competence Based Interview Scoring

0	No evidence	<ul style="list-style-type: none">• Could not provide any evidence
1	Poor	<ul style="list-style-type: none">• Little evidence of positive indicators• Mostly negative indicators, indecisive
2	Areas for concern	<ul style="list-style-type: none">• Limited number of positive indicators• Many negative indicators, indecisive
3	Satisfactory	<ul style="list-style-type: none">• Satisfactory display of positive indicators• Occasional negative indicator, none indecisive
4	Good to Excellent	<ul style="list-style-type: none">• Strong display of positive indicators

5.4 Develop Competence – Learning and Development

The key requirement of developing competence is to extend and maintain the competence of operational personnel within the Hydrocarbon operating facility. A vital key to developing competence is through the application of learning and development initiatives, discussed in detail, previously in this thesis.

For each individual it was necessary to create, implement and maintain an individual development plan. This was ultimately geared to the outcome of the selection, recruitment and assessment process. The plan included, for example, induction training, process plant hydrocarbon core training modules developed

to a Vocational Qualification (VQ) structure and standard thereby allowing for accreditation at some point in the future, legislative requirements, Alpha specific (internal or external provision), and process plant, machinery and work equipment specific.

An overview of the proposed learning and development interventions are shown in Tables 5.5 and 5.6. Learning and development interventions were linked to both core and functional competencies. A full description of all learning and development interventions are contained within the next chapter.

Table 5.5 Learning and Development Interventions – Core

Learning & Development Interventions Matrix – Core Competencies	Induction	Process Plant Training Unit 1 Introduction to Hydrocarbon Operations	Process Plant Training Unit 2 Shut Down & Make Safe	Process Plant Training Unit 3 Operation of Ancillary Plant & Boil Off Gas Disposal	Process Plant Training Unit 4 Export System	Process Plant Training Unit 5 Natural Liquefaction (N/A)	Process Plant Training Stage 6 Power Generation	Process Plant Training Unit 7 Permit to Work & Risk Assessment for Permit to Work	Process Plant Training Unit 8 Environmental Awareness	Process Plant Training Unit 9 Hydrocarbon Jetty Operations	Process Plant Training Unit 10 General Risk Assessment	Legislative Requirements	Alpha Hydrocarbon Specific	Process Plant, Machinery & Work Equipment Vendor Specific
Communication		•	•	•	•	N/A	•	•	•	•	•	•	•	•
Customer Focus	•	•			•	N/A		•	•	•	•	•	•	•
Developing Self/ Others	•	•	•	•	•	N/A	•	•	•	•	•	•	•	•
Ethics/ Alpha Culture	•					N/A								
Information Technology		•	•	•	•	N/A	•	•	•	•	•	•	•	•
Leadership			•	•	•	N/A	•	•	•	•	•	•	•	•
Numeracy		•		•	•	N/A	•		•	•	•			
Problem Solving		•	•	•	•	N/A		•	•		•			
Teamwork	•	•	•	•	•	N/A	•	•	•	•	•	•	•	•

Table 5.6 Learning and Development Interventions - Functional

Learning & Development Interventions Matrix – Functional Competencies	Alpha Hydrocarbon Induction	Process Plant Training Unit 1 Introduction to Hydrocarbon Operations	Process Plant Training Unit 2 Shut Down & Make Safe	Process Plant Training Unit 3 Operation of Ancillary Plant & Boil Off Gas Disposal	Process Plant Training Unit 4 Export System	Process Plant Training Unit 5 Natural Liquefaction (N/A)	Process Plant Training Stage 6 Power Generation	Process Plant Training Unit 7 Permit to Work & Risk Assessment for Permit to Work	Process Plant Training Unit 8 Environmental Awareness	Process Plant Training Unit 9 Hydrocarbon Jetty Operations	Process Plant Training Unit 10 General Risk Assessment	Legislative Requirements	Alpha Hydrocarbon Specific	Process Plant, Machinery & Work Equipment Vendor Specific
Administration		•	•	•	•	N/A	•	•	•	•	•	•	•	•
Application		•	•	•	•	N/A	•	•	•	•	•	•	•	•
Compliance		•	•	•	•	N/A	•	•	•	•	•	•	•	•
Coordination		•	•	•	•	N/A		•	•	•	•	•	•	•
Design and Development		•				N/A		•	•			•	•	•
Operation		•	•	•	•	N/A	•	•	•	•	•	•	•	•
Maintenance				•	•	N/A		•	•	•	•	•	•	•
Management			•	•	•	N/A	•	•	•	•	•	•	•	•
Utilization and Optimization		•	•	•	•	N/A	•	•	•	•	•	•	•	•

5.5 Assess Competence

The key objective of assessing competence was to determine the extent to which personnel currently meet the established competence criteria at the Alpha Hydrocarbon processing installation. Given that the Alpha site is a brand new hydrocarbon processing installation, and at the initial stages, would not contain stored hydrocarbon, then the assessment of competence was split in two stages. This included competence assessment after competence

development i.e. learning and development initiatives and during full operational activities i.e. when hydrocarbon is stored and distributed. This second assessment of competence falls outside of the scope of this thesis.

The assessment of competence was undertaken in two ways, this included VQ type assessment at the end of each training module and assessment via the scale of competency descriptors, describe previously within this chapter.

Each candidate had an assessment plan and was assessed using a variety of assessment methods. These included, Observation (O) – observing a candidate undertaking day to day activities. Professional Discussion (PD) – a formal discussion with the candidate utilising competence based questioning. Witness Statement (WS) – evidence of overall performance provided by a third party such as the candidates supervisor. Questioning (Q) – assessing skills, knowledge and understanding through the process of direct questioning, for example, explain the liquefaction process. Examination of Outcomes (EO) – the measurement of practical application of the skills, knowledge and understanding, for example, removing a pump in the correct sequence and in a safe manner. Simulation (S) – for some activities it is impossible to have a real life scenario to practice upon, consequently, simulation is the only real alternative, for example, an emergency situation requiring an evacuation of the facility. Projects and Assignments (PA) – the candidate learning and development were both developed assessed through a project or an assignment, for example, devising a new system of work. Finally, Formal Tests

(FT) – testing a candidates skills, knowledge and understanding utilising a pass or fail mechanism. An example of an assessment plan is shown in the next chapter.

The evidence provided by each candidate fell into two categories this included, performance type evidence, for example, the operation of a power generator and knowledge, understanding and behaviour type evidence, for example, knowing and understanding how the power generator operates, its various settings, start up, shut down, emergency shutdown and being able to work in an effective, efficient and safe manner. All forms of evidence submitted by the candidate had to be valid, authentic, current, sufficient, reliable and safe.

5.6 Monitor Competence

The key requirement here was to monitor whether personnel within the hydrocarbon facility passed as proficient, leading and/or coaching continue to perform to the expected standards. From the onset personnel would have been deemed competent in two ways. First being assessed using a VQ methodology and secondly achieving the necessary ranking on the competency descriptor scale i.e. proficient, leading or coaching. However, as time progresses competence can be eroded through a process of skills, knowledge, understanding and behaviour decay.

For all personnel under the scope of the ICAF it was necessary to establish proactive mechanisms in order to monitor individual competence. A variety of

proactive mechanisms for monitoring competence were introduced into the Alpha Hydrocarbon processing facility. These included, first, self assessment by the individuals themselves. Personnel were invited to rate their own perceptions of competence on the competency descriptor scales i.e. one to five. Second, appraisals were initiated that resulted in an ongoing assessment of performance for all operational staff within the hydrocarbon facility. Third, observations were undertaken by supervisors, managers and peer groups. Within such an environment such as a COMAH top tier hydrocarbon facility it was necessary to ensure that everyone played a vital part in observing any non-conformance of any kind. Failure to do so could have resulted in catastrophic consequences. Fourth, the results of accidents and/or incidents were monitored and analysed in order to prevent a reoccurrence and/or mitigate potentially fatal consequences. Fifth, it was necessary to recognise competence decay. This was identified by the individuals themselves and by their managers and supervisors. Sixth, a system to identify repeated mistakes and a constant failure to perform correctly was initiated. Clearly we must identify repeated mistakes and failures and take appropriate corrective action. This may take the form of retraining, redeployment to other areas of the business etc. The key is to identify the root causes of the mistakes or failures and take appropriate measured actions. Finally, a system to identify a perceived lack of commitment brought on by such things as low morale, motivation, illness etc was developed. This took the form of a performance management policy and procedure. It was considered vital to identify the root causes for the perceived lack of commitment

and take appropriate measured actions where appropriate. As humans we all go through periods such as these during our working lives.

5.7 Deal With Failure to Perform Competently

It was necessary to determine the root causes for failure to perform competently. Reasons may include, for example, organisational culture, time and/or commercial pressures leading to the need to cut as many corners as possible, team relationship, such as, poor/ineffective leadership, abysmal communications, inadequate inter personal relationships, failure of the ICAF such as personnel undertaking tasks for which they have not been deemed competent, failure to reassess and develop competence..

In some instances it may be deemed appropriate to redeploy or terminate the employment of personnel who persistently fail to perform competently.

Termination must only be considered a viable option where competence development measures have failed to achieve desired outcomes.

As part of the overall reality, that at some stage within the realms of a brand new operating facility, Alpha Hydrocarbon developed a series of policies and procedures to deal with such an eventuality. The policies and procedures included competence assurance, grievance and discipline, learning and development and performance management. Each one of these policies and procedures of these procedures would have an impact on personnel who continually fail to perform competently

5.8 Audit and Review

The key requirement of the audit process was to examine the ICAF with sufficient frequency, so as to give confidence that it was meeting its intended aim, operating as intended and to initiate improvements where non-conformance has been identified and corrective actions are required. The audit encompasses an annual check of the operation of the ICAF, through to more frequent checks of particular elements. The key focus was on ensuring that personnel have the correct level of competence for the tasks they are undertaking. The scope, nature, extent frequency etc of the audit will vary depending upon the risks being controlled. The frequency of the audit process will be increased if, for example, non-conformance has been determined and corrective actions are required. The audit programme will check, for example, are all safety critical work activities covered by the ICAF, are the skills, knowledge, understanding and behaviour elements appropriate and sufficient for each role, are the assessment methods judging competence correctly and comprehensively; that corrective actions have been implemented as a result, of non-conformance identified.

In the case of Alpha Hydrocarbon the audit process took the form of both an internal and external provision. The Quality Department undertake audits on a periodic basis in order to assess aspects of the ICAF. Similarly, the external training providers and assessors responsible for the implementation of the hydrocarbon process plant training undertook their own audit arrangements at suitable points within the learning and development.

The key requirement of the audit process was to examine the overall effectiveness and efficiency of the ICAF as a whole and that it is achieving its desire aim. Over a period of time the audit process will examine a whole wealth of data to include, for example, assessments of competence, the management of non-conformance, the management of change, health and safety performance data, and the root causes competency decay.

5.9 Conclusions

This chapter has explored the development of a best practice ICAF, the contents of which were identified in Chapter Four. I was able to define the purpose and scope of the ICAF for use at the Alpha Hydrocarbon installation. I concluded that the Alpha Hydrocarbon installation was a work activity area encompassed by COMAH 1999, as amended, consequently individual competence is considered to be of vital importance. An action research approach based on Lewin's (1933) cyclical (iterative spiral) process was applied to the development of the ICAF. Examples of the four phases of planning, acting, observing and reflecting were provided within the introduction section.

I was able to develop a competence criteria based around three key areas that included core competencies, functional competencies and work activity impact areas. The competence criterion was defined as a result of a twofold analysis of both the job descriptions, as well as identifying the task requirements for operating a hydrocarbon installation. The task requirements were identified following visits to two operating hydrocarbon installations within the UK. I was

able to identify a methodology for the selection, recruitment and assessment of personnel capable of operating a hydrocarbon facility (after competence development). This included the pre-assessment of competence, to ensure that the learning and development initiatives are appropriate. This was achieved through the application of competence based interviews, which were given a numeric value of responses given by the interviewee. In addition, I was able to show how to develop competence through the implementation of various learning and development initiatives. These included, for example, induction, hydrocarbon process plant training. I demonstrated how competence could be assessed, this included, for example, after competence development i.e. learning and development initiatives. The assessment of competence was undertaken in two ways, this included, for example, assessment via the scale of competency descriptors i.e. one to five. I noted how competence would be monitored to ensure continuance of skill, knowledge, understanding, behaviour. This took the form of self assessments, annual appraisals etc. I was able to identify how to deal with failure to ultimately perform competently, this may result in applying additional learning and development initiatives, re-deployment to other areas or dismissal from the hazardous installation. Finally I concluded that audits and reviews are vital elements in evaluating the overall effectiveness and efficiency of the ICAF in organisational performance terms.

The thesis will now move on to discuss the learning and development interventions that will underpin the ICAF.

Chapter Six:

Learning and Development Initiatives

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Chapter Six:

Learning and Development Initiatives

6.0 Introduction

The theme of this chapter is to report on the design and development of learning and development initiatives in order to underpin the ICAF. In Chapter Three, I noted that my action research approach was based on Lewin's (1933) cyclical (iterative spiral) process. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the learning and development needs analysis and the development of structured and systematic learning and development initiatives. This included for example, **planning** – deciding on the most appropriate method in order to undertake the learning and development needs analysis, **acting** – discussions with various learning and development providers, **observing** – the delivery of formal training courses to verify quality of delivery, and finally, **reflecting** – ensuring the learning and development needs analysis and the learning and development interventions encompassed all hydrocarbon topic areas.

Previously I noted within this thesis that 'learning', 'training', and 'development' are terms that are often used interchangeably. Learning was defined as a process leading to increased adaptive capacity, in other words, an arena where individuals learn and possess the capabilities that enable them to do so to help their employers to build and retain competitive advantage. The term 'development' is usually used in a wider context than either 'learning' or

‘training’ and covers both of these. It tends to refer to a longer process of learning, acquiring skills or knowledge that may include a number of elements such as training, coaching, formal and informal interventions, education or planned experience. Training was defined as an instructor-led and content-based intervention leading to desired changes in behaviour, and which, unless it is ‘on-the-job’ training, involves time away from the workplace in a classroom or equivalent. For the purposes of the reporting within this chapter, learning, training, and development were grouped under a general heading of learning and development. The learning and development interventions were derived from a learning and development needs analysis outlined previously.

6.1 Learning and Development

The following Learning and Development options were identified for use at Alpha Hydrocarbon:

6.1.1 Coaching (Developing Skill and Knowledge)

This can meet many competency development needs. In most circumstances coaching was undertaken by the direct line Manager or by a nominated member of their team. It is the single most common form of development action and the most natural and cost effective way of meeting development requirements. To give Managers practical help on how to use coaching to develop an individual’s competency a coaching guide has been developed. This guide includes information on what behaviors to look for, tips on how to use each skill and on the job actions to help individuals develop the competencies. A coaching course

may also be available from time to time depending on need. Each of the specific on-the-job actions should be accompanied by proactive coaching from the Manager to maximize the development opportunity.

6.1.2 Mentoring (Providing Support, Guidance and Advice)

Mentoring is the nomination of someone outside of immediate Line Management to help and support and offer advice. It is a role best undertaken by a person required as skilled at giving impartial advice and who knows their way around the organisation. People who are likely to be good at mentoring are often strong in developing others. In addition a good choice of mentor would be someone strong in the competency or skill in which the individual needs developing. It is important for everyone to understand that the mentor does not replace the manager's role as a developer or coach but that they are there to give appropriate help and advice when required. Before setting up a mentoring relationship it should be discussed with HR Department who can ensure that everyone involved understands their role and any training of the mentor can be provided.

6.1.3 360-Degree Feedback

Three hundred and sixty degree feedback is a way in which an individual can receive structured feedback about his or her skills. It involves the completion of a rating questionnaire by the individual's manager, team members, peers and internal customers. The results of the questionnaire are analysed and fed back to the individual highlighting strengths and development needs to be carried out

in a structured and measured way to ensure accuracy and because it is a sensitive process. For this reason HR should be consulted and if necessary involved in the process to ensure all involved understand their responsibilities to give constructive feedback.

6.1.4 Increased Role

One of the simpler ways of developing individuals is to give them a bigger role in their current position. This has the benefit of stretching the individual whilst retaining their knowledge and skills.

6.1.5 Project Work

Special work projects are one off one-person projects rather than team projects. They will be confined within the individuals department and will usually be of fairly short duration. A good source for special work projects is to delegate part of a manager's project. It is important though that the special work project is appropriately defined being SMART i.e. specific, measured, achievable, relevant and time-bound. Support via coaching and or mentoring will also be required.

6.1.6 Functional or Cross Functional Projects

Opportunities to work on functional or cross-functional projects arise where the company or function decides to tackle a specific problem using a team of people. This might be the case where, for example, a new set of procedures are required within the function or the introduction of new systems right across

the Company and the individual can bring views or expertise to the team. The difference between functional or cross-functional projects and a special work project is that the special project would be a one-person project rather than a team project.

6.1.7 Secondments

Secondments provide an opportunity for individuals to widen their experience of the business and at the same time broaden and add to their skills and competencies by spending time in another department. Secondments serve a number of purposes. Where the individual already has a link into the part of the business into which they are seconded, it will strengthen the relationships and provide an insight into the impact they have on that part of the business. Where there are no current links it provides an insight into another part of the business and enriches both the individual and the part of the business they are seconded to. They also provide both the individual and the Company with a relatively risk free way of trying out other roles. Secondments into external customer organisations may also be realistic in some areas of the business.

6.1.8 Role Modelling

Role modelling entails identifying someone with strength in a particular competency; they then become a role model for the individual with the development need. Opportunities would be sought for the person to observe the role model in different situations and to talk through what the role model does and how they do it.

6.1.9 Other Development Material

The learning and development department holds information on a variety of books, DVD's and individual open learning packages that can be loaned.

6.1.10 Formal Courses

The formal courses were categorised into two, these included, functional skills training. Functional skills training involved training courses on the methods or processes used within a function. It may be appropriate to update job knowledge and/or expertise by attending seminars or conferences. Competency development courses, on the other hand, were designed to develop the individual's competence (the how) and maximise their contribution to the business whilst realising their potential. Typically these courses provided an insight into best practice and an opportunity to practice in a safe environment. In all cases attendance was linked to practical development opportunities once back in the workplace in order to reinforce the learning and ensure transferability into the job. In both cases discussions with the HR Department were held before courses are booked. This ensured that the learning and development need could be evaluated and matched to courses.

The courses on offer at Alpha Hydrocarbon were categorised as follows, Alpha Hydrocarbon employee induction, legislative requirements, Alpha business specific, for example, media awareness and process plant, machinery and work equipment specific, for example, training delivered by the suppliers of the new

items of plant, machinery and work equipment. This learning and development suite of programmes addressed the needs of a diverse audience with an interest in plant start-up, commissioning and operation etc.

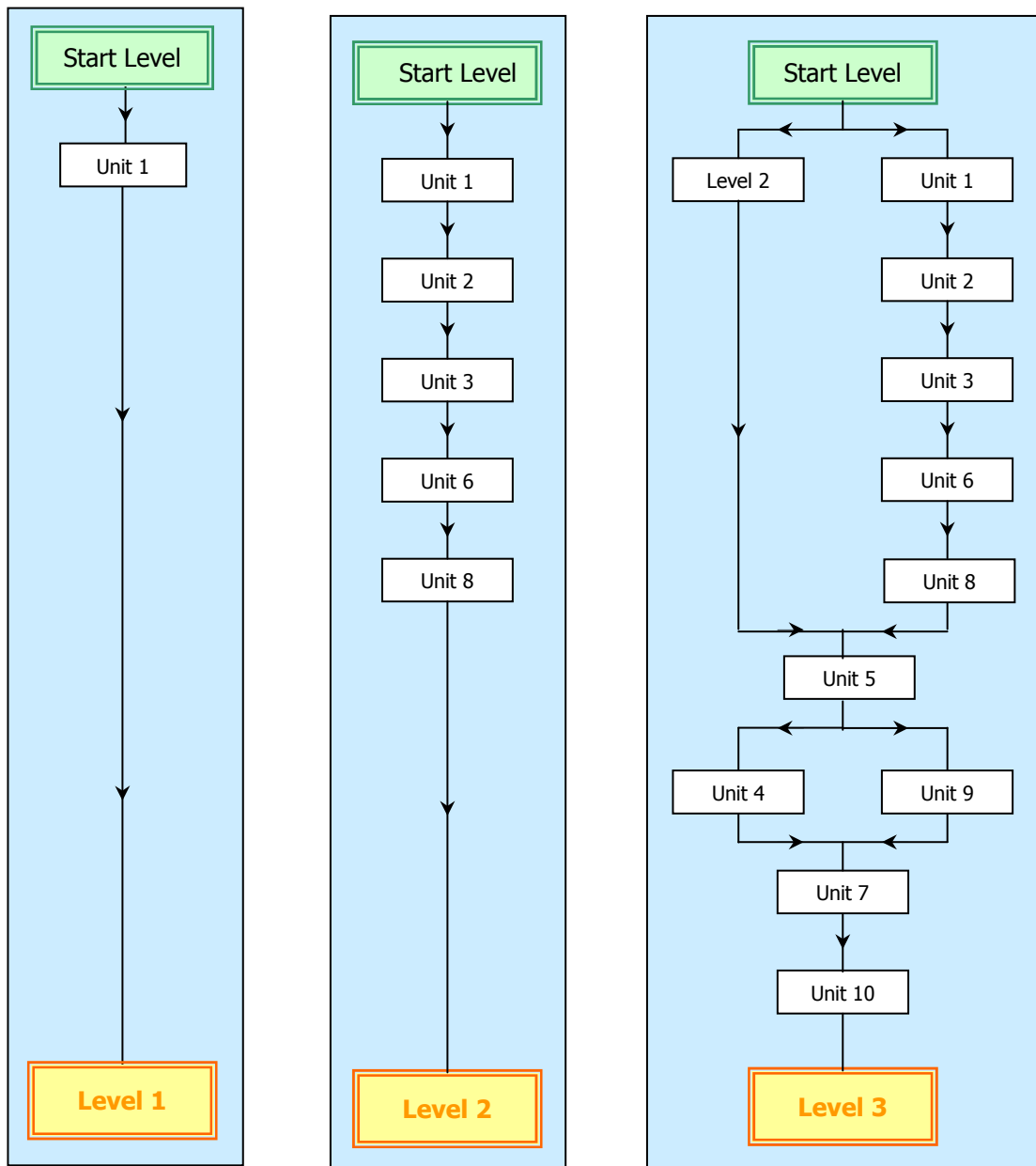
6.1.11 Hydrocarbon Process Plant Specific Courses

I noted previously in Chapter Five that I was able to identify core hydrocarbon process activities that I subsequently utilized as a basis for developing the hydrocarbon core learning and development interventions. The process plant learning and development intervention is a complete scheme that will enable a candidate to demonstrate competence in hydrocarbon process operations. The scheme is built upon a series of units and elements that are ultimately structured around a VQ approach. The units and elements have been approved by City and Guilds International and could therefore be utilized to obtain a full VQ at any point in the future, subject to suitable and sufficient VQ assessment. Due to operational demands and the subsequent late commissioning of the plant, it was decided by the Operations Director to delay the VQ assessment process, until some point in the future. Training would be delivered and assessed to a City and Guilds standard; however, formal accreditation would be delayed.

The units are listed below and the overall scheme is described in Figure 6.1. The scheme was designed in order to provide a thorough understanding of the component parts of a hydrocarbon process plant operation. In addition, it

identifies the candidate's roles and responsibilities with respect to operations, health, safety and environmental compliance.

Figure 6.1 Hydrocarbon Process Plant Operations Units



Guidance was provided to the candidates as they progressed through a structured and systematic learning and development process. The candidates' progress was assessed on an ongoing basis and underpinning knowledge and understanding of the plant and processes is established and recorded.

The hydrocarbon process plant learning and development units are as follows:

1. An Introduction to Hydrocarbon Operations;
2. Shut Down and Make Safe;
3. Operation of Ancillary Plant and Boil-Off Disposal;
4. Export System;
5. Natural Hydrocarbon Liquefaction;
6. Power Generation;
7. Permit to Work and Risk Assessment for Permit to Work;
8. Environmental Awareness;
9. Hydrocarbon Jetty Operations;
10. General Risk Assessment;

Each unit is made up of a number of elements and unless otherwise stated all elements must be completed to successfully complete a unit. Upon analysis of the process plant core units it is possible to determine that they mirror exactly the core hydrocarbon process areas I identified during the analysis stage.

The assessment plan for each unit ensured that the standards of performance and knowledge and understanding have been demonstrated, to the satisfaction

of the trainer/assessor. Typical assessment methods included observation (O), professional discussion (PD), witness statement (WS), questioning (Q), examination of outcomes (EO), simulation (S), projects and assignments (PA) and finally formal tests (FT). The evidence provided by the trainees fell into two categories these included, performance type evidence as well as knowledge and understanding type evidence. All forms of evidence submitted by the trainees had to be valid, authentic, current, sufficient, reliable and safe in its manner.

The term ‘an appreciation’ was intended to indicate a level of knowledge and understanding that demonstrated, for example, an awareness of the existence, the scope and the background to the content covered by the knowledge and understanding. The term ‘working knowledge and understanding’ indicated an ability to, for example, identify and apply relevant information, procedures and practices, needing only occasional recourse to reference materials, being able to describe, in their own words, key principles. This does not mean the ability to quote “chapter and verse”. Rather they must have knowledge of what supporting information is available, how and where to find it and from whom to seek further guidance and information confirm any additional required detail.

6.2 Conclusions

This chapter has reported on the design and development of learning and development initiatives that were utilized to underpin the ICAF. An action research approach based on Lewin’s (1933) cyclical (iterative spiral) process

was applied to the learning and development needs analysis and the development of suitable and sufficient learning and development initiatives. Examples of the four phases of planning, acting, observing and reflecting were provided within the introduction section.

Various initiatives were examined and these fell into two distinct categories. These included, for example, learning and development activities such as coaching, mentoring, as well as internal and/or external courses were categorised as functional skills training and competency development. The chosen merits of each chosen method was considered, however in practice the key was to utilize a combination of methods in order to achieve the desired outcome i.e. the development of individual competence to a standard required to operate the Alpha Hydrocarbon process plant facility effectively, efficiently and above all else safely.

The thesis will now move on to consider the implementation of the ICAF.

Chapter Seven:

Implementation of the ICAF

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Chapter Seven:

Implementation of the ICAF

7.0 Introduction

This chapter reports on the implementation of the ICAF, developed in detail previously in this thesis. Previously within this thesis I noted that my action research approach was based on Lewin's (1933) cyclical (iterative spiral) process. The four action research phases of planning, acting, observing and reflecting (Lewin, 1933), were applied to each stage of the implementation of the ICAF within the Alpha Hydrocarbon installation. This included for example, **planning** – deciding on the most appropriate change management model, **acting** – identifying the change management coalition/guiding team, **observing** – identifying blockages to the change management process, and finally, **reflecting** – evidence of a culture change.

In Chapter Three, I noted that Kotter (1990) made it his business to study both success and failure of change initiatives within organisations. The eight key requirements for successful change management developed by Kotter (1990) and streamlined by Kotter and Rathgeber (2007), was utilized as an implementation model. First, it was necessary to create a sense of urgency, given the abysmal failure of Alpha hydrocarbon to develop an ICAF. In the words of the Operations Director "business as usual is no longer an acceptable plan, we must move forward".

Second, it was necessary to pull together the guiding team. In the case of Alpha Hydrocarbon, the key members of the coalition included the Managing Director, the Operations Director, the Operations Manager, I the builder of the ICAF and the third party contractor responsible for the implementation of the ICAF. The third party contractor was chosen due to time constraints and lack of internal manpower resources.

Third, it is necessary to develop the change vision and strategy. In the case of Alpha Hydrocarbon this was the developed best practice ICAF that will bring about the required change agenda. In constructing the ICAF I ensured that it was possible to explain the ICAF vision under key headings. These included, core competencies, functional competencies, activity impact areas, competency descriptors and hydrocarbon process plant training (VQ accredited).

Fourth, it was necessary to communicate in order to achieve understanding and buy in. The best practice ICAF was communicated to the operations department via a series of meetings. I presented the newly developed best practice ICAF. I highlighted the requirement for significant learning and development interventions in order to underpin the ICAF.

Fifth, there is a need to empower others to act. From the onset of the requirement for change within Alpha Hydrocarbon, it became clear that there were no significant obstacles that would hinder change momentum. This was a

brand new Hydrocarbons processing facility and the need to move forward to commissioning and operation was paramount in everyone's mind.

Sixth, it is vital to produce short-term wins. The ICAF was constructed in such a way as to allow for short term wins, these included, for example, a ten stage core modular learning and development programme applicable to Hydrocarbons process operations. Each stage was assessed independently of the other, allowing for the candidate to be awarded a full unit of competence.

Seventh, it was essential not to let up. All Improvements within Alpha Hydrocarbon were consolidated at each stage. The key will be the short term wins I mentioned above.

Eighth, it was vital to create a new culture. Given that the Alpha Hydrocarbon processing facility is a brand new operation, then clearly ensuring the success of the change management initiative was vital. Success sent a clear signal to everyone within the organisation that after an abysmal start, things were now well and truly back on track.

In Chapter Five I developed an ICAF that encompassed eight key features, the chapter will now move on to discuss the implementation of each of these eight features in turn.

7.1 Define Purpose and Scope of ICAF

In Chapter Four I noted that the types of competence that the Alpha organisation required in order to undertake its role in the community professionally were wide ranging. The Hydrocarbon process operating facility fell under the COMAH umbrella, given that large quantities of hydrocarbon were being stored and distributed. In consultation with the Managing Director and Operations Manager, it was decided that the focus of my consultancy aide was to develop an ICAF, which encompassed only those under the operational umbrella. Staff such as finance, commercial, office based administration etc would not form part of the framework.

Prior to the implementation of the ICAF, I decided that it would be prudent to check that other senior managers at the operating facility were happy to delay the implementation of the ICAF within their areas of control, until some point in the future. I decided to contact each of the senior managers in turn in order to discuss the ICAF. I had a meeting with each of the remaining senior managers in turn and they all confirmed that they did not wish to participate with individual competence assurance at this time; it was something that would be concluded at a later date. Upon analysis of the meetings that were held, it became clear that the people concerned were only focused on setting up their departments and did not want to become involved with something they felt was only a necessity for operational safety critical tasks. From a personal perspective I believe this to be very short sighted, however, I was being paid in a consultancy role, and could therefore only voice a personal view. I did ask the question

whether any of their department's activities, which impacted on operations, could be deemed safety critical. The responses of the senior managers could only be couched in terms as a 'wall of silence'.

7.2 Develop Competence Criteria

Previously within this thesis, I noted that the development of the competence criteria was derived through six point analyses, which included visits to other hydrocarbon installations, reviewing job descriptions and task analysis of operational tasks required to operate a hydrocarbon facility. The full scope of the criteria described the core and functional competencies, together with the activity impact areas for staff at the Alpha Hydrocarbon installation. It was also a guide to help identify ways of further developing potential, building strengths and developing skills and knowledge.

Prior to the implementation of the ICAF, I set up a breakfast meeting with the Managing Director, Operations Director and Operations Manager, in order to review the ICAF, prior to implementation and to check whether or not any last minute changes were required. The key focus of this meeting was to determine that there was a comfort factor with the ICAF and that the developed competencies and activity impact areas encompassed all operational bases. The breakfast meeting concluded that the ICAF was a 'fit for purpose' model for implementation and approval was subsequently reached with a go ahead date being confirmed.

During the later stages of development of the ICAF and in particular the fine tuning of the competencies and activity impact areas, one key member was missing from the senior management team. The company solicitor had been on a leave of absence due to sickness. Consequently, I thought it of vital importance to check the legal validity and reliability of the ICAF, with particular reference to competencies and activity impact areas. For example, had I missed anything of a discriminatory nature? I therefore contacted the company solicitor and arranged a meeting in order to talk through any potential concerns. The outcome from the meeting was a resounding success and I was given formal legal approval to proceed with the implementation of the ICAF.

7.3 Select Recruit and Assess Competence

Previously within this thesis, I concluded that the HSE considers, integrating recruitment and selection into the overall individual assurance competency framework as a best practice approach. Through the process of a competence based in-depth interview, it is possible to extrapolate evidence of competence undertaken by the candidate in a previous life. All personnel were recruited via a competence based in-depth interview.

Competence based interviews are based on a format where each question is designed to test specific skills, knowledge, understanding, behaviour etc. The answers provided by the interviewee are then matched against a pre-described criterion and are subsequently marked accordingly. For example, the interviewers may want to probe a candidate's ability to respond under stress i.e.

in a hydrocarbon emergency situation. Competence based interviews are systematic in their approach as each question is targeted at particular facets of a person's skill, knowledge, understanding behaviour. Candidates are asked probing questions relating to specific circumstances, which they then need to confirm with concrete, viable answers. The interviewers should then drill deeper to test the validity that response to a real life scenario.

The format for the recruitment, selection and assessment process encompassed advertisements/recruitment consultants, first stage screening interview with HR, second stage competence based interview with the HR Manager, Operations Manager and Supervisor. I will now report on each of these in turn.

7.3.1 Advertisements/Recruitment Consultants

In an ideal world it would be beneficial to recruit, select and assess personnel who have a proven track record within a hydrocarbon type process industry. Previously I concluded that there was a number of existing hydrocarbon facilities within the UK. Upon analysis of the existing plants a key concern became evident as to why it may become impracticable to select, recruit and assess personnel from existing facilities. In the main this included, geographical location, none of the existing plants were in close proximity to the new Alpha hydrocarbon process installation.

The option of selecting, recruiting and assessing personnel from current hydrocarbon operating facilities was not discounted completely; however, there was a clear cause for concern from the onset. Given the problems highlighted it became necessary to explore different options. Clearly, one of the favoured options was to select, recruit and assess personnel from a comparable industry. One such industry is the oil and gas sector in general. For example, someone currently working with a different type of hydrocarbon would have the necessary ‘transferable skills, knowledge, experience, attitude and behaviour’ after suitable and sufficient competence development (learning and development), to enable them to operate this hydrocarbon process facility. It was decided therefore, through the use of national advertising, to target personnel currently working in existing Hydrocarbon facilities as well as those who worked in the different types of hydrocarbon sectors.

In addition to national advertising, a number of national recruitment consultants were contacted in order to assist with the selection and recruitment process. Many of those contacted purported to have significant numbers of personnel on their databases that had Hydrocarbon/petro-chemical experience and potentially would have the necessary transferable attributes to operate and hydrocarbon facility.

7.3.2 First Stage Screening Interview with HR

The first stage screening interview process was undertaken by the HR department, using a set of predetermined guidelines agreed with the operations

department. For example, could an interviewee demonstrate a proven track record of working within a hydrocarbon/petro-chemical type process operation, what was their approach to teamwork etc?

The purpose of the first stage screening process was to identify suitable candidates with the potential strengths to operate a hydrocarbon process facility. The interview process was an expected norm easily recognised by both candidates and managers. This is because as well as providing information to predict performance, interviews also provides an opportunity for the interviewer and interviewee to meet face to face and exchange information. In the case of Alpha Hydrocarbon the initial stage screening process interview allowed for the candidate to ask questions about the job and the Alpha Hydrocarbon organization in general and decide if they would like this particular type of organisation and the job in general. For the Alpha Hydrocarbon organisation it was an opportunity to describe the job and the responsibilities the job holder would need to take on in more detail, assess candidates' ability to perform in the role via the use of basic questioning, discuss with the candidate details such as start dates, training provisions and terms and conditions such as employee benefits and give a positive impression to the candidate of the company as a 'blue chip' employer' (who they'd like to work should they be offered the position). Candidates, who passed the first stage initial screening process with the HR department, were invited back to a second stage competence based interview with members of the operations department.

7.3.3 Second Stage Competence Based Interview

Previously I noted that competence based interviews are based on a format where each question is designed to test specific skills, knowledge, understanding, behaviour etc. The answers provided by the interviewee were then matched against a pre-described criterion and were subsequently marked accordingly. Competence based interviews are systematic in their approach as each question is targeted at particular facets of a person's skill, knowledge, understanding behaviour etc. Candidates were asked probing questions relating to specific circumstances, which they then needed to confirm with concrete, viable answers. The interviewers then bored further to test the validity of candidate responses.

Clearly the next stage was to turn the theory of competence based interviews into reality. Previously with this thesis I identified core and functional competencies, together with activity impact areas. As a direct result of these key features in was decided, in consultation with the HR department to construct a series of competence based interview questions that would ultimately be applicable to all candidates and would be scored utilising the competence based scoring mechanism. Prior to the interview it was necessary to determine which type of response would score positive points and which types of responses would score negative points. Marks could then be allocated accordingly to the responses given. All negative responses would receive a score of nought, whilst all positive responses would be scored on a predetermined numeric scale of one to four. An ideal predetermined scored

three and above, was concluded from the onset. This also considered trainability i.e. being able to develop a candidate to the require standard.

Candidates would be required to score three or above in all of the set questions in order to pass the competence based interview stage. An example is shown in Table 7.1 and 7.2.

Table 7.1 Example Competence Based Interview Questions

Competencies	Activity Impact Areas	Question	Score 0-4
Operation	Process & Systems	Describe how you have operated a process or system.	3
Compliance	Legislation, Regulation, ACoPs & Standards	Describe how you comply with Legislation, Regulation, ACoPs & Standards.	4
Management	Self and Other Personnel	Describe how you manage yourself and other personnel.	3

Table 7.2 Competence Based Interview Scoring

0	No evidence	<ul style="list-style-type: none"> Could not provide any evidence
1	Poor	<ul style="list-style-type: none"> Little evidence of positive indicators Mostly negative indicators, indecisive
2	Areas for concern	<ul style="list-style-type: none"> Limited number of positive indicators Many negative indicators, indecisive
3	Satisfactory	<ul style="list-style-type: none"> Satisfactory display of positive indicators Occasional negative indicator, none indecisive
4	Good to Excellent	<ul style="list-style-type: none"> Strong display of positive indicators

7.4 Develop Competence – Learning and Development

I noted in Chapter Five that the key requirement of developing competence is to extend and maintain the competence of all operational personnel within the hydrocarbon process plant facility. A vital key to developing competence is through the application of learning and development initiatives. It is also necessary to reflect on trainees learning styles in order to ascertain the most appropriate learning and development vehicle for the particular styles.

For each individual it was necessary to create, implement and maintain an individual learning and development action plan. This was ultimately geared to the outcome of the selection, recruitment and assessment process. The plan included, for example, induction, process plant hydrocarbon core training modules, legislative, process plant, machinery and work equipment vendor specific.

Due to limited manpower resources being available within the HR department, it was decided by the Operations Director, in consultation with the Operations Manager, to send the competence development and assessment stages out to third party competitive tender. I was asked to attend a meeting with the Operations Director where I was tasked with identifying suitable organisations that could both develop and assess competence to the requirements of COMAH 1999, as amended.

I set about producing a briefing document highlighting key aspects of the hydrocarbon process plant operations and this was sent to three organisations that purported to have a proven track record within hydrocarbon competence development and assessment within the UK. A deadline date was set for the return of the competitive tenders. Of the three organisations concerned only two returned their competitive tenders for subsequent analysis. The organisation who failed to return their tender was eliminated at this stage, without any further contact being made as to ascertain the reasons why. The remaining two organisations were asked to attend the Alpha Hydrocarbon facility, in order to undertake a half day presentation as to the methodology that would be adopted for both competence development and assessment. From an analysis of the presentations, one clear winner emerged, by virtue of the fact that they had a proven track record of delivery and assessment and were fresh from a similar hydrocarbon operating facility within the UK, whereby they had undertaken an exact replica of what was required. In order to examine the quality of their prior consultancy work an evaluation of the learning and development provider was undertaken at this stage (reported in Chapter Eight).

On successful competition of the evaluation process the organisation concerned started work immediately the following week. They put in place immediately the following a Learning and Development Coordinator, permanently based at the Alpha Hydrocarbon process facility, An Administrator to deal with paperwork and course booking complexities and three Trainers/Assessors who were experienced across the complete spectrum of hydrocarbon process operations.

I will now examine each aspect of the individual learning and development plan in turn.

7.4.1 Induction

The term 'induction' is used to describe the whole process whereby new personnel adjust or acclimatise to their jobs and surroundings. As part of this process, 'orientation' can be used to refer to a specific course or training event that new starters attend, and 'socialisation' can be used to describe the way in which new employees build up working relationships and find roles for themselves within their new teams.

The induction process for all operational personnel at the Alpha Hydrocarbon processing facility was twofold. First all new employees attended a half day classroom based session whereby key features were explained to them in detail. This included for example, terms and conditions of employment, health and safety, security, company culture etc. The second stage of the induction process was a planned visit to a shareholder company in the Persian Gulf. The visit itself was not in any way considered 'just nice trip abroad' or a 'jolly', however, it was the start of the competence development process. Each new employee was given a fact finding workbook, which needed to be completed in detail, and would then be assessed by the trainer who accompanied them on the visit. The workbook covered the following topic areas, hydrocarbon extraction, wellhead processing, hydrocarbon properties, hazards, storage, handling and transportation etc.

7.4.2 Process Plant Hydrocarbon Core Modules

There were ten process plant hydrocarbon core modules. These have been noted previously. For each of the above topics, a series of candidate workbooks were produced. The workbooks were produced by the third party contractor responsible for the management and delivery of the learning and development initiatives. However, due to time constraints on the part of the third party contractor, I was asked to compile the assessment workbooks for each core hydrocarbon process plant topic areas. This task afforded me a valuable insight into the assessment of experiential learning and development material. An example of my work is shown in Figure 7.1. In addition, I was asked to produce a unit workbook for general risk assessment that was based on an experiential learning unit approach. This unit workbook is shown in the Professional Development Portfolio Appendix One.

Delivery of this learning and development intervention took the form of classroom based delivery combined with experiential learning and development activities. Candidates would then attend a series of lectures and preset group activities for a chosen topic. Each candidate in turn would then be required to undertake a series of candidate activities and/or candidate practical activities, For example, a candidate activity would entail, for example, producing a sketch of the power generator, describing the operation of the nitrogen plant. With regard to a practical activity the trainee, for example, would take the Trainer/Assessor and demonstrate the operation of closing a hydrocarbon valve.

On completion of each activity, a review was undertaken on a one to one with the Trainer/Assessor, in order to assess knowledge and understanding and determine whether any further training input was required.

7.4.3 Legislative Requirements

A complex processing facility, such as the Alpha Hydrocarbon installation, is engulfed by a whole raft of legislative requirements, which have a forbearing on both employer and employee, for example, The Management of Health and safety at Work Regulations 1999. This learning and development intervention took the form of classroom based delivery with an end test on competition.

7.4.4 Alpha Specific

This learning and development intervention took the form of classroom based delivery and encompassed all topics pertinent to the Alpha Hydrocarbon processing facility. Topics included, for example, media awareness.

7.4.5 Process Plant, Machinery and Work Equipment

A process is a series of actions, changes, or functions bringing about a result, for example, re-gasification process of hydrocarbon. On the other hand machinery is defined as an assembly of linked parts or components, at least one of which moves including, the appropriate actuators, control and power circuits, joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material. Work equipment is

more broadly defined and covers a very wide range of equipment, both power-operated and manually-operated.

As one could imagine a process operating facility such as Alpha Hydrocarbon has a vast array of process plant, machinery and work equipment.

Consequently, identifying all of the process plant, machinery and work equipment can only be described as a logistical nightmare. An inventory was undertaken of all of the process plant machinery and work equipment by the Learning and Development Coordinator. On completion of the inventory all of the vendors who supplied the items were contacted, in order to ascertain how much training would be provided, both at a cost and a no cost option. The Learning and Development Coordinator was then able to timetable the training according for all of the candidates concerned. This training was delivered both on and off site, within the UK and overseas. Off site, at the vendor premises, was always considered a viable option, by virtue of the fact that candidates could practice on live developmental rigs in a controlled and safe environment. Candidates attending training at a process plant, machinery and/or work equipment vendors would be assessed by the vendors trainers on a pass or fail basis.

7.5 Assess Competence

I noted earlier in this thesis that the key objective to assessing competence is to determine the extent to which personnel currently meet the established competence criteria at the Alpha Hydrocarbon installation. Given that the Alpha

Hydrocarbon site is a brand new operating facility, and at the initial stages, would not contain stored hydrocarbon, then the assessment of competence was split in two stages. This included competence assessment, after competence development i.e. learning and development initiatives and during full operational activities.

The assessment of competence outputs were recorded in three distinct ways. First, self assessment by the candidate themselves, second, assessment by the Trainer/Assessor at the end of each learning and development input and third, assessment via the scale of one to five competency descriptors i.e. unaware, aware, proficient, leading and/or coaching.

Assessment of competence was undertaken in a number of ways these included, for example, observing a candidate undertaking day to day activities, a formal discussion with the candidate utilising competence based questioning, evidence of overall performance provided by a third party such as the candidates supervisor, assessing skills, knowledge and understanding through the process of direct questioning, the measurement of practical application of the skills, knowledge and understanding.

The evidence provided by each candidate falls into two categories this included, performance type evidence, for example, the operation of a power generator and knowledge, understanding and behaviour type evidence, for example, knowing and understanding how the power generator operates, its various

settings, start up, shut down, emergency shutdown etc. and being able to work in an effective, efficient and safe manner.

All forms of evidence submitted by the candidate had to be of a valid, authentic, sufficient etc nature. An example of the assessment process is shown in Figure 7.1 and Figure 7.2.

7.6 Monitor Competence

As I noted earlier in this thesis, a fundamental requirement of the ICAF was to monitor whether personnel within the hydrocarbon processing facility, passed as proficient, leading and/or coaching continue to perform to the expected standards. Personnel were deemed competent in two ways. First the achievement of the hydrocarbon process plant training units and elements and secondly achieving the necessary ranking on the competency descriptor scale i.e. proficient, leading or coaching. However, as time progresses competence can be eroded through a process of skills, knowledge, understanding and behaviour decay.

Figure 7.1 Example Assessment Plan

Element 3.1 Application of Health, Safety and Environmental Policies and Procedures					
Standards of Performance					
<p>In achieving this Element you must have:</p> <ol style="list-style-type: none"> 1. Completed Candidate Activity 1: <ul style="list-style-type: none"> • Read the site safety and emergency policies, procedures and instructions; • Listed what has been read and indicate when they were read. 2. Reviewed and discussed the activity with the trainer 3. Completed Candidate Activity 2: <ul style="list-style-type: none"> • Read and discussed the following policies and procedures: <ul style="list-style-type: none"> ○ Site evacuation; ○ HV switch rooms; ○ Protective clothing; ○ Vehicles; 4. Reviewed and discussed the activity with the trainer; 5. Reviewed and discussed the Application of Health, Safety and Environmental Policies and Procedures Element with the trainer. 					
Evidence Requirements					
<p>The following form part of the evidence requirements:</p> <ol style="list-style-type: none"> 1. Trainer Log – list of delegates who have attended; 2. Trainer Flip-chart – review and discussion material; 3. Unit Work-book – completed candidate activities. 					
Underpinning Knowledge and Understanding					
<p>At the end of the training candidates must be able to demonstrate a working knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Health, Safety, and Environmental policies, procedures and work instructions; <ul style="list-style-type: none"> • Individual roles and responsibilities; • Site emergency evacuation; • HV switch rooms; • Protective clothing; • Vehicle usage and restrictions. 					
Assessment Method					
Observation	O		Examination of Outcomes	EO	
Professional Discussion	PD		Simulation	S	
Witness Statement	WS		Project and Assignment	PA	
Questioning	Q		Formal Test	FT	

Figure 7.1 Example Assessment Plan Continued

		Activity					Assessment Method						Reviews	
	Incomplete	Partially Complete	Complete	O	PD	WS	Q	EO	S	PA	FT	Incomplete	Partially Complete	Complete
Element 3.1														
CA 1														
CA 2														
Element 3.2														
CA 3														
CA 4														
Element 3.3														
CA 5														
CA 6														
CA 7														

For all personnel under the scope of the ICAF it was necessary to establish proactive mechanisms in order to monitor individual competence. The proactive mechanisms for monitoring competence included, first, self assessment by the individuals themselves. Prior to appraisal personnel were invited to rate their own perceptions of competence on the competency descriptor scales i.e. 1 – 5. Second, appraisals of performance were introduced in order to evaluate the ongoing performance for all operational staff within the hydrocarbon facility. Third, observations were made by supervisors, managers, and the peer group in general. Within such an environment as a COMAH hydrocarbon facility it is necessary to ensure that everyone plays a vital part in observing any non-conformance of any kind. Failure to do so could result in catastrophic consequences. Fourth, it was necessary to evaluate the results of accidents and/or incidents. The key is to learn from all accidents and incidents and put in place corrective actions that will prevent a reoccurrence and/or mitigate potentially fatal consequences. Fifth, the recognition of ‘skill decay’ is vital. This can be identified by an individual, manager/supervisor and is caused by, for example, not majoring in a specific work area for such a long time. Sixth, repeated mistakes, constant failure to perform correctly are a major cause for concern. Clearly it was necessary to identify repeated mistakes and failures and take appropriate corrective action. This took the form of retraining, redeployment to other areas of the business etc. The key is to identify the root causes of the mistakes or failures and take appropriate measured actions. Finally, it was necessary to action a perceived lack of commitment brought on by low morale, motivation, illness etc – It was necessary once again to identify

the root causes for the perceived lack of commitment and take appropriate measured actions where appropriate. As humans we all go through periods such as these during our working lives. The key is to have a caring employer who can help us overcome these issues.

7.7 Deal With Failure to Perform Competently

I noted in Chapter Five that it is necessary to determine the root causes for failure to perform competently. Reasons may include, for example, organisational culture, time and/or commercial pressures leading to the need to cut as many corners as possible, team relationship, such as, poor/ineffective leadership, abysmal communications, inadequate inter- personal relationships etc.

As a direct result of the overall success of the competence based selection, recruitment and assessment process, it was only necessary to deal with a situation of failing to perform competently in one particular instance. Upon analysis of the situation concerned it became clear that one of the Operative's in the warehouse was failing to meet the stringent standards required by Alpha Hydrocarbon. Deeper investigation revealed that square pegs had been inserted into round holes, in a figure of speech. From the onset, one of the key requirements of personnel, working at the Alpha installation was the ability to work as part of a team. This was due to the fact that small numbers of personnel were employed within the operations department and the

sophisticated technology present depicted the necessity for a team approach, for example, hydrocarbon unloading operations.

The individual concerned was identified by both the Trainer/Assessor as weak candidate, who could not work as part of a team and were considered to be a loner. The Operations Director was notified accordingly and this resulted in a guidance and counselling session being administered by the HR department. It was concluded at the end of this guidance and counselling session to terminate the employment of the individuals concerned. This course of action was arrived at via mutual agreement.

7.8 Audit and Review

In Chapter Five I noted that the key requirement of the audit process was to examine the ICAF with sufficient frequency, so as to give confidence that it is meeting its intended aim, operating as intended and to initiate improvements where non-conformance has been identified and corrective actions are required. An audit may encompass an annual check of the operation of the ICAF, through to more frequent checks of particular elements. The key focus is on ensuring the effectiveness and efficiency of the ICAF system as a whole. The scope, nature, extent frequency etc. of the audit will vary depending upon the risks being controlled. The frequency of the audit process will be increased if, for example, non-conformance has been determined and corrective actions are required. The audit programme was dissected into two distinct stages these

included, during the initial stages of implementation ICAF and after the ICAF has been in operation for some considerable time.

In the case of Alpha Hydrocarbon the audit process took the form of both an internal and external provision. The Quality department undertook audits on a periodic basis in order to assess aspects of the ICAF. Similarly, the external Trainers/Assessors responsible for the implementation of the hydrocarbon process plant training undertook their own audit arrangements at suitable points in the learning and development. Audit was built into the ten hydrocarbon process plant learning and development interventions.

The key requirement of the review process was to examine the overall effectiveness and efficiency of the ICAF as a whole. Was it achieving its desired aim? The review process examined a whole wealth of data to include, for example, assessments of competence, third party learning and development delivery.

An example of the audit process utilized by the third party learning provider is shown in Figure 7.3.

Figure 7.3 Example Audit and Review

Reviews			Audit			
Incomplete	Partially Complete	Complete	Number	Incomplete	Partially Complete	Complete

Areas Discussed/Actions/Comments						
1						
2						
3						
4						
5						
6						

Assessor/Verification/Audit					
Assessor	Internal Verifier	External Verifier	Auditor	Candidate	Date

7.9 Conclusions

This chapter has reported on the implementation of the ICAF, developed in detail previously in this thesis. An action research approach based on Lewin's (1933) cyclical (iterative spiral) process was applied to the implementation of the ICAF. Examples of the four phases of planning, acting, observing and reflecting were provided within the introduction section.

Previously within the thesis I noted that Kotter (1990) and Kotter and Rathgeber (2007) outlined eight key stages for successful implementation of a change management philosophy and this was utilized as part of the implementation strategy. I defined both the purpose and scope of individual competency assurance framework for use at Alpha Hydrocarbon. I concluded that the Alpha Hydrocarbon installation was a work activity area encompassed by COMAH 1999, as amended, consequently individual competence is considered to be of vital importance. Prior to the implementation of the ICAF, I decided that it would be prudent to check that other senior managers at the operating facility were happy to delay the implementation of the ICAF within their areas of control, until some point in the future. I contacted each of the senior managers in turn in order to discuss the ICAF. Each senior manager outside of operations confirmed that they did not wish to participate with individual competence assurance at this time; it was something that would be concluded at a later date.

I developed and implemented a competence criteria based around three key areas. These included, core competencies, functional competencies and work

activity impact areas. Prior to the implementation of the ICAF, I set up a breakfast meeting with the Managing Director, Operations Director and Operations Manager, to check whether or not any last minute changes were required. The outcome of this meeting concluded that the ICAF was fit for purpose and that I should move forward to implantation. I demonstrated how personnel could be selected; recruited and assessed using a process of competence based interviewing. This entailed an analysis of interviewee negative and positive responses. Each response was rated on a scale of 0 – 4, with interviewees having to score 3 and above on all the interview questions, in order to be offered employment by Alpha. Personnel competence was developed through the implementation of various learning and development initiatives. These included, for example, Induction, hydrocarbon Process Plant operations. In addition, I demonstrated how competence was assessed in practice. This was undertaken utilising a variety of assessment methods to included, for example, after competence development i.e. learning and development interventions. The assessment of competence was undertaken in two ways, these included a hydrocarbon process plant assessment and assessment via the scale of competency descriptors i.e. 1 – 5. I was able to demonstrate how competence was monitored to ensure continuance of skill, knowledge, understanding, behaviour etc. This took the form of self assessments, annual appraisals etc. Furthermore I identified how to deal with failure to ultimately perform competently. It was noted that in one particular instance that one employee had their contract of employment terminated as a direct result of their inability to work as part of a team. Finally, I was able to

demonstrate the audit and review process for ensuring overall effectiveness and efficiency of the individual competency development framework in organisational performance terms.

The thesis will now move on to discuss the evaluation of the ICAF.

Chapter Eight:

Evaluation of the ICAF

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Chapter Eight:

Evaluation of the ICAF

8.0 Introduction

The theme of this chapter is to report on the evaluation of the ICAF, developed in detail in Chapter Five and implemented in Chapter Seven. As I have previously noted, the key fundamental requirement at Alpha Hydrocarbon was the development of an ICAF, which would ensure that operational personnel had the correct degree of competence (skills, knowledge, attitude, behaviour), in order to achieve a status of 'competent under training' and therefore be in a position to move forward in order to be assessed as 'competent under operations'. The purpose of the evaluation was to determine whether this fundamental requirement has been achieved in practice. In Chapter Two, I noted that my action research approach was based on Lewin's (1933) cyclical (iterative spiral) process. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the evaluation of the ICAF within the Alpha Hydrocarbon installation. This included for example, **planning** – deciding on the most appropriate evaluation methodology, **acting** – implementing the process of evaluation to the various stages of learning and development, **observing** – the delivery of formal courses in order to validate quality of delivery and finally, **reflecting** – on the evaluation data provided in order to identify the requirements for corrective actions.

It was noted earlier in this thesis that various kinds of evaluation provides feedback to different people, these include, employees, learning and development providers, supervisors and managers and the organisation as a whole regarding a return on investment regarding the ICAF, in particular competence development activities.

Before moving on to consider the evaluation of the ICAF, at the Alpha Hydrocarbon installation, I will first examine and analyse the various types of evaluation methodologies currently available.

8.1 Analysis of Evaluation Methodologies

The idea of evaluation being applied specifically to learning and development was first initiated by Donald L Kirkpatrick at the University of Wisconsin (*Kirkpatrick, 1994*). He has published widely on training evaluation, more recently with his similarly inclined son James (*Kirkpatrick & Kirkpatrick, 2007*). According to Tamkin et al 2002, the Kirkpatrick evaluation methodology is the most widely used and understood. Kirkpatrick described the evaluation as a series of steps; however, this has now been modified to read levels (*Kirkpatrick, 1996*).

According to Kirkpatrick (*1996*) evaluation revolves around a four level process. At 'Level One' it is necessary to evaluate the reaction of trainees, in essence, what they thought and felt about the learning and development intervention they attended. 'Level Two' evaluation is designed to examine the extent to which

learning and development has taken place, in other words, the increase in skill, knowledge and capability (competence). The focus at 'Level Three' is on evaluating the extent of the trainee's behaviour and capability improvement and on their ability to implement and apply the newly learnt skill and knowledge. Finally, at 'Level Four' the emphasis is on evaluating results. This is achieved by analysing the impact the learning and development interventions had on the trainee and on the organisation as a whole. Level Four evaluation is more commonly known as a measure of return on investment.

The strengths of the Kirkpatrick approach lies in its simplicity and the pragmatic way in which it assists learning and development practitioners to reflect on employee development activities (*Alliger & Janak, 1989*). It is easy to comprehend and makes practical sense to a wide diversity of organisations within industry and commerce alike.

One of the common criticisms of the Kirkpatrick four level model is based on the misunderstanding that the levels are arranged in an ascending value of information, with results data being viewed more important than reactions (*Bernthal, 1995*). Bernthal (1995) argued that the model mixes evaluation and effectiveness and that these do not form a continuum. However, on closer analysis it can be argued that the model was never meant to be a hierarchy of stages when it was first developed by Kirkpatrick, and it is clear that the value of the information provided will depend predominantly on the type of evaluation required. In addition, there is also an assumption that each level has a direct

bearing on the previous level. Once again it is possible to counter this argument, as the model was never meant to have any inter-relationship between the various levels. In essence each level would provide differing levels of data.

Hamblin (1974) was one of the first to modify Kirkpatrick's model (*Tamkin et al, 2002*). Upon analysis of Hamblin's five point model it is possible to conclude that the first three levels correspond closely to the Kirkpatrick model i.e. Level One: reactions, Level Two: learning and Level Three: job behaviour. However the final level is split into two, organisation and ultimate value. At Level Four, Hamblin, focused on the organisation, in essence this was the effects on the organisation, from the participant's job to performance changes. Hamblin called Level Five, ultimate value. Here he wanted to examine financial effects on both the organisation and the economy as a whole. In reality how one could quantify the effects on the economy is highly debatable. Unlike Kirkpatrick, Hamblin suggested that the five models he devised did form a hierarchy of evaluation.

Phillips is another writer within the training evaluation arena; he defined a new fifth level, which he termed 'return on investment' (*Phillips, 1994; Phillips and Holton, 1995*). His five level evaluation model is largely comparable to the Kirkpatrick four level model, however, he added a fifth dimension termed 'return on investment'. Upon subsequent analysis it is possible to determine that Phillips was attempting to separate out the monetary benefits of training compared to the cost involved.

There has been extensive research into training evaluation, since Kirkpatrick developed his four level theory. However, it is possible to conclude that many of the other evaluation models that have been developed are all in the main variations on the Kirkpatrick theme. In terms of the selection of a particular evaluation model or level of evaluation, the literature and practice suggests that the approach to evaluation should depend on a number of different variables (*Tamkin et al, 2002*). Nickols (2000) summarised the overall evaluation debate succinctly by concluding there is no one recipe book approach. To properly evaluate, requires one to think through the purpose of the learning and development intervention, the purpose of the evaluation, the audiences for the results of the evaluation, the points at which measurements will be taken, the time perspective and the overall framework in use (*Tamkin et al, 2002*). The Kirkpatrick model continues to remain a useful tool for evaluation purposes. As I reiterated earlier, the strengths of the Kirkpatrick model lies in its simplicity and the pragmatic way in which it assists training/learning and development practitioners to reflect on employee development activities. It is easy to comprehend and makes practical sense, and in keeping with the pragmatic way in which this research has been undertaken, I have decided to utilize the Kirkpatrick model to evaluate the ICAF at the Alpha Hydrocarbon installation.

From a personal perspective, one of the fundamental criticisms of the Kirkpatrick (1996) model relates to the measurement of training, learning or development after the event has occurred. Therefore it cannot fully take into account, for example, the design and development of the event, why the event

has been initiated in the first place, abilities of learning and development providers etc. Given this fundamental criticism of the Kirkpatrick (1996) model, I rectified my concerns, by applying the process of evaluation to other elements, for example, evaluating past performance of learning and development providers, evaluating senior manager reactions to the newly developed ICAF.

8.2 Chosen Evaluation Methodology

Kirkpatrick's (1996) four level evaluation model, highlighted previously was used as a model evaluation framework. At Level One I decided not only to evaluate the reaction of trainees, as what they thought and felt about the learning and development intervention they attended, but to also to focus on the evaluation of other key aspects that would impact on the ultimate success of the ICAF. In Chapter Three I noted that one of the fundamental criticisms of the Kirkpatrick (1996) model relates to the measurement of training, learning or development after the event has occurred. Given this fundamental criticism I decided to apply the process of evaluation to other elements, for example, evaluating the views of senior management to the newly developed ICAF, evaluating the performance of learning and development providers

Level Two evaluation was utilized a methodology to measure the extent to which learning and development has taken place, in other words a measurement of the trainees' competence development.

The focus at Level Three was on evaluating the extent of the trainee's behaviour and capability improvement and on their ability to implement and apply the newly learnt skill and knowledge.

Finally, at Level Four the emphasis was on evaluating tangible results. This was achieved by analysing what impact the ICAF had on the Alpha Hydrocarbon organisation as a whole. The return on investment measurement involved the ability to operate the hydrocarbon processing facility in a safe, efficient and effective manner, to the satisfaction of all stakeholders, within their given area of competence.

8.3 Evaluation of Developed ICAF

I noted previously that prior to the implementation of the ICAF; I decided that it would be prudent to check that other senior managers at the Alpha Hydrocarbon operating facility were happy to delay the implementation of the ICAF within their areas of control, until some point in the future. I decided to contact each of the senior managers in turn in order to discuss the ICAF. I had a meeting with each of the remaining senior managers in turn and they all confirmed that they did not wish to participate with individual competence assurance at this time; it was something that would be concluded at a later date.

In order to evaluate what I had been told verbally, I decided to write to each of the senior managers concerned in order that I would have documentary

evidence of their wishes. In terms of Kirkpatrick's four levels, the evaluation I was seeking at this stage could be described as Level One reaction data. I was seeking to gauge initial satisfaction to the newly developed ICAF. Each of the senior managers was asked to confirm that they had no concerns with the developed ICAF, that no changes were being requested and that they did not want to participate with the ICAF implementation, within their respective departments, at this time. All of the senior managers canvassed confirmed that they were delighted with the ICAF and that they did not want to implement the ICAF within their respective departments at this time.

In addition, in Chapter Seven I noted that prior to the implementation of the ICAF; I set up a breakfast meeting with the Managing Director, Operations Director and Operations Manager, in order to review the ICAF, prior to implementation and to check whether or not any last minute changes were required. The key focus of this meeting was to determine that there was a comfort factor with the ICAF and that the developed competencies and activity impact areas encompassed all operational bases. The breakfast meeting concluded that the ICAF was a 'fit for purpose' model for implementation and approval was subsequently reached with a go ahead date being confirmed.

In addition, I noted that during the later stages of development of the ICAF and in particular the fine tuning of the competencies and activity impact areas, one key member was missing from the senior management team. The company solicitor had been on a leave of absence due to sickness. Consequently, I

thought it of vital importance to check the legal validity and reliability of the ICAF, with particular reference to competencies and activity impact areas. I therefore contacted the company solicitor and arranged a meeting at the company's head office in order to talk through any potential concerns. The outcome from the meeting was a resounding success and I was given formal legal approval to proceed with the implementation of the ICAF.

Once again in order to evaluate what I had been told verbally, I decided to write to Managing Director, Operations Director, Operations Manager and company solicitor in order that I would have documentary evidence. This was once again a Level One reaction data measure. Each member canvassed was asked to confirm that they had no concerns with the developed ICAF and that no changes were being requested. All those canvassed confirmed that they were delighted with the ICAF and that I should proceed to the implementation stage.

8.4 Evaluation of Third Party Provider

Previously in this thesis I noted that due to limited manpower resources being available within the HR department, it was decided by the Operations Director, in consultation with the Operations Manager, to send the competence development and assessment stages out to competitive third party tender. I was asked to attend a meeting with the Operations Director where I was tasked with identifying suitable organisations that could both develop and assess competence to the requirements of COMAH 1999, as amended. I set about producing a briefing document highlighting key aspects of the hydrocarbon

process operations and this was sent to three organisations that purported to have a proven track record within hydrocarbon competence development and assessment within the UK. From an analysis of the presentations made in order to secure the competence/assessment contract, one clear winner emerged (Beta, not their real name), by virtue of the fact that they had a proven track record of delivery and assessment and were fresh from a similar hydrocarbon operating facilities within the UK, whereby they had undertaken an exact replicas of what was required. In order to examine the quality of their prior consultancy work, an evaluation of the learning and development provider was undertaken at this stage.

I asked the Beta organisation to supply the names of two hydrocarbon process operating plants where they had undertaken both hydrocarbon competence development and assessment. I also asked if they had any objection to me contacting these two hydrocarbon operating facilities. Beta had no objections and I contacted the two operating plants according, with the view to visiting, in order that I could evaluate their work at first hand.

From an analysis of the visits a positive picture of evaluation emerged regarding the two operating plants concerned. During the discussions it emerged that the Beta organisation had been set up by three key people who had taken voluntary redundancy from the two organisations concerned. Between these three people there was over 100 years of hydrocarbon process operations, maintenance, management, and learning and development skills, knowledge and experience.

In order to undertake an analysis at the Level One evaluation stage, I decided to speak to a sample of the workforce and examine documentary evidence where possible. Everyone I spoke to confirmed that they were delighted with the work of the Beta organisation. There had been no history of negative feedback recorded of any kind. This was confirmed by viewing a selection of course evaluation forms. At Level Two there was strong evidence

At the Level Two evaluation stage I focused my attention on the degree of competence that had been developed by the Beta within the two organisations concerned. A positive picture emerged, in so much, that I was shown documentary evidence, in the form of competence development matrices, which highlighted beyond question how learning and development had impacted significantly on competence development.

Next I turned my attention to Level Three type evaluation, in particular, evidence of behavioural change. Once again there were exceptional positive indicators present regarding behaviour change, for example, everywhere I looked everyone wore the correct personal protective equipment (PPE). This in itself provided evidence of a strong behavioural safety culture.

Finally, I asked for evidence regarding Level Four evaluation, in essence the return on learning and development investment. It was confirmed that the two hydrocarbon processing facilities were operating highly efficiently and in a cost

effective manner. Hydrocarbon was being supplied to the national grid network and clearly the Beta organisation had played a vital part within all of this. I reported my findings of the positive evaluation to the Operations Director and as a result of the evaluation findings approval was given to utilize the Beta organisation, in order to develop and assess competence at Alpha Hydrocarbon. Beta commenced work the following week. I noted that they immediately put in place the following, a Learning and Development Coordinator, permanently based at the Alpha Hydrocarbon process facility, an Administrator to deal with paperwork and course booking complexities and three Trainers/Assessors who were experienced across the complete spectrum of hydrocarbon process operations.

8.5 Evaluation of Learning and Development

I noted in Chapter Six that the learning and development interventions encompassed, for example, induction training (delivered by Beta), process plant hydrocarbon core training modules – VQ accredited (delivered by Beta), process plant, machinery and work equipment specific (delivered by suppliers direct).

The evaluation of the above learning and development interventions was undertaken utilising Kirkpatrick's (1996) four levels of evaluation model. I will now report on the evaluation of each one of these in turn.

8.5.1 Level One Evaluation – Reactions

I noted previously within this chapter Level One, or participant reaction information, measures participant satisfaction with the learning and development intervention. This participant reaction that can be measured both internally and externally, is key in deciding whether there is worth in repeating the same intervention again, if changes (minor or major) are required, or if a total disaster occurs, and in the words of the delegates the learning and development intervention was abysmal for a number of reasons. These could include for, example, trainer knowledge/performance, content, venue etc. Sometimes called 'smile' or happy sheets, Level One evaluation consists of a questionnaire, rating delegate satisfaction with the learning and development intervention.

The Beta organisation produced a Level One reactions based analysis evaluation form, for use at Alpha Hydrocarbon. Upon analysis of the form, the reactions level data was categorised under four distinct heading. These included facilities and instructions, course content, trainer and the overall balance of program.

An example (scanned copy) of the level 1 reactions evaluation form, utilized by the Beta organisation is shown in Figure 8.1

Figure 8.1 Level One Evaluation – Reaction

Beta HRD	Validation and Evaluation of Training	Form	BS1-20.00-03/j				
		Revision	00				
		Date					

Name of Trainee						Date:
Receiving Manager or Supervisor						
Details of Training						

Part 1: Facilities and Instructions Evaluation

Evaluation	Excellent Poor					
	6	5	4	3	2	1
Hotel facilities?						
Catering quality?						
Training accommodation and/or facilities?						
Training location?						
How do you rate the instructions received regarding the following?						
Attending the event?						
Completing pre-event material?						
Bringing material to the event?						
Travelling to the event?						
Remarks:						

Part 2: Course Content Evaluation

To what extent do you feel your personal learning objectives have been achieved?						
Which of your personal learning objectives were not achieved, and why?						
Which parts of the event do you feel will be the most useful back at work?						
Which parts of the event do you feel will be the least useful, or not at all useful, back at work?						
Are there any subjects you feel should have been included?						
How do you rate the event?	Useful Useless					
	6	5	4	3	2	1
	Interesting Not interesting					
	6	5	4	3	2	1

What is your overall rating of this event?	Good Bad						
	6	5	4	3	2	1	
Would you recommend others with similar needs to your own to attend this event?	Yes No						
	6	5	4	3	2	1	
How do you rate the number of course participants?	Too few		Just right		Too many		
How do you rate the handouts issued?	Quality						
	6	5	4	3	2	1	
	Quantity						
	6	5	4	3	2	1	
	Relevance						
	6	5	4	3	2	1	
	How do you value the visual aids used?	Quality					
		6	5	4	3	2	1
Quantity							
6		5	4	3	2	1	
Relevance							
6		5	4	3	2	1	
Well used Badly used							
6		5	4	3	2	1	
Comments:							
Part 3: Trainer Evaluation							
Evaluation	Excellent Poor						
	6	5	4	3	2	1	
How do you rate the trainer in relation to the following:							
Knowledge of subject?							
Organisation of sessions?							
Obvious preparation?							
Style and delivery?							
Responsiveness to group?							
Creating a good learning climate?							
Comments:							

Part 4: Balance of Programme						
Evaluation	Excellent Poor					
	6	5	4	3	2	1
How do you rate the balance between input sessions, activities, discussions, and videos etc?						
How do you rate the length of the event?						
How effective were the practical activities?						
How do you rate the time given to the following:						
Course activities?	Excellent Poor					
	6	5	4	3	2	1
Follow-up discussion?						
What level of time would you like to have seen given?						
Comments?						

Under the facilities and instructions heading, delegates were asked to rate such things, for example, as hotel facilities, catering quality and training accommodation/facilities. Delegates were asked to score each aspect on a scale of excellent (six), very good (five), good (four), satisfactory (three), less than satisfactory (two) and poor (one). In addition, the evaluation form allowed for comments on any of the above.

Course content was evaluated under headings, for example, to what extent course objectives had been achieved, what were the most and least useful parts of the course and identifying the requirement for additional topics to be covered is. Once again a six to one scale was employed to determine such things as usefulness, interest, quality, quantity, relevance etc.

The quality of the trainer was evaluated under heading such as, for example, topic knowledge, organisation, preparation, style of delivery and responsiveness to the group. Once again, the trainer was rated on a scale of six (excellent) – one (poor).

The final stage of evaluation at the Level One reactions stage was to evaluate the balance of the training/development program. Typical headings at this stage included, for example, balance of input, activities and discussions, length of event, practical activities and follow up discussion. The balance of the program was rated, once again, on a scale of six (excellent) – one (poor).

At the end of each learning and development intervention, an analysis was undertaken of the Level One reactions data provided by each of the delegates and a database was produced accordingly, in order to monitor the data. In one particular instance the scores relating to an external learning and development provider caused serious concern. Over 75% of the delegates had scored a training event on legislative compliance as only three or less. Immediate action was taken by Beta to remove the organisation concerned off the list of approved suppliers. This demonstrated that the Level One reaction evaluation was achieving its desired aim.

8.5.2 Level Two Evaluations – Learning and Development

Level Two evaluation measures the extent to which learning and development has occurred. This is defined as the measurement of underpinning knowledge and understanding i.e. what delegates have learnt and whether or not they know how to implement this newly acquired skill in practice. All learning and development interventions must have at least one or in some cases a series of objectives i.e. what the delegate should be able to achieve (the output) on completion of the learning and development intervention. In reality this is what the knowledge and understanding elements encompass. The learning and development objectives provide an initial basis for the Level Two evaluation process. It is at this point it is possible to ascertain not only how satisfied delegates are with the learning and development intervention, but in reality what can they do differently and a result of the inputs received. Formal tests (practical or mental), skill practices, simulations, group work, role plays,

professional discussions, questioning, project work etc are all methodologies that can be adopted to evaluate knowledge and understanding in practice. The setting of learning and development objectives was the key driver utilized by Beta as part of the Level Two evaluation process. Upon analysis of these learning and development objectives it is possible to conclude that each one of these is measurable and quantifiable in output terms. For example, identify a range of hydrocarbon process related hazards. In order to achieve this outcome delegates were tasked with constructing a hazard checklist for use as an aide memoir and then utilising the hazard checklist to identify a range of hydrocarbon process related hazards (Figure 8.2). An example of the standard of performance, evidence requirements and underpinning knowledge and understanding requirements for this task is highlighted in Figure 8.3.

In order to fulfil the Level Two evaluation requirements, delegates' underpinning knowledge and understanding was assessed in a number of ways, these included, for example, questioning, and the examination of outcomes.

Where a delegate was undertaking a learning and development intervention, outside of the scope hydrocarbon process plant operations, it was decided to utilize the same standard of approach, in order for there to be commonality across the range of Level Two evaluation.

Figure 8.2 Hazard Checklist Construction

Candidate Activity 1: Devise a Hydrocarbon Process Plant specific hazard checklist for use as an aide memoir, when undertaking a risk assessment. You may find the following headings useful:	
Mechanical Hazards	Hazard Description
Electrical Hazards	Hazard Description
HYDROCARBON Process Hazards	Hazard Description
Hazardous Substances	Hazard Description
Work Activity Hazards	Hazard Description
Work Environment	Hazard Description

Figure 8.3 Example Element

Element 10.1 Identify Hazards					
Standards of Performance					
<p>In achieving this Element you must have:</p> <ol style="list-style-type: none"> 1. Read and discussed with the Trainer, the relevant sections of the Unit Workbook; 2. Completed Candidate Activity 1: <ul style="list-style-type: none"> • Devised a Hydrocarbon operating facility hazard checklist, for use as an aide memoir; 3. Reviewed and discussed the activity with the Trainer; 4. Completed Candidate Activity 2: <ul style="list-style-type: none"> • Utilized the hazard checklist to identify a range of Hydrocarbon operating facility hazards, to include: <ul style="list-style-type: none"> ○ Type; ○ Description; 5. Reviewed and discussed the activity with the Trainer; 6. Reviewed and discussed the Identify Hazards Element with the Trainer. 					
Evidence Requirements					
<p>The following form part of the evidence requirements:</p> <ol style="list-style-type: none"> 1. Trainer Log – list of delegates who have attended; 2. Trainer Flip-chart – review and discussion material; 3. Unit Work-book – completed candidate activities. 					
Underpinning Knowledge and Understanding					
<p>At the end of the training candidates must be able to demonstrate a working knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Hydrocarbon operating facility hazards. <ul style="list-style-type: none"> • Mechanical; • Electrical; • Hydrocarbon process; • Substances; • Work activities; • Work environment. 					
Assessment Method					
Observation	O		Examination of Outcomes	EO	
Professional Discussion	PD		Simulation	S	
Witness Statement	WS		Project and Assignment	PA	
Questioning	Q		Formal Test	FT	

8.5.3 Level Three Evaluation – Behaviour

Level Three evaluation measures whether the underpinning knowledge and understanding is being implemented in an 'on the job' type scenario. In other words the employee concerned is applying what they have learnt to the day to day activities that they encounter in their job role. Given that this Level Three measurement focuses on changes in behaviour, it can be difficult to measure for several reasons. Delegates cannot implement the new behaviour until they have the opportunity to do so. In addition, it is difficult to predict when the new behaviour will be implemented. Even if there is an opportunity to do so, the delegate may not implement the required behaviour at the first calling.

Consequently, timing becomes a vitally important element in the measurement factor. To compound matters further, the delegate may have learnt the correct behaviour, however, is prevented from implementing it due to organisational factors, for example, manager prevention. It is at this behavioural level that serious health and safety issues occur within the workplace. An employee can have the necessary underpinning knowledge and understanding imparted to them, however, if they are prevented from majoring in a particulate work area, possibly due to production demands, then the terminology 'skills decay' can become prominent. The employee will lose the correct behaviours, due to the fact that they have not majored in that particular area. An example of this that applies to every single one of us is in the use of computers. If you do not work on a computer for say a period of six months, then it is possible to lose the correct level of behaviour, for example, how do I animate a PowerPoint presentation.

According to Kirkpatrick (1996) measuring Levels One and Two should occur immediately after the learning and development input, however, this cannot be the case at Level Three. To evaluate this correctly we must find time to observe the delegates during a real live scenario in order that positive behaviour traits can be correlation and corrective actions applied to negative ones.

As part of this requirement to evaluate at Level Three, Beta constructed a series of practical activities which would allow for the proving of correct and safe behavioural traits. For example, requested permission from duty Process Supervisor to proceed, followed correct company policy/procedure, isolated equipment, de-pressured, purged, tested and recorded results (gas to air). Upon completion the Trainer/Assessor would review and discuss the practical activity with the trainee. Practical activities would be undertaken in four distinct stages. First, the Trainer would undertake a demonstration. Second, the trainee would undertake the task(s) with Trainer/Assessor assistance. Third, the trainee would undertake the tasks with minimum Trainer/Assessor input, until mastery. This in reality could mean a few weeks. Fourth, the trainee would undertake the task(s) with no input from the Trainer/Assessor (unless a serious health and safety issue became evident), in order that the correct underpinning knowledge, understanding and behaviour could be demonstrated and assessed as competent.

All of the above were evaluated by the Beta organisation and where mastery of the task was not evident then additional inputs were made into the underpinning

knowledge and understanding. The Level Three evaluation process did not result in any object failures being recorded.

8.5.4 Level Four Evaluation – Results

Level Four evaluation is designed to measure business impact. It is more often than not referred to as 'return on investment'. In essence its primary function is to determine whether the benefits from the training have been worth the cost of the learning and development interventions. At this level, the evaluation is not accomplished through the methods like those utilized in the previous three levels. According to Kirkpatrick (1996), results at Level Four could be determined by factors such as, for example, cost reduction, increase in turnover/profits, increased sales, improved customer service reduction in waste/errors etc. However given that the Alpha Hydrocarbon processing facility is a brand new Greenfield site development it was impossible to examine any of the aforementioned measures initially. Consequently, it was necessary to focus on other tangible results and to measure the other elements at a later stage when the plant was up and running.

The measurement factors at Level Four were the achievement of the hydrocarbon process plant units and elements that were assessed to a VQ standard, achieving the correct grade of competency descriptor i.e. three and above and finally the ability to be in a state of readiness to commission the hydrocarbon process facility.

8.6 Conclusions

This chapter has reported on the evaluation of the ICAF at the Alpha major hazardous installation. An action research approach based on Lewin's (1933) cyclical (iterative spiral) process was applied to the evaluation of the ICAF. Examples of the four phases of planning, acting, observing and reflecting were provided within the introduction section.

A review and analysis was undertaken of the numerous most widely utilized evaluation methodologies currently applied to learning and development. Having reflected on the various evaluations methodologies available, I decided that the evaluation of the ICAF would be undertaken using a modified Kirkpatrick (1996) four level methodology, due to its simplistic, pragmatic and widely recognised nature. The evaluation process was applied to the various stages of the ICAF. Firstly, there was the evaluation of developed ICAF (Level One reactions). The views of the Managing Director, Senior Managers, Company Solicitor and Operations Director and Manager were sought and from an analysis of all their views it was possible to conclude they had no concerns with the developed ICAF, they did not require any changes to be made to the ICAF, outside of operational based staff they did not want to participate with the ICAF, within their respective departments, at this time and finally that I could proceed to the next stage i.e. implementation.

Secondly, I evaluated the third party provider. Visits were made to two hydrocarbon processing facilities in order to evaluate the competence

development and assessment work previously undertaken by the Beta organisation. From an analysis of these visits exceptional positive indicators emerged regarding the Beta organisation, at all four levels of the evaluation process.

Thirdly I undertook evaluation of the learning and development interventions. At Level One Beta devised an evaluation form which sought trainee feedback, for example, facilities and instructions, course content, trainer input. As a result of serious negative feedback from delegates at this stage, one supplier of learning and development interventions was removed from the approved list of suppliers. Evaluation was undertaken at Level Two in order to measure the extent to which learning and development occurred. Beta decided to assess delegates' underpinning knowledge and understanding in a number of ways, for example, observation, the examination of outcomes. As part of a requirement to undertake evaluation at Level three, Beta constructed a series of practical activities which would allow for the proving of correct and safe behavioural traits. The tests were constructed around maximum and then minimum Trainer/Assessor input until mastery was achieved. Finally evaluation was undertaken at Level Four, in order to measure organisational impact or the more common term the return on investment. The measurement factors included the achievement of hydrocarbon process plant operations units and elements, achieving the correct grade of competency descriptor i.e. three and above and the ability to be in a state of readiness to commission the hydrocarbon process facility.

The thesis will now move on to the final chapter.

Chapter Nine:

Conclusions

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Chapter Nine:

Conclusions

9.0 Introduction

This thesis has examined the concept of the development and implementation of an ICAF, at the Alpha Hydrocarbon major hazardous installation. Previously in Chapter Two, I noted that I had decided on an action research methodology due to, for example, its practical, collaborative and problem solving nature. This action research approach was utilized in order to achieve the desired change agenda within Alpha Hydrocarbon. My approach was based on Lewin's (1933) cyclical (iterative spiral) process, which consisted of four distinct phases, these included, planning, acting, observing and reflecting. These four phases were applied to operationalising each of the five research objectives, highlighted in Chapter Two. Examples of these four distinct phases are shown in each of the review sections below.

The ICAF was developed and implemented in order to ensure compliance with the requirements of COMAH 1999, as amended. One of the key requirements of COMAH 1999, as amended, is that of employee competence, in order to help minimise the potential for human error for safety critical tasks. In this context, a safety critical task is any task or job whereby sub-standard performance and/or failure, could contribute to a major accident. The key focus, therefore, is on major accident prevention. The thesis will now conclude with a review of the research

aim and objectives, the contributions of thesis, the limitations of the research, future research opportunities and finally my personal reflections.

9.1 Review of Research Aim and Objectives

In Chapter One I noted that the aim of the research was to develop an ICAF at the Alpha Hydrocarbon major hazardous installation and to implement learning and development interventions to underpin the ICAF, in order to ensure that all operationally-based employees were deemed ‘competent under training’.

A status of ‘competent under operational conditions’, would not be achieved until such time as the facility became operational and was fully managed by the Alpha Hydrocarbon operations department. In order to achieve the research aim it is necessary to set out a series of key research objectives. The objectives of the research were to:

1. Undertake a critical review of relevant literature regarding individual competence assurance, so as to place the research into a wider context;
2. Develop a best practice ICAF for Alpha Hydrocarbon;
3. Develop learning and development initiatives in order to underpin the ICAF at Alpha Hydrocarbon;
4. Implement the best practice ICAF and action plan to achieve the desired change agenda, in order that operationally- based trainees achieve competence under training status;
5. Evaluate the implementation of the best practice ICAF.

9.1.1 Research Objective One

Research Objective One was to undertake an examination and analysis of current academic and practitioner literature, regarding the topic of individual competency assurance. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the literature review. This included for example, **planning** – deciding on the literature review topic areas, **acting** – obtaining the literature from various documentary sources, **observing** – ensuring the literature was up-to-date and from reliable sources that would stand the test of academic rigour, and finally, **reflecting** – ensuring the literature dealt with all aspects of the ICAF topic area.

The review began with an in-depth search for suitable material appertaining to the research aim. Reviews and analysis were undertaken of major accident regulations, competence and competency frameworks as well as learning, training and development. I noted that the need for regulatory action, regarding major accident sources, was prompted as a direct result of a number of serious accidents within the member states of the European Union (EU) (*Norman, 1999*). These included, for example, Seveso, Italy, 1976 a large dioxin release from a chemical plant. The outcome from this accident at Seveso, as well as other similar accidents within the EU resulted in the first European directive concerned with accidents and incidents at major hazard installations. Known as the Seveso I Directive (*82/501/EEC*), it was incorporated into UK law as CIMA 1984 (*Norman, 1999*). I noted that the Seveso Directive was amended twice, first, in 1987 by Directive 87/216/EEC of 19 March 1987 and secondly, in 1988

by Directive 88/610/EEC. Both amendments were aimed at broadening the scope of the original Seveso 1 Directive. On 9 December 1996, Council Directive 96/82/EC on the control of major-accident hazards the so-called Seveso II Directive was adopted. EU member states had up to two years to bring into force their national laws, regulations and administrative provisions to comply with this new directive (*Norman, 1999*). In response to this new directive the UK government implemented COMAH 1999. The main overriding aim of Seveso II was to improve the effectiveness and efficiency of Seveso I. As a direct result of a continuance of accidents and incidents at major hazardous installations, further changes were announced by the UK Government, this resulted in COMAH 1999, as amended (*HSE, 2005*). One of the key requirements of COMAH is that of employee competence, in order to help minimise the potential for human error for safety critical tasks (*COMAH, 1999, as amended*). In 2008, it was noted that minor amendments were made to terminology (*COMAH, 2008*).

From an analysis of the work undertaken by the CIPD (*2007*) it was possible for me to conclude that 'competency' is more precisely defined as the behaviours that employees must have, or must acquire, to input into a situation in order to achieve high levels of performance, these are more commonly termed 'soft' skills and include such things as communication, problem solving. While "competence" on the other hand relates to a system of minimum standards or is demonstrated by performance and outputs, these are commonly referred to as hard skills as they include such things as operation, maintenance.

Upon analysis of the work undertaken by the CIPD it was possible to conclude that competencies are a signal from the organisation to the individual of the expected areas and levels of performance. They provide the individual with a map or indication of the behaviours that will be valued, recognised and in some organisations rewarded. Competencies can be understood to represent the language of performance in an organisation, articulating both the expected outcomes of an individual's efforts and the manner in which these activities are carried out (*CIPD, 2007*). I noted that it is possible to develop competency frameworks in a number of ways. Firstly, it is possible to draw on the competency lists produced in support of occupational standards and the framework of a NVQ. Secondly, competency lists are available on the World Wide Web (WWW) and these will come from a variety of sources. However, one thing which cannot be accessed in this way is a completed ICAF. Fletcher (*1991*) emphasised the use of the NVQ system as a means of assessing the competence of individuals to carry out tasks. However, I noted that in practice some companies do not try to follow the NVQ format as there is no way of specifying the hazards related to the tasks that are being assessed. In addition, some companies found that the NVQ system did not cover assessment for competence for all tasks; consequently they are questioning the methods used to assess the competence of individuals to carry out safety related tasks consistently and effectively (*Fletcher, 1991; Wright et al, 2003*). I noted that the HSE consider the area of competence assessment as vital, and in 2003 they commissioned a report entitled 'Competence assessment for hazardous industries'. It concluded that past major incidents were directly attributable to the

lack of skill and knowledge, which has resulted in some form of human error failing (*Wright et al, 2003*). According to the HSE (2007), competence can be defined as a combination of practical skills, knowledge, thinking and experience. It also includes the ability to undertake work activities to a required standard, on a regular and continual basis. I concluded that an ICAF on the other hand, should enable all personnel to fulfil responsibilities and to perform activities to a recognised and acceptable standard of competence on an ongoing basis. The purpose of such a system is to control, in a logical sequence and integrated manner, all work tasks within an organisation that are considered safety critical as it is no longer acceptable to make untested assumptions about staff competence (*Wright et al, 2003*).

I noted that prior to the report ‘Competence assessment for hazardous industries’, other research was being undertaken by the HSE in the area of developing and maintaining staff competence (*HSE, 2002*). The guide ‘Developing and Maintaining Staff Competence’ was written for the railway sector, however, it applies equally well to areas such as hazardous installations. Upon analysis of the HSE’s approach I determined that a CMS can be viewed as a cycle defined by 15 principles linked in five phases (*HSE, 2002*). Upon analysis of the HSE’s 15 key principles of a CMS it was possible to determine which of these principles applies to the development and maintenance of individual competence. Further analysis revealed that in 2007, the HSE published a new document relating to competence entitled, ‘Managing Competence for Safety Related Systems. This guidance on competence applied to everyone, in all

industry sectors, whose decisions and work with safety-related systems could impact on health and safety in some way. The fundamental aim of the publication was for all personnel within scope to be suitably qualified and experienced for their own work activities, roles and responsibilities. I noted that unlike the 2002 document for the railway sector no attempt was made by the HSE to define individual competence within their 2007 document.

Consequently, in order to define individual competence in the context of both documents I decided to undertake a comparison of the two approaches in order to identify common themes. This aided my ultimate goal of defining a best practice ICAF.

‘Learning’, ‘training’, and ‘development’ are terms that are often used interchangeably. Consequently, this has lead to some confusion, especially as the way the terms are used has changed gradually over the years (*CIPD, 2007b*). Since the mid-1990s, there has been a gradual shift in the techniques and language used to describe the steps taken by employers to help employees perform their jobs more effectively. Until recent times, ‘training’ would have been the word most frequently employed whether to describe a development technique, for example, a classroom-based event. Now ‘learning’, often linked with ‘development’, is the key term (*CIPD, 2007b*).

A review and analysis of learning, training and development concluded that learning is a process leading to increased adaptive capacity (*CIPD, 2007b*). Development on the other hand is usually used in a wider context than either

‘learning’ or ‘training’ and covers both of these. It tends to refer to a longer process of learning, acquiring skills or knowledge that may include a number of elements such as training, coaching, formal and informal interventions, education or planned experience. Training was defined as an instructor-led, content-based intervention leading to desired changes in behaviour, and which, unless it is ‘on-the-job’ training, involves time away from the workplace in a classroom or equivalent. I noted that Kolb and Fry (1975) and Kolb and Kolb (2001) concluded that the learning cycle can begin at any one of the four points and that it should be approached as a continuous cycle, for example, concrete experience, testing in new situations. From a personal perspective I concluded that learning cannot commence at any point on the cyclical scale, unless it is properly managed within a hazardous environment, due to the dire consequences of uncontrolled experimental activities.

From an analysis of the relevant literature it was possible for me to define the component parts of individual competency development. This was determined as a result of a comparison of key documents published by the HSE entitled *Developing and Maintaining Staff Competence (2002)*, as well as, *Managing Competence for Safety Related Systems (2007)*. As a result of additional analysis I was able to define key aspects of a best practice ICAF, which contained eight key stages.

The chapter concluded with an analysis of the conceptual framework and key concepts. A conceptual framework was defined as a map or research travel

plan. At the start of the research process, I noted that it was important to consider the relevant theory underpinning the research phenomenon. By evaluating this theory the researcher can begin to develop a loosely structured conceptual framework to guide them (*Sinclair, 2007*). By identifying the relevant literature to which the research contributes and showing a satisfactory knowledge of the context and background of the research, I concluded that this was one of the main criteria which would be applied to assessing the merits of my Professional Doctorate thesis. I was able to demonstrate how the literature identified and critically reviewed within this chapter was intrinsically linked to the conceptual framework and key concepts of the research.

9.1.2 Research Objective Two

Research Objective Two was to develop a best practice ICAF, for use at the Alpha Hydrocarbon installation. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the development of the best practice ICAF. This included for example, **planning** – deciding how the ICAF could be developed, **acting** – discussions with the Operations Director and visits to other hydrocarbon installations, **observing** – how competence was developed and assessed within other hydrocarbon installations, and finally, **reflecting** – ensuring that the task analysis had encompassed all hydrocarbon tasks.

In discussions it became apparent that the company did not want to ‘pirate’ existing models; however, they did not want to ‘reinvent the wheel’ either. They required an ICAF that was specific to the needs of the organisation, building where possible on best practice from other organisations. From a legal perspective there is only a requirement to develop a competence assurance framework only for safety critical tasks and I suggested that it would be beneficial to develop an ICAF for the whole of the Alpha organisation, however, my suggestion was declined due to organisational pressures.

A roadmap for the development of the ICAF was agreed. This included five key aspects for development. First, I analysed three key HSE documents on the topic area of individual competence assurance. These included, ‘Competence Assessment for Hazardous Industries’, ‘Developing and Maintaining Staff Competence’ and ‘Managing Competence for Safety Related Systems, the contents of which were described in Chapter Four. Second, I undertook a key word search of the World Wide Web, in order to determine whether any ICAF’s were within the public domain. Third, I visited three other hydrocarbon operating facilities, owned by the stakeholder companies. This included visits to the Persian Gulf and the Iberian Peninsula. Fourth, I visited two hydrocarbon installations, within the UK and was able to gain access to them through known consultancy contacts. Fifth, I reviewed job descriptions. Sixth, I undertook a task analysis of operational activities, in order to identify competencies and work activity areas.

I was able to define the purpose and scope of the ICAF for use at Alpha Hydrocarbon installation. I concluded that the Alpha Hydrocarbon installation was a work activity area encompassed by COMAH 1999, as amended, consequently individual competence is considered to be of vital importance. I was able to develop a competence criteria based around three key areas that included core competencies, functional competencies and work activity impact areas. The competence criterion was defined as a result of a twofold analysis of both the job descriptions, as well as identifying the task requirements for operating a hydrocarbon installation. The task requirements were identified following visits to two operating hydrocarbon installations within the UK. I was able to identify a methodology for the selection, recruitment and assessment of personnel capable of operating a hydrocarbon facility (after competence development). This included the pre-assessment of competence, to ensure that the learning and development initiatives are appropriate. This was achieved through the application of competence based interviews, which were given a numeric value of responses given by the interviewee. In addition, I was able to show how to develop competence through the implementation of various learning and development initiatives. These included, for example, induction, hydrocarbon process plant training. I demonstrated how competence could be assessed, this included, for example, after competence development i.e. learning and development initiatives. The assessment of competence was undertaken in two ways, this included, for example, assessment via the scale of competency descriptors i.e. one to five. I demonstrated how competence would be monitored to ensure continuance of skill, knowledge, understanding,

behaviour. This took the form of self assessments, annual appraisals etc. I was able to identify how to deal with failure to ultimately perform competently, this may result in applying additional learning and development initiatives, re-deployment to other areas or dismissal from the hazardous installation. Finally I concluded that audits and reviews are vital elements in evaluating the overall effectiveness and efficiency of the ICAF in organisational performance terms.

9.1.3 Research Objective Three

Research Objective Three was to analyse and develop learning and development interventions in order to underpin the ICAF. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the learning and development needs analysis and the development of structured and systematic learning and development initiatives. This included for example, **planning** – deciding on the most appropriate method in order to undertake the learning and development needs analysis, **acting** – discussions with various learning and development providers, **observing** – the delivery of formal training courses to verify quality of delivery, and finally, **reflecting** – ensuring the learning and development needs analysis and the learning and development initiatives encompassed all hydrocarbon topic areas.

A learning and development needs analysis was undertaken. This involved the systematic gathering of data to find out where there are gaps in the existing skills, knowledge and attitudes of employees. It involved the gathering of data

about employees' capabilities and organisational demands for skills, and the analysis of the implications of new and changed roles for changes in capability.

Careful analysis of learning and development needs was important because unless the right quality of employee was present, Alpha Hydrocarbon would have struggled to implement strategies and achieve targets. Similarly, providing learning opportunities to staff enabled the development and achievement of personal and career goals. Well-planned learning and development was an effective retention strategy, particularly for ambitious and externally mobile employees. All learning and development interventions were designed to meet previously identified learning needs in order to be cost-effective. Having a clear idea of what needed to be learned and the outcomes expected provided a basis to evaluate the effectiveness of implementation of the learning strategy.

A structured and systematic approach to the identification of learning and development needs ensured that training was targeted at both the needs of the organisation and the individual employee, and ensured that the best possible use is made of the resources available.

Learning and development needs were categorised into three levels, first, organisational level, for example, those that affects the whole organisation, such as legislative requirements. Second, there are those at job and departmental level, for example, those that affected the department and jobs of those who work therein such as the new process plant supplied by the vendor

companies. Third, those at individual level, for example, the gap between the individual's current competence and the competence required operating the Alpha Hydrocarbon processing facility.

Various interventions were examined and these fell into two distinct categories. These included, for example, learning and development activities such as coaching, mentoring, as well as internal and/or external courses which can be categorised as functional skills training and competency development. The chosen merits of each chosen method was considered, however in practice the key was to utilize a combination of methods in order to achieve the desired outcome i.e. the development of individual competence to a standard required to operate the Alpha Hydrocarbon process plant facility effectively, efficiently and above all else safely.

9.1.4 Research Objective Four

Research Objective Four was the implementation the best practice ICAF and action plan to achieve the desired change agenda, in order that operational based trainees achieve competence under training status. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the implementation of the ICAF within the Alpha Hydrocarbon installation. This included for example, **planning** – deciding on the most appropriate change management model, **acting** – identifying the change management coalition/guiding team, **observing** – identifying blockages to the

change management process, and finally, **reflecting** – evidence of a culture change.

The eight key requirements for successful change management developed by Kotter (1990) and later streamlined by Kotter and Rathgeber (2007), was utilized as an implementation model. First, it was necessary to create a sense of urgency, given the abysmal failure of Alpha hydrocarbon to develop an ICAF. In the words of the Operations Director “business as usual is no longer an acceptable plan, we must move forward”.

Second, it was necessary to pull together the guiding team. In the case of Alpha Hydrocarbon, the key members of the coalition included the Managing Director, the Operations Director, the Operations Manager, I the builder of the ICAF and the third party contractor responsible for the implementation of the ICAF. A third contractor was chosen due to time constraints and lack of internal manpower resources.

Third, it is necessary to develop the change vision and strategy. In the case of Alpha Hydrocarbon this was the developed best practice ICAF that will bring about the required change agenda. In constructing the ICAF I ensured that it was possible to explain the ICAF vision under key headings. These included, core competencies, functional competencies, activity impact areas, competency descriptors and hydrocarbon process plant training (VQ accredited).

Fourth, it was necessary to communicate in order to achieve understanding and buy in. The best practice ICAF was communicated to the operations department via a series of meetings. I presented the newly developed best practice ICAF. I highlighted the requirement for significant learning and development interventions in order to underpin the ICAF.

Fifth, there is a need to empower others to act. From the onset of the requirement for change within Alpha Hydrocarbon, it became clear that there were no significant obstacles that would hinder change momentum. This was a brand new Hydrocarbons processing facility and the need to move forward to commissioning and operation was paramount in everyone's mind.

Sixth, it is vital to produce short-term wins. The ICAF was constructed in such a way as to allow for short term wins, these included, for example, a ten stage core modular learning and development programme applicable to Hydrocarbons process operations. Each stage was assessed independently of the other, allowing for the candidate to be awarded a full unit of competence.

Seventh, it was essential not to let up. All Improvements within Alpha Hydrocarbon were consolidated at each stage. The key will be the short term wins I mentioned above.

Eighth, it was vital to create a new culture. Given that the Alpha Hydrocarbon processing facility is a brand new operation, then clearly ensuring the success

of the change management initiative was vital. Success sent a clear signal to everyone within the organisation that after an abysmal start, things were now well and truly back on track.

I defined both the purpose and scope of individual competency assurance framework for use at Alpha Hydrocarbon. I concluded that the Alpha Hydrocarbon installation was a work activity area encompassed by COMAH 1999, as amended, consequently individual competence is considered to be of vital importance. Prior to the implementation of the ICAF, I decided that it would be prudent to check that other senior managers at the operating facility were happy to delay the implementation of the ICAF within their areas of control, until some point in the future. I contacted each of the senior managers in turn in order to discuss the ICAF. Each senior manager outside of operations confirmed that they did not wish to participate with individual competence assurance at this time; it was something that would be concluded at a later date. I developed and implemented a competence criteria based around three key areas. These included, core competencies, functional competencies and work activity impact areas. Prior to the implementation of the ICAF, I set up a breakfast meeting with the Managing Director, Operations Director and Operations Manager, in order to review the ICAF, prior to implementation and to check whether or not any last minute changes were required. The outcome of this meeting concluded that the ICAF was fit for purpose and that I should move forward to implantation. I demonstrated how personnel could be selected; recruited and assessed using a process of competence based interviewing. This entailed an analysis of

interviewee negative and positive responses. Each response was rated on a scale of nought to four, with interviewees having to score three and above on all the interview questions, in order to be offered employment by Alpha. Personnel competence was developed through the implementation of various learning and development initiatives. These included, for example, induction, hydrocarbon process plant training. In addition, I demonstrated how competence was assessed in practice. This was undertaken utilising a variety of assessment methods to included, for example, after competence development i.e. learning and development interventions. The assessment of competence was undertaken in two ways, these included hydrocarbon process plant assessment and assessment via the scale of competency descriptors i.e. one to five. I was able to demonstrate how competence was monitored to ensure continuance of skill, knowledge, understanding, behaviour etc. This took the form of self assessments, annual appraisals etc. Furthermore I identified how to deal with failure to ultimately perform competently. It was noted that in one particular instance that one employee had their contract of employment terminated as a direct result of their inability to work as part of a team. Finally, I was able to demonstrate the audit and review process for ensuring overall effectiveness and efficiency of the individual competency development framework in organisational performance terms.

9.1.5 Research Objective Five

Research Objective Five was to evaluate the implementation of the best practice ICAF. In the case of Alpha Hydrocarbon, the key fundamental

requirement was for the development and implementation of an ICAF, which would ensure that operational personnel had the correct degree of competence (skills, knowledge, attitude, behaviour etc), in order to operate a hydrocarbon processing facility safely, effectively and efficiently. The purpose of the evaluation was to determine whether this fundamental requirement has been achieved in reality. The four action research phases of planning, acting, observing and reflecting (*Lewin, 1933*), were applied to each stage of the evaluation of the ICAF within the Alpha Hydrocarbon installation. This included for example, **planning** – deciding on the most appropriate evaluation methodology, **acting** – implementing the process of evaluation to the various stages of learning and development, **observing** – the delivery of formal courses in order to validate quality of delivery and finally, **reflecting** – on the evaluation data provided in order to identify the requirements for corrective actions.

Kirkpatrick's (1996) four level evaluation model was used as a model evaluation framework. At Level One I decided not only to evaluate the reaction of trainees, as what they thought and felt about the learning and development intervention they attended, but to also to focus on the evaluation of other key aspects that would impact on the ultimate success of the ICAF. I decided to apply the process of evaluation to for example, evaluating the views of senior management to the newly developed ICAF, evaluating the performance of learning and development providers

Level Two evaluation was utilized a methodology to measure the extent to which learning and development has taken place, in other words a measurement of the trainees' competence development.

The focus at Level Three was on evaluating the extent of the trainee's behaviour and capability improvement and on their ability to implement and apply the newly learnt skill and knowledge.

Finally, at Level Four the emphasis was on evaluating tangible results. This was achieved by analysing what impact the ICAF had on the Alpha Hydrocarbon organisation as a whole. The return on investment measurement involved the ability to operate the hydrocarbon processing facility in a safe, efficient and effective manner, to the satisfaction of all stakeholders, within their given area of competence.

The evaluation process was applied to the various stages of the ICAF. Firstly, there was the evaluation of developed ICAF (Level One Reactions). The views of the Managing Director, Senior Managers, Company Solicitor and Operations Director and Manager were sought and from an analysis of all their views it was possible to conclude they had no concerns with the developed ICAF, and they did not require any changes to be made to the ICAF. Outside of operationally-based personnel they did not want to participate with the ICAF, within their respective departments, at this time. Clearly the feedback indicated that I could proceed to the next stage i.e. implementation.

Second, I evaluated the third party provider. Visits were made to two hydrocarbon processing facilities in order to evaluate the competence development and assessment work previously undertaken by the Beta organisation. From an analysis of these visits it was possible to conclude that there were exceptional positive indicators, at all four levels of the evaluation process.

Third, I undertook evaluation of learning and development. At Level One Beta devised an evaluation form which sought trainee feedback, for example, facilities and instructions, course content, trainer input. As a result of serious negative feedback from delegates at this stage, one supplier of learning and development interventions was removed from the approved list of suppliers. Evaluation was undertaken at Level Two in order to measure the extent to which learning and development occurred. Beta decided to assess delegates' underpinning knowledge and understanding in a number of ways, for example, observation, professional discussion, project and assignment. As part of a requirement to undertake evaluation at Level Three, Beta constructed a series of practical activities which would allow for the proving of correct and safe behavioural traits. The tests were constructed around maximum and then minimum trainer input until mastery was achieved, for example, the trainee would undertake the tasks with no input from the trainer (unless a serious health and safety issue became evident), in order to demonstrate the correct underpinning knowledge, understanding and behaviour. Finally evaluation was undertaken at Level Four in order to measure business impact or return on

investment. The measurement factors included the achievement of hydrocarbon process plant units and elements, achieving the correct grade of competency descriptor i.e. three and above and the ability to be in a state of readiness to commission the hydrocarbon process facility.

9.2 Contributions of Thesis

The fundamental requirement of a doctoral thesis is an output measured by an original contribution to learning. The key outputs from this thesis which constitute an original contribution to learning are contributions to theory, contributions to practice and contributions to methodology.

9.2.1 Contribution to Theory

In Chapter Two I noted that in more recent years, there has been a surge of interest in pragmatism, in philosophy (*Kloppenber, 1996*), social theory (*Baert, 2004*), law (*Posner, 2003*), medical ethics (*Hester, 2003*), education (*Biesta, 2007*) and public administration (*Shields, 2003*). However, there is little evidence regarding the use of pragmatism within an industrialised setting. Given this fundamental claim that pragmatism is a tool for action, I decided to apply this philosophy in order to generate organisational change within the Alpha Hydrocarbon industrial setting. In addition, I noted that I had decided on an action research methodology due to, for example, its practical, collaborative and problem solving nature. My approach was based on Lewin's (1933) cyclical (iterative spiral) process, which consisted of four distinct phases, these included, planning, acting, observing and reflecting. I cite this pragmatic action

research approach within a new Greenfield site industrial setting as a contribution to theory.

I noted in Chapter Four, in 2002 the HSE identified key aspects of developing and maintaining individual competence. In 2007, the HSE published a new document relating to competence entitled, 'Managing Competence for Safety Related Systems. This guidance on competence applied to everyone, in all industry sectors, whose decisions and work with safety-related systems could impact on health and safety in some way. The fundamental aim of the publication was for all personnel within scope to be suitably qualified and experienced for their own work activities, roles and responsibilities. However, unlike the 2002 document no attempt had been made to define individual competence. The model put forward by the HSE contained four phases and fifteen key principles. By undertaking a comparison of both the 2002 and 2007 HSE documents I was able to define a best practice ICAF.

An analysis of the three HSE publications revealed that they only provided a basic overview of competence assurance. There was no attempt to align the three documents with one another and provide a common overarching competence framework. My approach was to undertake a detailed analysis and review of the three key HSE documents and provide a common thread to the theme of individual competence assurance. This newly developed ICAF I cite as a six-fold contribution to theory. This six-fold contribution can be highlighted as follows. First, I developed an ICAF model, based on HSE best practice. Second,

I developed a series of core competencies. Third, I developed a series of functional competencies. Forth, I outlined key activity impact areas. Fifth, I defined a series of competency descriptors. Sixth, based on a combination of all elements of the ICAF, I was able to achieve a state of competence under training’.

9.2.2 Contribution to Practice

The hydrocarbon process plant training is a complete scheme that will enable a candidate to demonstrate competence in order to operate a hydrocarbon facility. The scheme is built upon a series of units and elements that can be combined in several ways to gain three levels of a hydrocarbon VQ. The scheme was designed to inform the candidate what they need to achieve in order to gain an understanding of the component parts of the hydrocarbon complex process. In addition, it identifies the candidate’s roles and responsibilities with respect to operations, health, safety and environmental compliance.

Guidance was provided for the candidates as they progress through a structured and systematic learning and development process. The candidates’ progress is assessed on an ongoing basis and underpinning knowledge and understanding of the plant and processes is established and recorded. Each unit is made up of a number of elements and unless otherwise stated all elements must be completed to successfully complete a unit. The assessment plan for each unit ensured that the standards of performance and knowledge

and understanding have been demonstrated, to the satisfaction of the VQ accrediting body.

Whilst the use of NVQ's, are not uncommon within hazardous industries, my approach is an industry first, in so much that it I have taken hydrocarbon training modules and converted them into a specific VQ. Unfortunately due to operational constraints I noted that it was decided not to action the VQ at this time but at some point in the future. Clearly, by adopting a VQ approach to delivery and assessment then the achievement of the qualification at some point in the future will be a mere formality, only requiring suitable and sufficient VQ assessment. This approach of utilising a formal VQ approach I cite as my contribution to practice.

9.2.3 Contribution to Methodology

As I noted previously the best practice ICAF contains eight key features. Upon analysis of these eight key features it is possible to determine the generalisability of the ICAF. Whilst it has been applied to a hazardous installation in this instance, there is no reason whatsoever why the ICAF cannot be implemented within both industry and commerce as a whole. As part of testing the validity and reliability of my ICAF, I took the opportunity to subject the ICAF to peer review. I presented the ICAF development to 30 members of the Institution of Occupational Safety and Health (IOSH), at a South Wales branch meeting, held in 2008. The overwhelming conclusion of the IOSH branch members was the overall simplicity of the ICAF and how it could be

implemented within all sectors of the workplace. One particular organisation commented how they could implement the ICAF within their large health and safety department. A very novel idea indeed, if it could be implemented within health and safety, then all other departments could follow suit. In addition, the ICAF is published on the IOSH website. Consequently, I cite this generalisability as my contribution to methodology.

9.3 Limitations of the Thesis

The key limitations of this thesis are threefold; first, no consideration has been afforded to the topic of human factors analysis (see 9.3.1). Second, the ICAF forms part of a bigger picture CMS (see 9.3.2), the development of which was outside of the scope of my consultancy activities. Third, competence has only been assessed under training; it must be reassessed under full operational conditions (see 9.3.3).

9.3.1 Human Factors Analysis

As I stated earlier within the thesis, I was tasked as a freelance consultant to develop and implement a best practice ICAF at the Alpha Hydrocarbon processing facility. Consequently, human factors analysis was outside the realms of my consultancy remit.

‘Reducing Error and Influencing Behaviour’ (*HSE, 2003b*) is the key document in understanding HSE’s approach to human factors. It gives a simple introduction to generic industry guidance on human factors; it defines human

factors as environmental, organisational and job factors, and human and individual characteristics, which influence behaviour at work in a way which can affect health and safety (*HSE, 2003b*).

It is estimated that approximately 90% of all accidents in the workplace have 'human error' cited as their primary cause. Human error has been a major factor in all of the highly publicised disasters in recent memory (*Cox & Tait, 1993; Reasons, 1994; Parliamentary Office of Science and Technology, 2001*). These include, for example, the explosion at the Bhopal chemical plant in India, the explosion at the Flixborough chemical plant disaster.

Human error is a generic term that encompasses all those occasions in which a planned sequence of mental or physical activities fails to achieve their intended outcomes. Many errors are made as an important part of learning, maintaining skills and problem solving etc (*Cox & Tait, 1993; Reasons, 1994; Parliamentary Office of Science and Technology, 2001*). It is vital therefore that an analysis of human-factors is undertaken at the Alpha Hydrocarbon processing facility.

Human error can be categorised as follows (*HSE, 2003b*):

Slips – are failures in carrying out the actions of a particular task. They can be described as 'actions not as planned'. Typical slips scenarios may include, for example, errors of commission, the incorrect adjustment of a valve.

Lapses – cause us to forget to carry out an action, to lose our place in a task or even to forget what we had intended to do in the first place. For example, an experienced tanker driver had virtually completed the filling of his vehicle from a bulk tank of flammable liquid when a nearby telephone rang. After ignoring the telephone for five minutes he closed the various valves on the installation and went to answer the call. On returning to the vehicle he drove away having forgotten that he had not disconnected the tanker hose from the installation. The pipe-work fractured and a significant health, safety and environmental incident occurred. Examples of how this type of error can be avoided are to provide written procedures that have 'place markers' or spaces to tick off each step, supervise key tasks and strictly enforce rules about interrupting staff engaged on critical tasks. A pre-flight take-off checklist utilized by aviation pilots is a classic example in order to prevent lapses.

Rule-based Mistakes – these occur when our behaviour is based on remembered rules or procedures. We have a tendency to remember familiar rules and apply these accordingly, for example, an operator was very familiar with the task of filling a tank. He expected the filling operation to take approximately 30 minutes. However, on this occasion the diameter of the pipe entering the tank had been enlarged and the tank was filling much more quickly than anticipated. He ignored a high level alarm on the grounds that the tank could not fill so quickly, consequently the tank overflowed.

Knowledge-based Mistakes – the investigations following the major collapse of a tunnel revealed that the organisation had relied upon the experience of one person as the only control measure. However, the nature of this method of working meant that this person had no reliable instrumentation for detecting when was becoming unstable. Relying on experience was actually relying on knowledge-based reasoning of the so called expert.

Routine Violations – the inquiry into the Clapham Rail crash found that maintenance working practices had degraded to the point where it had become routine not to use the prescribed method for certain tasks. Poor supervision and problems with training and testing meant that this situation was allowed to become the norm.

Situational Violations – refers to breaking the rules due to pressure or if the incorrect equipment is in place, is called situational error. A steel erector was killed when he fell 20 metres from a structure under erection. Although a harness had been provided there was no provision for affixing the harness to the structure. In addition, no other safeguards had been provided to prevent workers falling from height.

Exceptional Violations – before the accident at the Chernobyl nuclear reactor a series of tests were being undertaken. When operator failure led to a dangerously low power level, the test should have been abandoned. Instead,

operators and engineers continued to improvise in an unfamiliar way and in an increasingly unstable environment that ultimately ended in disaster.

9.3.2 ICAF as Part of CMS

In Chapter Four I noted that competence plays a very important role in controlling operational health and safety risks. Risk control systems rely on a complex mix of hardware, software, human factors and safety management systems. The role of people in controlling risks is central to the HSE's requirements. Whilst the role of people is very important in normal operations, it is vital in degraded, abnormal and emergency operations when it is the ability of the individual to return the system to normal operation that is so important. It is only the competent individual who will be able to undertake such recovery, and this is why competent operation is so important. Where competent performance is not maintained accidents, incidents and injuries may result.

The purpose of a CMS is to control in a logical and integrated manner a cycle of activities within the company that will assure competent performance in work. The aim is to ensure that individuals are clear about the performance that is expected of them, that they have received appropriate training, development and assessment, and that they maintain or improve their competence over time. Learning and development seeks to create a level of competence for the individual or team, sufficient to allow individuals or teams to undertake the operation at a basic level. Initially, this will be under direct supervision which over time becomes less direct. Over time as practical experience grows,

operations can be carried out at a more complex level. Such an approach will also increase the confidence of the individual or team to deliver competent performance, while making them aware of their limitations. Assessment and reassessment are how judgements are made that the inputs (training, development and experience) have been understood sufficiently to deliver outputs defined in terms of competent performance and outcomes i.e. a safe plant/process.

Clearly, the ICAF has been developed using elements of a complete CMS, consequently, there is a vital requirement to ensure that all aspects of the CMS are executed and not just the elements contained within the ICAF, for example, in addition to being responsible for their own staff the client company remains responsible for operational health, safety and welfare of its contractors and sub-contractors, irrespective of where its resources came from, either through its own staff, contract, subcontract or agency staff or the self-employed. All of these categories of worker must be competent to control relevant major hazard installation risks. There are two options for client companies employing contract and subcontract personnel, agency and the self-employed. First, it is possible to include such personnel in a CMS that uses the same or equivalent standards as the client company uses. The client company should be able to verify and audit the competence management system and keep copies of certification showing individuals have been assessed as competent. Secondly, it is possible to regard these people as the client company's own staff and take them into the client

company's own competence management system, with periodical reassessments, learning and development and keeping suitable records.

Another example is the requirement to maintain the competence of managers, operating the CMS, in order that they understand their responsibilities and accountabilities as a whole. Managers must be aware of the impact of their activities on the CMS overall, and ensure their own competencies are maintained. In addition, the competence of the assessors who undertake the competency assessment should be periodically reassessed.

9.3.3 Additional Competence Assessment

A status of competence under training will require a significant amount of competence assessment in general. It required an assessment plan for each of the units and elements, in order to ensure that the standards of performance and knowledge and understanding have been demonstrated, to the satisfaction of the trained Assessor. In reality it required the application of a diverse number of assessment methods, for example, observation, professional discussion.

Upon analysis of the assessment methods utilized under training it is possible to conclude that a large number of robust qualities exist. However, according to the HSE, certain elements of competence assessment are best undertaken within the work setting under full-scale operational activities. These include, for example, interpersonal skills, – observation of actual behaviour in the work setting, team management skills – observation of actual behaviour in the work setting, as well as safety behaviours and attitudes – observation of actual

behaviour in the work setting, using behavioural markers for all of these aspects tends to provide valid and reliable measures. Therefore ongoing competence assessment will need to become the norm.

9.4 Future Research

Clearly competence plays a very important role in ensuring functional health and safety. For a person to be deemed competent, they need qualifications, experience, and qualities appropriate to their duties. To assure an effective and consistent standard of competence all personnel require a process of continuous improvement. When personnel begin to acquire competence for a new task, or begin progressing to a higher level of competence, they will be unaware, at least to some extent, of what they can and cannot do. Through a process of training and development initiatives, they will first become aware of their limitations and then overcome those limitations to become competent. Gradually, their work becomes second nature, and they become well practised even in situations that they encounter less often. In effect, people reach a level of almost automatic performance to a high standard. One of the fundamental problems is that associated with 'competence decay', without realising, personnel can again become unaware of their limitations. This could be because of external developments, for example, new technologies or because of a drift to bad habits in routine work. In order to avoid this monitoring and reassessment of performance must be undertaken at the individual level, and verification, audit and review must take place at a management system level.

While personnel may be currently competent, they do not necessarily retain a satisfactory level of competence over time. The level and nature of the competence of staff in a company will be continually changing.

As part of future research opportunities I would like to examine the root causes of the skills decay. Having identified root causes I would like to develop positive recommendations for change in order to rectify these concerns. It is not to say that organisations do not implement schedules of retraining, however, I feel from a personal perspective (based on observations) that too many just undertake training for training sake, in order that they can put a tick in a box. If we go some way to understanding the root causes of the skills decay, it will then be possible to derive the timing of the most suitable learning and development initiative, in order correct the non-conformance identified. Without wanting to pre-empt the findings of the future research, I have noted that many organisations allow staff to major in particular work areas for far too long, without exposing them to other aspects of their job descriptions. In reality, this is because many managers and supervisors feel they are obtaining the correct or in some cases exceeding production outputs with the individual(s) concerned. The problem comes when the individual concerned is moved from their comfort factor, and has to operate process, machinery and/or work equipment that they have not 'majored on' for some considerable time. It is at this point that serious health and safety ramifications can occur, which can result in fatal consequences. A more simplified example of this phenomenon is, if we do not work on a specific computer program for some considerable time, say six

months or more, when we finally return to the program we struggle to find the right sections. If the same is repeated within a hazardous environment, then the resulting consequences can be fatal. It is at this point we use the term 'human error' to describe the catastrophic consequences that can, and have occurred on a frequent basis over many years.

9.5 Personal Reflections

In 1971 I commenced my career within engineering. The fundamental reason for my choice of career was that I would be able to apply my practical attributes to the full. These practical attributes have remained constant throughout the intervening years; my philosophy was to always execute any project in a practical, hands-on manner. This practical, hands-on belief was instrumental in my choice of further academic development. I had previously completed an MSc degree at the University of Southampton in 1993, and an MPhil degree at Aston University in 2001. In addition, I have published widely in the areas of risk management, with particular emphasis on machinery and work equipment safety (see Chapter One). From a personal perspective I am totally committed to ongoing personal development. To this end my aim was to one-day complete a doctoral programme of study. Given that my approach to the execution of any project is one of a practical hands-on orientation, my aim was to undertake a professional doctorate rather than complete a traditional more academic orientated PhD. I researched a variety of academic institutions, who offered a professional doctorate programme centred on Change Management. I approached UWIC, and was accepted onto their DBA programme. The offer of a

place on the DBA coincided with the start of my management consultancy activities at the Alpha Hydrocarbon installation.

When I commenced my consultancy activities at Alpha Hydrocarbon it was very evident that the organisation was in the depth of a severe crisis. The failure to develop an ICAF, underpinned by learning and development interventions had caused severe strain on all departments. In addition, serious concerns had also been raised by key stakeholders, for example the HSE. For my part I had been tasked with the development and implementation of the ICAF, and on reflection I was able to conclude that this married exactly with the requirements of the UWIC professional doctoral programme which centred on change management.

After a series of discussions with my Director of Studies and Research Supervisor, I concluded that the most appropriate philosophy to adopt was one of pragmatism. Having identified that pragmatism was a philosophy based on a knowledge tool for action, and one which could lend itself to an industrialised setting, it was next necessary to identify a suitable practical research methodology, in order to underpin this philosophy. Having examined the various options available, I decided on an action research approach, which focused on the 'iterative spiral' of planning, acting, observing and reflecting. I had not previously applied an action research methodology to any of my previous academic studies, so in essence it was necessary to develop my own competence within this field of study. From the onset I felt very comfortable utilising this action research methodology, due to the fact that it married exactly

with my own pragmatic orientation. In my own mind I labelled the iterative spiral process as a method of continuous improvement, in effect a never ending journey to excellence. The outright success in developing and implementing the ICAF on such a prestigious project, is directly attributable to the confident way in which I implemented this action research methodology.

It is impossible for me to reflect on elements of my personal development without saying a few words regarding the Professional Doctorate as a whole. The doctoral programme is professional, well balanced and structured in its approach and it is the structure of the programme that I find most helpful. From a personal perspective, I cannot speak too highly regarding the professionalism and dedication of the staff, in particular Professor Eleri Jones and Professor David Brooksbank. This is the first time I have found an academic institution that caters for and exceeds the aspirations of mature students. This above all else has aided my professional development more than any other aspect. I am deeply indebted to both Eleri and David and to both of them I extend my sincere thanks.

My personal reflections of how I have satisfied a doctoral degree requirement are seven-fold. First, the development, implementation and evaluation of the ICAF have enabled me to create and interpret new knowledge, via original research of a quality to satisfy peer review and extend the forefront of the discipline.

Second, the research into ICAF's and CMS's in general has allowed me to develop a systematic acquisition and understanding of a substantial body of knowledge which is at the forefront of an academic and practitioner area, for example, COMAH, competency and competency frameworks, learning and development, competence assessment within hazardous industries.

Third, the doctoral research project has afforded me the general ability to conceptualise, design and implement a project for the generation of new knowledge, applications or understanding at the forefront of the discipline, and to adjust the project design in the light of unforeseen problems. Having undertaken two research degrees previously (MSc, MPhil), the ability to conceptualise in itself was not a new phenomenon, however, undertaking research at doctoral level has allowed for the further honing and development of these skills.

Fourth, the doctoral study has provided me with a more detailed understanding of applicable research techniques, in particular, action research. As I have already noted previously, an action research approach was vital due to the urgent requirement for the ICAF.

Fifth, the acquisition of the Professional Doctorate has enabled me to make informed judgements on complex issues in my chosen specialist field, in the absence of complete data. Furthermore, I am now able to communicate my ideas and conclusions clearly and effectively to technical and non technical

audiences. My presentation to the South Wales Branch of IOSH is an example of this skill and knowledge development in general terms.

Sixth, it is my wish to continue to undertake research and development at an advanced level, contributing substantially to the development of new techniques, ideas and approaches. I am currently examining options within this area of academia.

Seventh, I believe that I have the additional qualities and transferable skills necessary to enhance my employment within industry and commerce alike, both within the UK and overseas, in particular, within complex professional environments.

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Appendices

Appendix One – Semi-structured Interview Questions

1. Informed Consent

- a. Can you confirm that you are prepared to take part in the research?

2. Learning and Development

- a. Describe how the L & D function has operated previously?
- b. What is your opinion of the training and development function?
- c. How successfully has it operated in your department?
- d. What if anything would you change and why?
- e. Provide examples of the job competencies you have been given in your role?
- f. Describe how your training needs have been identified?
- g. How have these training needs been linked to your individual training plan?
- h. How have your training needs been fulfilled?
- i. Who decides what training courses you attend?
- j. Describe how your training was validated and evaluated?
- k. On a scale of 1-5 how would you rate the training and development function as a whole?

- 1. Very Good
- 2. Good
- 3. Satisfactory
- 4. Poor
- 5. Very Poor

Appendix Two

Developed ICAF

Learning & Development

**Individual Competence Assurance Framework (ICAF)
Operations Group**

Introduction

This document describes the core and functional competencies for operationally-based staff at the Alpha Hydrocarbon processing installation. It is also a guide to help identify ways of further developing potential, build strengths and develop skills and knowledge. This document can be used as a reference guide for developing staff on-the-job or as part of an agreed development planning process.

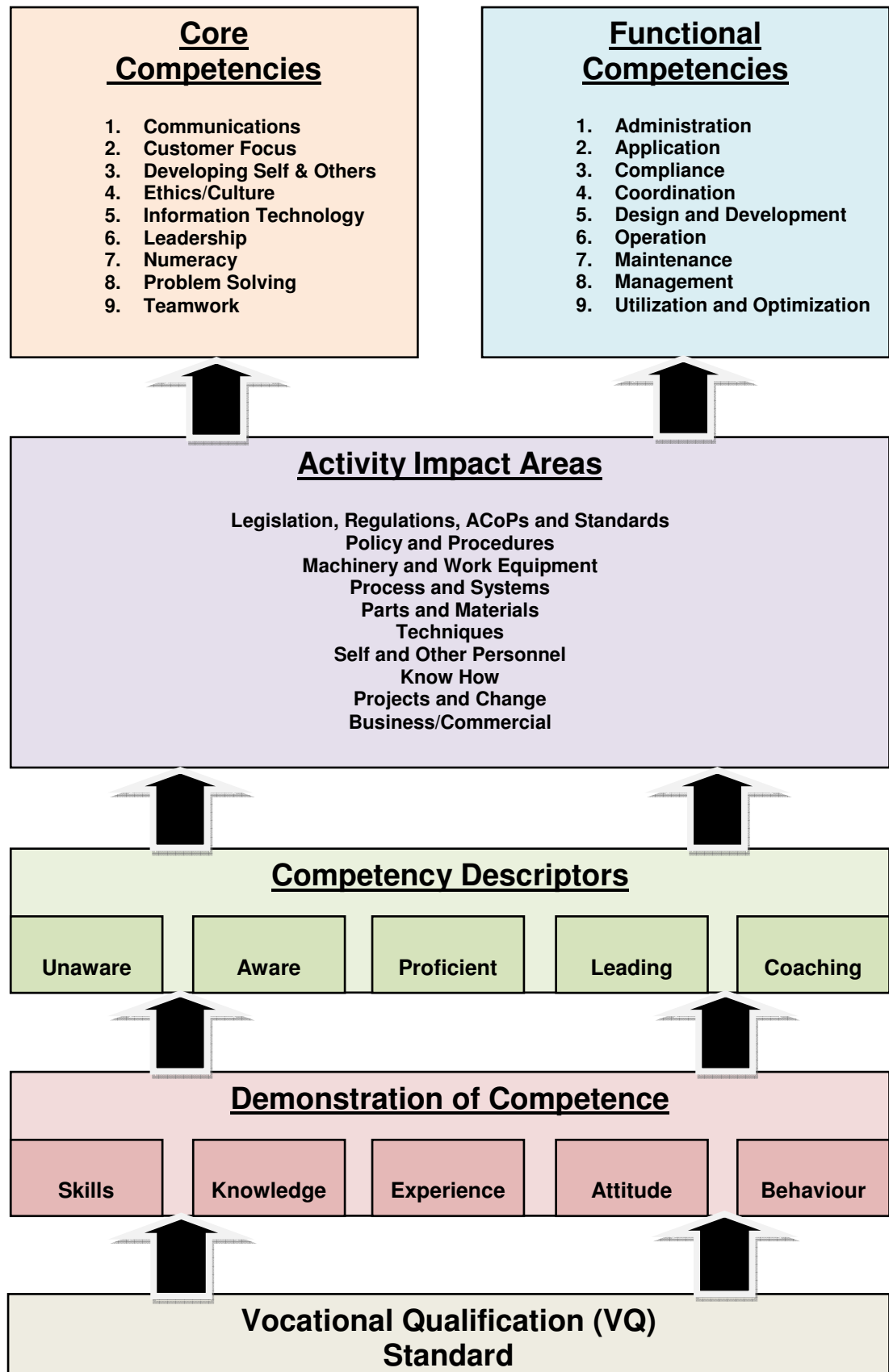
The competencies provide an integrated approach to support multiple applications and initiatives, and yet still allow for comparability of results. Each competency will be underpinned by a series of competency descriptors, for example, unaware, aware, proficient, leading and coaching.

Competency Definition

Competencies can be defined as:

1. A range of outcomes that are essential to perform a job, or more importantly, differentiate superior performers;
2. They incorporate a range of skills, knowledge, experience, attitude, behaviour and other relevant personal qualities, for example, unaware, aware, proficient, leading and coaching.

ICAF - Overview



Individual Competency Development Overview

The competencies are grouped into:

- **Core Competencies** - those that apply to all job functions within Alpha Hydrocarbon;
- **Role Specific Competencies** - those that may apply within specific job functions.

The **Nine** core competencies are:

1. Communication (Oral and Written);
2. Customer Focus;
3. Developing Self and Others;
4. Ethics and Culture;
5. Information Technology (IT);
6. Leadership;
7. Numeracy (Numerical and Graphical Information);
8. Problem Solving (Critical Thinking/Planning and Organising/Reviewing and Evaluating);
9. Teamwork.

The **Nine** functional competencies are:

1. Administration;
2. Application;
3. Compliance;
4. Coordination;
5. Design and Development;
6. Operation;
7. Maintenance;
8. Management;
9. Utilization and Optimization.

Core Competencies Explanation

Communication – is the process of transferring information from a sender to a receiver with the use of a medium in which the communicated information is understood by both sender and receiver. It is a process that allows us to exchange information by several methods, be it by an auditory means, such as speaking and sometimes tone of voice, and nonverbal, physical means, such as body language, eye contact.

Customer focus – means understanding and meeting or exceeding client/customer requirements. These are those groups or individuals, internal or external who use the organisation's products and/or services and will encompass the internal customer i.e. another work colleague.

Developing self and others – refers to a proposed strategy for influencing the order in which developments are made, for example, employee development, self development, the act of improving by expanding or enlarging or refining.

Ethics and culture – ethics are the accepted principles of right or wrong governing the conduct of the business and people. Culture refers to the attitudes and behaviour that are characteristic to the organisation.

Information technology – includes all matters concerned with the furtherance of computer science and technology and with the design, development, installation, and implementation of information systems and applications.

Leadership – this refers to influencing and directing the performance of individuals and groups towards the achievement of organisational goals.

Numeracy – numeracy is a proficiency which is developed mainly in mathematics but also in other subjects. It is more than an ability to do basic arithmetic. It involves developing confidence and competence with numbers and measures. Numeracy also demands understanding of the ways in which data is gathered by counting and measuring, and presented in graphs, diagrams, charts and tables.

Problem solving – forms part of the most complex of all intellectual functions. Problem solving has been defined as the higher-order thinking (cognitive) process that requires the modulation and control of more routine or fundamental skills. It is part of the larger problem process that includes problem finding and problem shaping.

Teamwork – is the concept of people working together cooperatively. Projects often require that people work together to accomplish a common goal; therefore, teamwork is an important factor in most organisations. Effective collaborative skills are necessary to work well in a team environment.

Functional Competencies Explanation

Administration – this includes work/duties undertaken in an administrative capacity, for example, completion of documentation, shift log, permit to work.

Application – this can be defined as diligent effort, the work of applying something, the act of bringing something to bear; using it for a particular purpose, for example, the application of legislative requirements and standards, policies and procedures, application of know how.

Compliance – is the act of adhering to, and demonstrating adherence, for example, compliance with legislative requirements and standards, policies procedures.

Coordination – this refers to making different people or other resources work together for a goal, affect or purpose, for example, coordination of contractors, process, and systems.

Design and development – design refers to the process of originating and developing a plan for a product, structure, system, or component, for example, design of a new process etc. Development refers to a proposed strategy for influencing the order in which developments are made, the act of improving by expanding or enlarging or refining, for example, employee development, organisation development, business development.

Operation – is an area of business that is concerned with the operation of various aspects of the business, for example, operating process plant and equipment.

Maintenance – this refers to retaining or restoring an item in or to a state in which it can perform its required intended function, for example, maintenance of machinery, plant and work equipment, policies and procedures.

Management – means the act of getting people together to accomplish desired goals. Management comprises of planning, organising, resourcing, leading, directing, controlling etc an organisation (a group of one or more people or entities) or effort for the purpose of accomplishing a goal.

Utilization and Optimization – utilize refers to putting into service; make work or employing (something) for a particular purpose or for its inherent or natural purpose. Optimize can be defined as modifying to achieve maximum efficiency, time or cost, in other words to make optimal; get the most out of; use best, for example, optimising a hydrocarbon process.

Activity Impact Areas

Each competency consists of a number of activity impact areas and each area will require a specific level of skill, knowledge and experience in order to demonstrate competence within that area.

The activity impact areas are:

1. Legislation, Regulations, ACoPs and Standards;
2. Policy and Procedures;
3. Machinery and Work Equipment;
4. Processes and Systems;
5. Parts and Materials;
6. Techniques;
7. Self and Other Personnel;
8. Know How;
9. Projects and Change;
10. Business/Commercial.

Activity Impact Area Explanation

Legislation, Regulations, Approved Codes of Practice (ACoP) and Standards – legislation (statute law) are laws which have been enacted by a legislature or other governing body. Under the current UK legislative system, an item of legislation is known as an Act of Parliament after enactment, for example, The Health and Safety at Work etc Act (HSWA) 1974. Subordinate legislation is referred to as a 'Regulation', for example, The Management of Health and Safety at Work Regulations 1999. From time to time EC Directives will emanate from the European Parliament in Brussels. These directives are adopted by the UK Government and converted into UK style legislation under the Westminster system. The HSWA 1974 allows for the development and approval of statements of preferred work practice, known as ACoPs. These are the recommended means of compliance with the requirements of the legislation and have been developed after consultation with the industry or industries concerned. An ACoP does not have the same legal force as an act or regulation, and failure to comply with is not, of itself, an offence. However, observance of a relevant ACoP may be considered as evidence of good practice in a court. Technical Standards are an established norm or requirement. They are usually a formal document that establishes uniform engineering or technical criteria, methods, processes and practices. They emanate from standards bodies, for example, British Standards Institute (BSI).

Policy and Procedures – a policy is a deliberate plan of action to guide decisions and achieve rational outcome(s), for example, a health and safety

policy. A procedure is a document containing a series of actions, acts or operations which have to be executed in the same manner in order to always obtain the same result in the same circumstances, for example, emergency response procedure.

Machinery and Work Equipment – machinery can be defined as an assembly of linked parts or components, at least one of which moves including, the appropriate actuators, control and power circuits, joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material. Work equipment is more broadly defined and covers a very wide range of equipment, both power-operated and manually-operated, for example, generators and hand-tools.

Processes and Systems – a process can be defined as a series of actions, changes, or functions bringing about a result, for example, recruitment and selection process. In addition, the definition can encompass the following a series of operations performed in the making or treatment of a product, for example, re-gasification process of a hydrocarbon. A system can be defined as a group of interacting, interrelated, or interdependent elements forming a complex whole, for example, a safe system of work.

Parts and Materials – a part can be defined as a portion, division, piece, or segment of a whole, in reality, this means a component that can be separated from or attached to a system; a detachable piece, for example, spare parts for a

compressor. Material is defined as a substance or substances out of which a thing is or can be made. In addition, it can mean something, such as an idea or information that is to be refined and made or incorporated into a finished effort, for example, information to develop a company policy/procedure.

Techniques – a technique is the systematic procedure by which a task is accomplished, in reality, this means the manner and skill with which Alpha Hydrocarbon personnel employ their tools and materials to achieve a predetermined effect.

Self and Other Personnel – self refers to Alpha Hydrocarbon and contract personnel, for example, you may work alongside an Alpha colleague or a contractor, or a combination of both.

Know How – this can be defined as familiarity, awareness, or understanding gained through experience or study, in reality, it is the sum or range of what has been perceived, discovered, or learned. Every employee/contractor brings with them their own particularly style of know how. The key is to tap into this vast array of skill, knowledge and experience.

Projects and Change – a project, as defined in the field of overall project management and consists of an endeavour undertaken to create a product, service etc. Most planned organisation change is brought about by the need to

respond to the requirements of both the internal and external working environment, for example, the development and implementation of the ICAF.

Business and commercial – business means the overall organisation set up to supply hydrocarbon to the UK market. The term commercial refers to all business activities.

Vision – means to be a leading Hydrocarbon processing facility, for example, efficiency, reliability.

Values – this refers to valuing its employees, shareholders, customers, suppliers, community and the environment.

Learning and Development Interventions – Core

Learning & Development Interventions Matrix – Core Competencies	Recruitment and Selection	Alpha Hydrocarbon Induction	Process Plant Training Unit 1 Introduction to Hydrocarbon Operations	Process Plant Training Unit 2 Shut Down & Make Safe	Process Plant Training Unit 3 Operation of Ancillary Plant & Boil Off Gas Disposal	Process Plant Training Unit 4 Export System	Process Plant Training Unit 5 Natural Liquefaction (N/A)	Process Plant Training Stage 6 Power Generation	Process Plant Training Unit 7 Permit to Work & Risk Assessment for Permit to Work	Process Plant Training Unit 8 Environmental Awareness	Process Plant Training Unit 9 Jetty Operations	Process Plant Training Unit 10 General Risk Assessment	Legislative Requirements	Alpha Hydrocarbon Specific	Machinery & Work Equipment Vendor Specific
Communication	•		•	•	•	•	N/A	•	•	•	•	•	•	•	•
Customer Focus	•	•	•			•	N/A		•	•	•	•	•	•	•
Developing Self/Others		•	•	•	•	•	N/A	•	•	•	•	•	•	•	•
Ethics/Culture	•	•					N/A								
Information Technology			•	•	•	•	N/A	•	•	•	•	•	•	•	•
Leadership				•	•	•	N/A	•	•	•	•	•	•	•	•
Numeracy	•		•		•	•	N/A	•		•	•	•			
Problem Solving	•		•	•	•	•	N/A		•	•		•			
Teamwork	•	•	•	•	•	•	N/A	•	•	•	•	•	•	•	•

Learning and Development Interventions - Functional

Learning & Development Interventions Matrix – Functional Competencies	Recruitment and Selection	Alpha Hydrocarbon Induction	Process Plant Training Unit 1 Introduction to Hydrocarbon Operations	Process Plant Training Unit 2 Shut Down & Make Safe	Process Plant Training Unit 3 Operation of Ancillary Plant & Boil Off Gas Disposal	Process Plant Training Unit 4 Export System	Process Plant Training Unit 5 Natural Gas (N/A)	Process Plant Training Stage 6 Power Generation	Process Plant Training Unit 7 Permit to Work & Risk Assessment for Permit to Work	Process Plant Training Unit 8 Environmental Awareness	Process Plant Training Unit 9 Jetty Operations	Process Plant Training Unit 10 General Risk Assessment	Legislative Requirements	Alpha Hydrocarbon Specific	Machinery & Work Equipment Vendor Specific
Administration			•	•	•	•	N/A	•	•	•	•	•	•	•	•
Application			•	•	•	•	N/A	•	•	•	•	•	•	•	•
Compliance			•	•	•	•	N/A	•	•	•	•	•	•	•	•
Coordination			•	•	•	•	N/A		•	•	•	•	•	•	•
Design and Development			•				N/A		•	•			•	•	•
Operation			•	•	•	•	N/A	•	•	•	•	•	•	•	•
Maintenance					•	•	N/A		•	•	•	•	•	•	•
Management				•	•	•	N/A	•	•	•	•	•	•	•	•
Utilization and Optimization			•	•	•	•	N/A	•	•	•	•	•	•	•	•

Functional Group Activities

The following tables indicate the generic group activities that are needed to be competent. However, within a group there may be several job roles and the staff that fulfils those roles will need different skill levels in each activity. The skill levels have been defined and quantified for each job role.

These tables will help the individual to understand what is expected to them and will assist in individual development plans.

Role Specific Activity Legend

Unaware	1
Aware	2
Proficient	3
Leading	4
Coaching	5

Role Specific Activity Requirements

Activity Matrix for: Managing Director	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	5	5	3	4	5	5				5
Apply	5	5		3		4	5	4	5	5
Comply	5	5		4					3	5
Coordinate			3	3	3	3	4		4	5
Design and Develop		4	4	3		3			3	5
Operate			3	3		3				
Maintain		4	3	3						4
Manage	4	4	3	3	3	3	5	5	5	5
Utilize and Optimize		4	3	4	3	3	3	3	4	5

Activity Matrix for: Operations Director	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	5	5	3	4	5	5			5	5
Apply	5	5		3		4	5	4	5	5
Comply	5	5		4					3	5
Coordinate			3	3	3	3	4		4	5
Design and Develop		4	4	3		3			3	5
Operate			3	3		3				
Maintain		4	3	3						4
Manage	4	4	3	3	3	3	5	5	5	5
Utilize and Optimize		4	3	4	3	3	3	3	4	5

Activity Matrix for: Operations Manager	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	5	5	3	4	5	5			5	5
Apply	5	5		3		4	5	4	5	5
Comply	5	5		4					3	5
Coordinate			3	3	3	3	4		4	5
Design and Develop		4	4	3		3			3	5
Operate			3	3		3				
Maintain		4	3	3						4
Manage	4	4	3	3	3	3	5	5	5	5
Utilize and Optimize		4	3	4	3	3	3	3	4	5

Activity Matrix for: Hydrocarbon Receiving Manager	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	4	4		3		4			4	4
Apply	4	4		4		4	4	4	3	4
Comply	4	4		3					3	4
Coordinate			3	5			4		4	5
Design and Develop		4	4	3		3			3	4
Operate			3	3		4				
Maintain		4	3	4						4
Manage	4	4	3	4		4	4	4	4	4
Utilize and Optimize		4		4		3	3	3		4

Activity Matrix for: Senior Engineer	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	4	4		3		4			4	4
Apply	4	4		4		4	4	4	3	4
Comply	4	4		3					3	4
Coordinate			3	5			4		4	5
Design and Develop		4	4	3		3			3	4
Operate			3	3		4				
Maintain		4	3	4						4
Manage	4	4	3	4		4	4	4	4	4
Utilize and Optimize		4		4		3	3	3		4

Activity Matrix for: Process Supervisor	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	4	4	3	4	3	4			4	4
Apply	4	4		4		4		4	3	3
Comply	4	4		4					3	3
Coordinate			3	3	3	3	4		3	3
Design and Develop		4	4	4		3			3	4
Operate			3	3		3				
Maintain			3	4						4
Manage	4	4	4	4	3	4	4	4	4	4
Utilize and Optimize		4	4	4	3	4	4	4	4	4

Activity Matrix for: Process Operator (Plant)	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	3	3	3	3	3	3			3	3
Apply	3	3		3		3		3	3	3
Comply	3	3		3					3	3
Coordinate			3	3	3	3	3		3	3
Design and Develop		4		3		3			3	3
Operate			3	3		3				
Maintain		3	3	3						3
Manage	3	3	3	3		3	3	3		
Utilize and Optimize		4	3	4	3	3	3	3	3	3

Activity Matrix for: Process Operator (CCR)	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	3	3	3	3	3	3			3	3
Apply	3	3		3		3		3	3	3
Comply	3	3		3					3	3
Coordinate			3	3	3	3	3		3	3
Design and Develop		4		3		3			3	3
Operate			3	3		3				
Maintain		3	3	3						3
Manage							3			
Utilize and Optimize		4	3	4	3	3	3	3	3	3

Activity Matrix for: Maintenance Supervisor	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	4	4	3	4	3	4			4	4
Application	4	4		4		4		4	3	3
Comply	4	4		4					3	3
Coordinate			3	3	3	3	4		3	3
Design and Develop		4	4	3		3			3	4
Operate			4	3		3				
Maintain		4	4	4						4
Manage	4	4		4	3	4	4	4	4	4
Utilize and Optimize		4	4	4	3	4	4	4	4	4

Activity Matrix for: Maintenance Technician	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	4	3	3	3	3	4			4	3
Application	4	4		4		4		4	3	3
Comply	4	4		4					3	3
Coordinate			3	3	3	3	4		3	3
Design and Develop		4	4	3		3			3	4
Operate			3	3		3				
Maintain		3	4	4						4
Manage										
Utilize and Optimize		3	4	4	3	4	4	4	4	4

Activity Matrix for: Material Services Supervisor	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	4	4	3	4	4	4			4	4
Apply	4	4		4		4		4	3	3
Comply	4	4		4					3	3
Coordinate			4	4	4	3	4		3	3
Design and Develop		4		4		3			3	4
Operate			3	4		3				
Maintain		4	3	4						4
Manage	4	4	4	4	4	4	4	4	4	4
Utilize and Optimize		4	3	4	4	3	4	4	4	4

Activity Matrix for: Material Services Operator	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	3	3	3	3	3	3			3	
Apply	3	3		3		3		3	3	3
Comply	3	3		3					3	3
Coordinate			3	3	3	3	3		3	3
Design and Develop		3		3		3			3	3
Operate			3	3		3				
Maintain		3	3	3						3
Manage							3			
Utilize and Optimize		3	3	4	3	3	3	3	3	3

Activity Matrix for: Quality Controller	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	3	4	3	4	3	3			3	3
Apply	3	3		3		3		3	3	3
Comply	3	3		3					3	3
Coordinate				4		4	3		3	3
Design and Develop				3		3			3	3
Operate			3	3		4				
Maintain		3	3	3						3
Manage							3			
Utilize and Optimize		3	3	4	3	3		3	3	3

Activity Matrix for: Admin Assistant	Legislation, Regulations, ACoPs, Standards	Policy & Procedures	Machinery and Work Equipment	Processes and Systems	Parts and Materials	Techniques	Self and Other Personnel	Know How	Projects and Change	Business and Commercial
Administer	3	3	3	3	3	3				3
Apply	3	3		3		3		3	3	3
Comply	3	3		3					3	3
Coordinate			3	3	3	3	3		3	3
Design and Develop						3			3	3
Operate			3	3		3				
Maintain		3	3	3						3
Manage							3			
Utilize and Optimize		3	3	3	3	3		3	3	3

GENERIC ACTIVITIES AND DESCRIPTORS					
COMPETENCY	DESCRIPTORS				
	1. UNAWARE	2. AWARE	3. PROFICIENT	4. LEADING	5. COACHING
Administration Has the skills, knowledge and experience (relative to job) necessary to be able to undertake administrative activities.	Unaware does not understand relevant administrative activities. Skill, knowledge and experience are less than adequate to effectively execute the job.	Has awareness and understanding of administration activities within a closely defined area and limited experience of practical application.	Demonstrates comprehensive working knowledge and practical application of all administrative activities.	Demonstrates wide-ranging knowledge of all administrative activities. Knowledge and experience in this area is beyond the level required for the current post.	Demonstrates wide-ranging knowledge of all administrative activities at the level required for the post. Has a full appreciation of how these activities interact beyond the post.
Application Has the skills, knowledge and experience relating to the effective and efficient application.	Unaware cannot demonstrate any practical application. Skill, knowledge and experience are less than adequate to effectively execute the job.	Has awareness and understanding within a closely defined area and limited experience of practical application. Possesses knowledge and experience but applies inadequately to effectively execute the job.	Demonstrates comprehensive working knowledge and practical application(s) relevant to the post. Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.	Demonstrates wide-ranging skills, knowledge and application(s). Knowledge and experience in this area is beyond the level required for the current post. Application enables development of the role.	Demonstrates wide-ranging skill, knowledge and application(s) at the level required for the post. Knowledge and experience in this area is beyond the level required for the current post. Level of knowledge and experience and application enables development of the role and business processes.
Compliance Has the skills, knowledge and experience necessary to ensure compliance.	Unaware and does not understand relevant legislative and business requirements and standards. Skill, knowledge and experience are less than adequate to effectively execute the job.	Has an awareness of and understanding of legislative and business requirements within a closely defined area. Limited experience of practical application.	Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.	Demonstrates wide-ranging knowledge of all legislative requirements and business standards. Knowledge and experience in this area is beyond the level required for the current post.	Demonstrates wide-ranging knowledge of all legislative requirements and business standards. Has a full appreciation of how these activities interact beyond the post.

<p>Coordination Has the skills, knowledge and experience to be able to coordinate resources.</p>	<p>Unaware and is unable to coordinate activities.</p> <p>Knowledge and experience are less than adequate to effectively execute the job.</p>	<p>Has awareness and understanding of coordinating activities within a closely defined area and limited experience of practical application.</p>	<p>Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p>	<p>Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>Demonstrates wide-ranging knowledge of all coordinating activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>
<p>Design and Development Has the skills, knowledge and experience necessary to be able to undertake design and development activities.</p>	<p>Unaware and is unable to undertake design and development activities.</p> <p>Knowledge and experience are less than adequate to effectively execute the job.</p>	<p>Has awareness and understanding of design and development within a closely defined area and limited experience of practical application.</p>	<p>Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p>	<p>Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p>	<p>Demonstrates wide-ranging knowledge of all design and development activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>
<p>Operation Has the skills, knowledge and experience necessary to be able to undertake a variety operational activities.</p>	<p>Unaware and unable to undertake the required operational activities relevant to the post.</p> <p>Knowledge and experience are less than adequate to effectively execute the job.</p>	<p>Able to undertake a limited number of operational activities.</p> <p>Demonstrates a basic understanding and function and ability to differentiate between some operational activities.</p>	<p>Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p>	<p>Demonstrates comprehensive understanding of operational activities and systems operational techniques.</p> <p>Effectively applies operational knowledge, skills and experience in this area</p>	<p>Demonstrates a comprehensive understanding of a complex range (including specialised) operational activities and systems operational techniques.</p> <p>Effectively applies and develops knowledge, skills and experience in this area.</p>
<p>Maintenance Has the skills, knowledge and experience necessary to be able to undertake maintenance activities.</p>	<p>Unaware and unable to undertake the require maintenance activities relevant to the post.</p> <p>Knowledge and experience are less than adequate to effectively execute the job.</p>	<p>Able to undertake a limited number of maintenance activities.</p> <p>Demonstrates a basic understanding and function and ability to differentiate between some maintenance activities.</p>	<p>Demonstrates detailed knowledge of maintenance activities relevant to the post.</p> <p>Regularly demonstrates full and optimal maintenance application.</p>	<p>Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques.</p> <p>Effectively applies maintenance knowledge, skills and experience in this area.</p>	<p>Demonstrates a comprehensive understanding of a complex range (including specialised) maintenance activities and systems maintenance techniques.</p> <p>Effectively applies and develops knowledge, skills and experience in this area.</p>

<p>Management Has the skills, knowledge and experience necessary to be able to manage resources effectively and efficiently</p>	<p>Has no understanding of the concept of management, does not engender enthusiasm or respect.</p> <p>Unable to present the business aims or team vision.</p> <p>Has no understanding of cost implications, including those related to their actions.</p> <p>Is not aware of budgetary techniques, has difficulty understanding budgetary information.</p>	<p>Able to discuss the concepts of management and identify the core elements of Management.</p> <p>Describe the consequence of ineffective management.</p> <p>Aware of the cost implications relevant to the post.</p> <p>Understands basic budgetary techniques and information.</p>	<p>Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p>	<p>Applies concepts of management in all activities.</p> <p>Is recommended by others as an example of an exemplary manager.</p> <p>Is confident in dealing with conflict.</p> <p>Demonstrates the ability to interpret a wide range of business information.</p> <p>Can assimilate detailed information and make use of it for the benefit of the business</p>	<p>Consistently applies best practice in management techniques.</p> <p>Shares that knowledge to the benefit of the business and other leaders in the business.</p> <p>Demonstrates the ability to interpret a wide range of business information at the level required for the current post.</p> <p>Competent in developing new commercial forums.</p>
<p>Utilization and Optimization Has the skills, knowledge and experience necessary to effectively utilize and optimize.</p>	<p>Unable to identify/name different utilization and optimization techniques relevant to the post.</p> <p>Does not understand function of various techniques, unable to differentiate.</p>	<p>Able to identify/name different utilization and optimization techniques relevant to the post.</p> <p>Demonstrates understanding of function of various techniques and ability to differentiate.</p>	<p>Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p>	<p>Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>Demonstrates understanding of complex range of utilization and optimization techniques and their application at the level required for the post.</p> <p>Competent in developing new techniques.</p>

Competencies	ROLE SPECIFIC SKILL REQUIREMENTS				
	Managing Director	Operations Director	Operations Manager	Hydrocarbon Manager	Senior Engineer
Administration Has the skills, knowledge and experience (relative to job) necessary to be able to undertake administrative activities.	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all administrative activities at the level required for the post.</p> <p>Has a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all administrative activities at the level required for the post.</p> <p>Has a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all administrative activities at the level required for the post.</p> <p>Has a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>

<p>Application Has the skills, knowledge and experience relating to effective and efficient application.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p> <p>5. Demonstrates wide-ranging skill, knowledge and application(s) at the level required for the post.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Level of knowledge and experience and application enables development of the role and business processes.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p> <p>5. Demonstrates wide-ranging skill, knowledge and application(s) at the level required for the post.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Level of knowledge and experience and application enables development of the role and business processes.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p> <p>5. Demonstrates wide-ranging skill, knowledge and application(s) at the level required for the post.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Level of knowledge and experience and application enables development of the role and business processes.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p>
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<p>Compliance Has the skills, knowledge and experience necessary to ensure compliance.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Has a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Has a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Has a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>
<p>Coordination Has the skills, knowledge and experience to be able to undertake the coordination of resources.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all coordinating activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all coordinating activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all coordinating activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all coordinating activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all coordinating activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>

<p>Design and Development Has the skills, knowledge and experience necessary to be able to undertake design and development activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p> <p>4. Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all design and development activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p> <p>4. Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all design and development activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p> <p>4. Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p> <p>5. Demonstrates wide-ranging knowledge of all design and development activities at the level required for the post, together with a full appreciation of how these activities interact beyond the post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p> <p>4. Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p> <p>4. Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p>
<p>Operation Has the skills, knowledge and experience necessary to be able to undertake a variety operational activities.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p> <p>4. Demonstrates comprehensive understanding of operational activities and systems operational techniques.</p> <p>Effectively applies operational knowledge, skills and experience in this area.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p> <p>4. Demonstrates comprehensive understanding of operational activities and systems operational techniques.</p> <p>Effectively applies operational knowledge, skills and experience in this area.</p>

<p>Maintenance Has the skills, knowledge and experience necessary to be able to undertake a variety of maintenance activities.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application. 4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application. 4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application. 4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application. 4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application. 4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>
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Management Has the skills, knowledge and experience necessary to be able to manage resources effectively and efficiently.	3. Manages by example, demonstrates a professional approach. Is honest, respected and consistently adapts style to meet business, team and individual needs. Successfully manages budgets, understands budgetary techniques and financial data relevant to the post. Able to interpret a range of financial information.	3. Manages by example, demonstrates a professional approach. Is honest, respected and consistently adapts style to meet business, team and individual needs. Successfully manages budgets, understands budgetary techniques and financial data relevant to the post. Able to interpret a range of financial information.	3. Manages by example, demonstrates a professional approach. Is honest, respected and consistently adapts style to meet business, team and individual needs. Successfully manages budgets, understands budgetary techniques and financial data relevant to the post. Able to interpret a range of financial information.	3. Manages by example, demonstrates a professional approach. Is honest, respected and consistently adapts style to meet business, team and individual needs. Successfully manages budgets, understands budgetary techniques and financial data relevant to the post. Able to interpret a range of financial information.	3. Manages by example, demonstrates a professional approach. Is honest, respected and consistently adapts style to meet business, team and individual needs. Successfully manages budgets, understands budgetary techniques and financial data relevant to the post. Able to interpret a range of financial information.
	4. Applies concepts of management in all activities. Is recommended by others as an example of an exemplary manager. Is confident in dealing with conflict.	4. Applies concepts of management in all activities. Is recommended by others as an example of an exemplary manager. Is confident in dealing with conflict.	4. Applies concepts of management in all activities. Is recommended by others as an example of an exemplary manager. Is confident in dealing with conflict.	4. Applies concepts of management in all activities. Is recommended by others as an example of an exemplary manager. Is confident in dealing with conflict.	4. Applies concepts of management in all activities. Is recommended by others as an example of an exemplary manager. Is confident in dealing with conflict.
	Demonstrates the ability to interpret a wide range of business information. Can assimilate detailed information and make use of it for the benefit of the business.	Demonstrates the ability to interpret a wide range of business information. Can assimilate detailed information and make use of it for the benefit of the business.	Demonstrates the ability to interpret a wide range of business information. Can assimilate detailed information and make use of it for the benefit of the business.	Demonstrates the ability to interpret a wide range of business information. Can assimilate detailed information and make use of it for the benefit of the business.	Demonstrates the ability to interpret a wide range of business information. Can assimilate detailed information and make use of it for the benefit of the business.
	5. Consistently applies best practice in management techniques. Shares that knowledge to the benefit of the business and other leaders in the business.	5. Consistently applies best practice in management techniques. Shares that knowledge to the benefit of the business and other leaders in the business.	5. Consistently applies best practice in management techniques. Shares that knowledge to the benefit of the business and other leaders in the business.	5. Consistently applies best practice in management techniques. Shares that knowledge to the benefit of the business and other leaders in the business.	5. Consistently applies best practice in management techniques. Shares that knowledge to the benefit of the business and other leaders in the business.
	Demonstrates the ability to interpret a wide range of business information at the level required for the current post. Competent in developing new commercial forums.	Demonstrates the ability to interpret a wide range of business information at the level required for the current post. Competent in developing new commercial forums.	Demonstrates the ability to interpret a wide range of business information at the level required for the current post. Competent in developing new commercial forums.	Demonstrates the ability to interpret a wide range of business information at the level required for the current post. Competent in developing new commercial forums.	Demonstrates the ability to interpret a wide range of business information at the level required for the current post. Competent in developing new commercial forums.

<p>Utilization and Optimization Has the skills, knowledge and experience necessary to effectively utilize and optimize.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p> <p>5. Demonstrates understanding of complex range of utilization and optimization techniques and their application at the level required for the post.</p> <p>Competent in developing new techniques.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p> <p>5. Demonstrates understanding of complex range of utilization and optimization techniques and their application at the level required for the post.</p> <p>Competent in developing new techniques.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p> <p>5. Demonstrates understanding of complex range of utilization and optimization techniques and their application at the level required for the post.</p> <p>Competent in developing new techniques.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post</p>
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Competencies	ROLE SPECIFIC SKILL REQUIREMENTS				
	Process Supervisor	Process Operator	Process Operator (CCR)	Maintenance Supervisor	Maintenance Technician
Administration Has the skills, knowledge and experience (relative to job) necessary to be able to undertake administrative activities.	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>

<p>Application Has the skills, knowledge and experience relating to effective and efficient application.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p>
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<p>Compliance Has the skills, knowledge and experience necessary to ensure compliance.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>
<p>Coordination Has the skills, knowledge and experience to be able to undertake the coordination of resources.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>

<p>Design and Development Has the skills, knowledge and experience necessary to be able to undertake design and development activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p> <p>4. Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p> <p>4. Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.</p> <p>4. Demonstrates wide-ranging knowledge of all design and development activities and experience in this area is beyond the level required for the current post.</p>
<p>Operation Has the skills, knowledge and experience necessary to be able to undertake a variety operational activities.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p> <p>4. Demonstrates comprehensive understanding of operational activities and systems operational techniques.</p> <p>Effectively applies operational knowledge, skills and experience in this area</p>	<p>3. Demonstrates detailed knowledge of operational activities relevant to the post.</p> <p>Regularly demonstrates full and optimal operational application.</p>

<p>Maintenance Has the skills, knowledge and experience necessary to be able to undertake a variety of maintenance activities.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application. 4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application.</p>	<p>4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application. 4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>
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<p>Management Has the skills, knowledge and experience necessary to be able to manage resources effectively and efficiently.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p> <p>4. Applies concepts of management in all activities.</p> <p>Is recommended by others as an example of an exemplary manager.</p> <p>Is confident in dealing with conflict.</p> <p>Demonstrates the ability to interpret a wide range of business information.</p> <p>Can assimilate detailed information and make use of it for the benefit of the business.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p> <p>4. Applies concepts of management in all activities.</p> <p>Is recommended by others as an example of an exemplary manager.</p> <p>Is confident in dealing with conflict.</p> <p>Demonstrates the ability to interpret a wide range of business information.</p> <p>Can assimilate detailed information and make use of it for the benefit of the business.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p>
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<p>Utilization and Optimization Has the skills, knowledge and experience necessary to effectively utilize and optimize.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post</p>
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Competencies	ROLE SPECIFIC SKILL REQUIREMENTS				
	Materials Services Supervisor	Material Services Operator	Quality Controller	Administration Assistant	
Administration Has the skills, knowledge and experience (relative to job) necessary to be able to undertake administrative activities.	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p> <p>4. Demonstrates wide-ranging knowledge of all administrative activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all administrative activities.</p>	

<p>Application Has the skills, knowledge and experience relating to effective and efficient application.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p> <p>4. Demonstrates wide-ranging skills, knowledge and application(s).</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p> <p>Application enables development of the role.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) relevant to the post.</p> <p>Possesses adequate knowledge and experience to perform the job and applies effectively to meet role requirements.</p>	
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<p>Compliance Has the skills, knowledge and experience necessary to ensure compliance.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p> <p>4. Demonstrates wide-ranging knowledge of all legislative requirements and business standards.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application of all legislative and business requirements and standards.</p>	
<p>Coordination Has the skills, knowledge and experience to be able to undertake the coordination of resources.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p> <p>4. Demonstrates wide-ranging knowledge of all coordination activities.</p> <p>Knowledge and experience in this area is beyond the level required for the current post.</p>	<p>3. Demonstrates comprehensive working knowledge and practical application(s) of all coordination activities.</p>	

Design and Development Has the skills, knowledge and experience necessary to be able to undertake design and development activities.	3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.	3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.	3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.	3. Demonstrates comprehensive working knowledge and practical application(s) of all design and development activities.	
Operation Has the skills, knowledge and experience necessary to be able to undertake a variety operational activities.	3. Demonstrates detailed knowledge of operational activities relevant to the post. Regularly demonstrates full and optimal operational application. 4. Demonstrates comprehensive understanding of operational activities and systems operational techniques. Effectively applies operational knowledge, skills and experience in this area.	3. Demonstrates detailed knowledge of operational activities relevant to the post. Regularly demonstrates full and optimal operational application.	3. Demonstrates detailed knowledge of operational activities relevant to the post. Regularly demonstrates full and optimal operational application. 4. Demonstrates comprehensive understanding of operational activities and systems operational techniques. Effectively applies operational knowledge, skills and experience in this area.	3. Demonstrates detailed knowledge of operational activities relevant to the post. Regularly demonstrates full and optimal operational application.	

<p>Maintenance Has the skills, knowledge and experience necessary to be able to undertake a variety of maintenance activities.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application. 4. Demonstrates comprehensive understanding of maintenance activities and systems maintenance techniques. Effectively applies maintenance knowledge, skills and experience in this area.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application.</p>	<p>3. Demonstrates detailed knowledge of maintenance activities relevant to the post. Regularly demonstrates full and optimal maintenance application.</p>	
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<p>Management Has the skills, knowledge and experience necessary to be able to manage resources effectively and efficiently.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p> <p>4. Applies concepts of management in all activities.</p> <p>Is recommended by others as an example of an exemplary manager.</p> <p>Is confident in dealing with conflict.</p> <p>Demonstrates the ability to interpret a wide range of business information.</p> <p>Can assimilate detailed information and make use of it for the benefit of the business.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p>	<p>3. Manages by example, demonstrates a professional approach.</p> <p>Is honest, respected and consistently adapts style to meet business, team and individual needs.</p> <p>Successfully manages budgets, understands budgetary techniques and financial data relevant to the post.</p> <p>Able to interpret a range of financial information.</p>	
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<p>Utilization and Optimization Has the skills, knowledge and experience necessary to effectively utilize and optimize.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p> <p>4. Demonstrates understanding of broad range of utilization and optimization techniques and their application.</p> <p>Demonstrates effective application at the level required for the current post.</p>	<p>3. Demonstrates detailed working knowledge and practical application of utilization and optimization techniques relevant to the post.</p>	
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Learning and Development

This section is a practical guide to choosing specific development options tailored to individual needs and contains:

- A development options matrix which sets out suggestions for developing each competency
- Explanations and guidance on each of the development options.

Development Options Matrix	Coaching	Mentoring	360 Degree Feedback	Increased Role	Project Work	Functional Project Team	Cross Functional Project Team	Secondment	Qualifications	Self Learning	In-house Training Activity	Away from Work Courses
Administration			•	•					•	•	•	•
Application	•	•	•	•	•	•	•	•		•	•	•
Compliance			•	•					•	•	•	•
Coordination	•	•	•	•	•	•	•	•	•	•	•	•
Design & Development	•	•	•	•	•	•	•	•	•	•	•	•
Operation	•	•	•	•	•	•	•	•	•	•	•	•
Maintenance	•	•	•	•	•	•	•	•	•	•	•	•
Management	•	•	•	•	•	•	•	•	•	•	•	•
Utilization and Optimization	•	•	•	•	•	•	•	•	•	•	•	•

The following development options are suitable for use within current role:

Coaching – This can meet many competency development needs. In most circumstances coaching will be by the direct line Manager or by a nominated member of the team. It is the single most common form of development action and the most natural and cost effective way of meeting development requirements. To give Managers practical help on how to use coaching to develop an individual's competency a coaching guide has been developed (see following section for detail). This guide includes information on what behaviours to look for, tips on how to use each skill and on-the-job actions to help individuals develop the competencies. A coaching course may also be available from time to time depending on need. Each of the specific on-the-job actions should be accompanied by proactive coaching from the Manager to maximise the development opportunity.

Mentoring – This is the nomination of someone outside of immediate Line Management to help and support and offer advice. It is a role best undertaken by a person required as skilled at giving impartial advice and who knows their way around the organisation. People who are likely to be good at mentoring are often strong in developing others. In addition a good choice of mentor would be someone strong in the competency or skill in which the individual needs developing. It is important for everyone to understand that the mentor does not replace the manager's role as a developer or coach but that they are there to give appropriate help and advice when required.

Before setting up a mentoring relationship it should be discussed with the HR Department who can ensure that everyone involved understands their role and any training of the mentor can be provided.

Three Hundred and Sixty Degree Feedback – This is a way in which an individual can receive structured feedback about his or her skills. It involves the completion of a rating questionnaire by the individual's manager, team members, peers and internal customers. The results of the questionnaire are analysed and fed back to the individual highlighting strengths and development needs to be carried out in a structured and measured way to ensure accuracy and because it is a sensitive process. For this reason HR should be consulted and if necessary involved in the process to ensure all involved understand their responsibilities to give constructive feedback.

Increased Role – One of the simpler ways of developing individuals is to give them a bigger role in their current position. This has the benefit of stretching the individual whilst retaining their knowledge and skills.

Project Work – Special work projects are one off one-person projects rather than team projects. They will be confined within the individuals department and will usually be of fairly short duration. A good source for special work projects is to delegate part of a manager's project. It is important though that the special work project is appropriately defined being SMART i.e. specific, measured,

achievable, relevant and time-bound. Support via coaching and or mentoring will also be required.

Functional or Cross Functional Projects – Opportunities to work on functional or cross-functional projects arise where the Company or function decides to tackle a specific problem using a team of people. This might be the case where, for example, a new set of procedures are required within the function or the introduction of new systems right across the Company and the individual can bring views or expertise to the team. The difference between functional or cross-functional projects and a special work project is that the special project would be a one-person project rather than a team project.

Secondments – These provide an opportunity for individuals to widen their experience of the business and at the same time broaden and add to their skills and competencies by spending time in another department. Secondments serve a number of purposes. Where the individual already has a link into the part of the business into which they are seconded, it will strengthen the relationships and provide an insight into the impact they have on that part of the business. Where there are no current links it provides an insight into another part of the business and enriches both the individual and the part of the business they are seconded to. They also provide both the individual and the Company with a relatively risk free way of trying out other roles. Secondments into external customer organisations may also be realistic in some areas of the business.

Role Modelling – Entails identifying someone with strength in a particular competency; they then become a role model for the individual with the development need. Opportunities would be sought for the person to observe the role model in different situations and to talk through what the role model does and how they do it. This would then be translated into specific objectives (SMART).

Qualifications – Gaining qualifications are actively encouraged as a way of increasing technical and functional expertise. The choice of which course will depend on the background of the individual as well as funding availability and should be discussed with the HR Department.

Off Job Courses – These fall into two categories, functional skills training and competency development. Functional skills training can involve training courses on the methods or processes used in the function. It may be appropriate to update job knowledge and/or expertise by attending seminars or conferences. Competency development courses are designed to develop the individual's competence (the how) and maximise their contribution to the business whilst realising their potential. Typically these courses will provide an insight into best practice and an opportunity to practice in a safe environment. In all cases attendance would be linked to practical development opportunities once back in the workplace to reinforce the learning and ensure transferability into the job. In both cases of functional and competency development, discussions with HR Department must be held before courses are booked. In this way the training

need can be evaluated and matched to other available courses in company or external open courses or alternative ways of meeting the need suggested. A programme of courses will be developed to meet needs where development needs analysis indicates there is demand and a course does not currently exist.

Other Development Material – The training department holds information on a variety of books, videos and individual learning packages that can be loaned.

Annex – Professional Development Portfolio



**PRIFYSGOL CYMRU
THE UNIVERSITY OF WALES**

ANNEX
PROFESSIONAL DEVELOPMENT PORTFOLIO

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28th May 2010

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Professional Development Portfolio (PDP):

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Professional Development Portfolio

1.0 Introduction to Reflective Practice

As professionals there is a requirement for us to become more focused on how to describe and measure ongoing professional development. Most of us belong to professional institutions, for example, the Institution of Occupational Safety and Health (IOSH), the Chartered Institute of Personnel and Development (CIPD). All of these professional institutions highlight the need for personal reflection on skills, knowledge, attitudes and personal values. Personal reflection happens as part of day-to-day living, for example, if we find ourselves in a difficult or challenging situation, we often spend time 'reflecting' mentally on what happened, what went wrong, what we could have done or said differently. Equally, we may reflect on what went well, and why. This kind of personal reflection has been translated into more formal processes often called 'reflective practice'. There have been numerous suggestions that formal reflection and discussion around practice can lead to an ongoing programme of learning and development, thereby ensuring we become a much rounder professional within our chosen field (*Schon, 1983; Gibbs, 1988; Bolton 2001; Johns, 2004*).

Reflective practice can be used for different purposes, these include, for example, identifying gaps in skills and knowledge and learning needs, analysing complex and challenging situations, analysing communication and relationships with colleagues, examining the basis of our decision making process (*Bolton, 2001*). I will now move on to consider various reflective practice models.

2.0 Reflective Practice Models

Platzer et al (1997) concluded that learning through reflective practice is more potent if there is an understanding of the various frameworks that exist, all of which encourage a structured and systematic approach to the act of reflection and learning. Several models of reflective practice have been developed over the years, and it is possible to conclude that there is no right or wrong approach. However, what is fundamental is that the reflective practitioner chooses a framework that offers the greatest comfort factor, as well as one that best assists you in learning from your experiences.

The most important aspect of engaging in reflective writing for work-based learning is that your writing is able to demonstrate a changed conceptual perspective. The process of reflection not only leads to more than just a gain in knowledge, it should also challenge the concepts and theories by which you make sense of knowledge as a whole. When one reflects on a situation you do not simply see more, you see it in a different context. This different way of viewing a situation is reflected in statements about a commitment to action. Action is the final stage of reflection (*Atkins & Murphy, 1994*). Sharing your reflective writing with your Director of Studies/Research Supervisor will assist you in the process of revealing new perspectives.

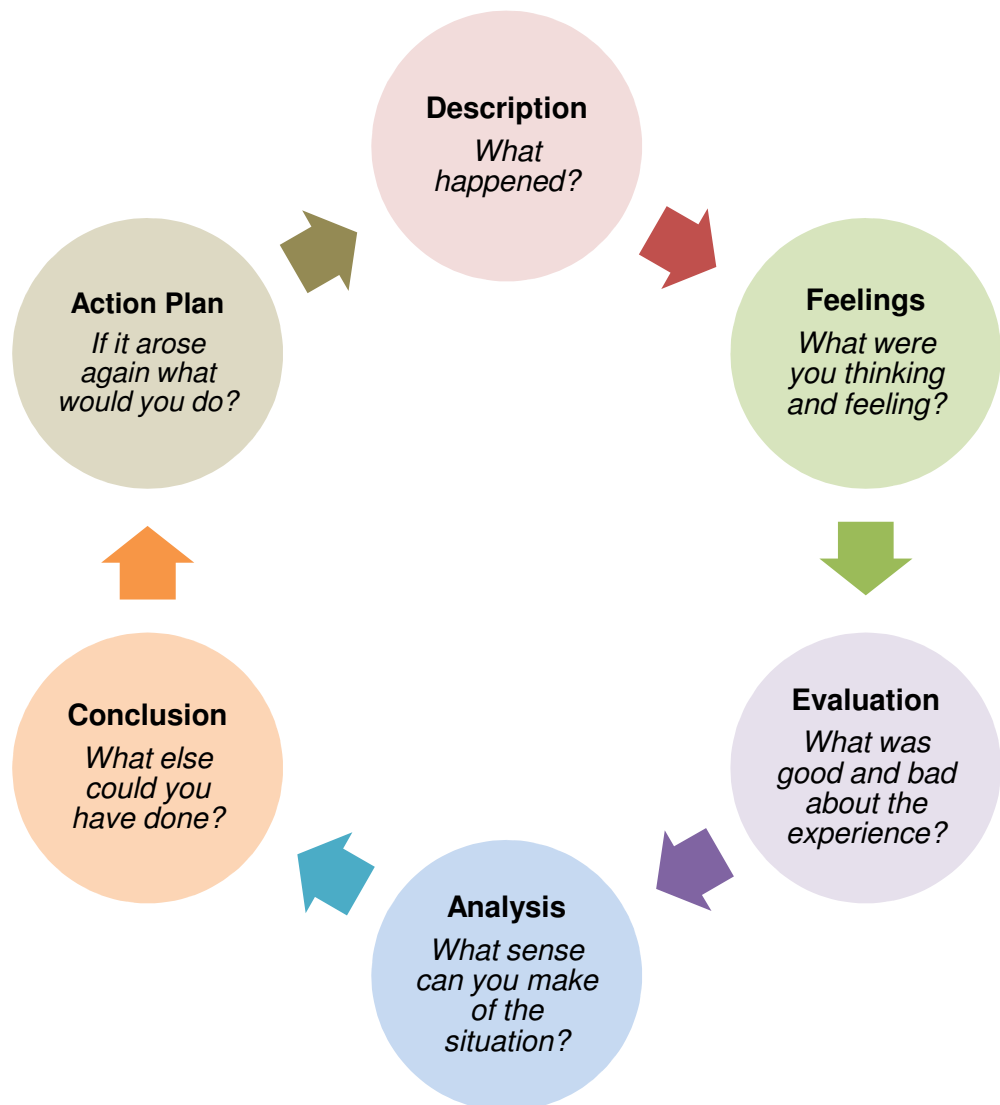
At a basic level models of reflective practice exist to provide guidance to help us look back over events that have happened, and to turn them into learning experiences. In essence models of reflection help us to; look at an event, understand it and more importantly learn from it

Dewey (1933) identified the three characteristics or attitudes of people who are reflective practitioners. These included open-mindedness, responsibility and wholeheartedness.

Schon (1990) identified two kinds of reflection; first, there is reflection-in-action. This means where the competent reflective practitioner utilizes knowledge, experience and judgement to guide decisions in real life everyday situations as they are happening. Second, there is reflection-on-action, this is retrospective reflection, in essence you reflect on actions that have already occurred, usually, but not always, fairly soon after the event.

Graham Gibbs developed his reflective cycle (Gibbs, 1988) based upon each stage of David A. Kolb's experiential cycle (Kolb & Kolb, 2001). He suggested how a full structured analysis of a situation could take place using prompt questions at each stage. Gibbs highlighted six distinct reflective stages, these included, description, feelings, evaluation, analysis, conclusion and action planning. Given my application of experiential learning during this research project, I decided to use the Gibbs model as a basis for my reflective practice. The Gibbs reflective cycle is shown below in Figure PDP 1.

Figure PDP 1 Gibbs Reflective Cycle (1988)



3.0 Introduction Project One – Assessment Plans

In Chapter Seven I noted that due to time constraints on the part of the third party contractor, I was asked to compile the assessment workbooks for each core hydrocarbon process plant topic areas. This task afforded me a valuable insight into the assessment of experiential learning and development material. An example of my assessment plan was shown in Figure 7.1. I will now move on to explain how the execution of this task impacted on my continuing professional development.

4.0 Link with Research

As a direct result of visits and subsequent analysis of two UK hydrocarbon processing facilities, reported in Chapter Five, I was able to identify core hydrocarbon process activities that I subsequently converted into core hydrocarbon learning and development interventions. The scheme is built upon a series of units and elements that are ultimately structured around a VQ approach. The units and elements have been approved by City and Guilds International and could therefore be utilized to obtain a full VQ at any point in the future, subject to suitable and sufficient VQ assessment. As previously noted, due to operational demands and the subsequent late commissioning of the plant, it was decided by the Operations Director to delay the VQ assessment process, until some point in the future. Training would be delivered and assessed to a City and Guilds standard; however, formal accreditation would be delayed.

The scheme was designed in order to provide a thorough understanding of the component parts of a hydrocarbon process plant operation. In addition, it identifies the candidate's roles and responsibilities with respect to operations, health, safety and environmental compliance. As I noted previously, due to time constraints on the part of the third party contractor, I was asked to develop the assessment plans for each of the core hydrocarbon learning and development interventions.

Guidance was provided to the candidates as they progressed through a structured and systematic learning and development process. The candidates' progress was assessed on an ongoing basis and underpinning knowledge and understanding of the plant and processes is established and recorded.

The hydrocarbon process plant assessment units are as follows:

1. An Introduction to Hydrocarbon Operations;
2. Shut Down and Make Safe;
3. Operation of Ancillary Plant and Boil-Off Disposal;
4. Export System;
5. Natural Hydrocarbon Liquefaction;
6. Power Generation;
7. Permit to Work/Risk Assessment for Permit to Work;
8. Environmental Awareness;
9. Hydrocarbon Jetty Operations;
10. General Risk Assessment.

Each unit is made up of a number of elements and unless otherwise stated all elements must be completed to successfully complete a unit. Upon analysis of the process plant core learning and development units it is possible to determine that they mirror exactly the core areas I identified during my analysis stage. I needed to ensure that there was a standard of performance and knowledge and understanding section contained within each element. This section would be subjected to scrutiny by the Trainer/Assessor.

I will now move on to highlight the elements I identified within each of the core hydrocarbon process plant assessment units.

4.1.1 An Introduction to Hydrocarbon Operations

The following elements were identified within the assessment unit:

Element 1.1 Introduction to the Site Facility

Element 1.2 Candidate Personal Objectives

Element 1.3 Site and Personal Safety

Element 1.4 Facility Operations

Element 1.5 Basic Chemistry and the Chemistry of Combustion

Element 1.6 Electrical Equipment in Hazardous Areas

Element 1.7 Personal Protective Equipment (PPE)

Element 1.8 Health, Safety and Environmental Legislation

4.1.2 Shut Down and Make Safe

The following elements were identified within the assessment unit:

Element 2.1 Site Evacuation – Personal Roles and Responsibilities;

Element 2.2 Communication;

Element 2.3 Fire Fighting Equipment;

Element 2.4 Plant Emergency Shutdown Valves;

Element 2.5 Fixed Deluge Systems;

Element 2.6 Safety Showers and Eye Wash Stations;

Element 2.7 Fire and Gas Detection System;

Element 2.8 Site Power Supply Trip.

4.1.3 Operation of Ancillary Plant and Boil-Off Disposal

The following elements were identified within the assessment unit:

Element 3.1 Awareness of Health, Safety and Environmental Policies and Procedures;

Element 3.2 Plant and Instrumentation Diagrams (P&ID's);

Element 3.3 Recognise the Significant Hazards on an LNG Facility;

Element 3.4 Gas and Atmosphere Testing;

Element 3.5 Plant Isolation and Purging;

Element 3.6 Electrical Distribution System;

Element 3.7 Prime Movers;

Element 3.8 Valves;

Element 3.9 Filters;

Element 3.10 Storage Tanks;

Element 3.11 Boil-off System;

Element 3.12 Heat Exchangers;

Element 3.12 Instrument Air System;

Element 3.13 Nitrogen System;

Element 3.14 Water Treatment System;

Element 3.15 Fuel Gas System;

Element 3.16 Gas Quality and Enrichment System;

Element 3.17 Recondenser System;

Element 3.18 Export Interface (In-tank Pump System, High Pressure Send-out Pump System, Vaporisers).

4.1.4 Export System

The following elements were identified within the assessment unit:

Element 4.1 Introduction to Export System;

Element 4.2 Storage Tanks;

Element 4.3 In-tank Pumps;

Element 4.4 Ex-tank Pumps;

Element 4.5 Nitrogen Ballast Plant;

Element 4.6 Vaporisers;

Element 4.7 Cool Down;

Element 4.8 Vaporising Costs.

4.1.5 Natural Hydrocarbon Liquefaction

Assessment plans were not developed for this core activity due to the fact that the liquefaction process was not part of the hydrocarbon process plant facility.

4.1.6 Power Generation

The following elements were identified within the assessment unit:

Element 6.1 Electrical Theory;

Element 6.2 Electrical Distribution Equipment & Locations;

Element 6.3 Power Generation – General Understanding;

Element 6.4 Generator Systems;

Element 6.5 Safety Systems;

Element 6.6 Generator Operations.

4.1.7 Permit to Work and Risk Assessment for Permit to Work

The following elements were identified within the assessment unit:

Element 7.1 Permit to Work Systems;

Element 7.2 Roles and Responsibilities;

Element 7.3 Types and Uses of Permits;

Element 7.4 Completion of Permit, Controls and Isolations;

Element 7.5 Addendum (Permitry Elements – Other Unit Workbooks).

4.1.8 Environmental Awareness

The following elements were identified within the assessment unit:

Element 8.1 Environmental Impact Recognition;

Element 8.2 Environmental Impact Reduction;

Element 8.3 Environmental Impact Minimisation;

Element 8.4 Environmental Impact Improvements;

Element 8.5 Environmental Impact Prevention;

Element 8.6 Addendum (Environmental Elements – Other Unit Workbooks).

4.1.9 Hydrocarbon Jetty Operations

The following elements were identified within the assessment unit:

Element 9.1 Candidate Learning and Development Objective Setting;

Element 9.2 Jetty Documentation;

Element 9.3 Jetty Layout;

Element 9.4 Radio Communication;

Element 9.5 Basic Sea Survival;

Element 9.6 Jetty Services;

Element 9.7 Mooring;

Element 9.8 Unloading Arms;

Element 9.9 Transfer Routes;

Element 9.10 Cargo Planning;

Element 9.11 Jetty Desuperheater.

4.1.10 General Risk Assessment

The following elements were identified within the assessment unit:

Element 10.1 Identify Hazards;

Element 10.2 Who May Be Harmed/What Damage May Occur and How;

Element 10.3 Evaluate Risks and Decide On Precautions;

Element 10.4 Record Findings and Implement;

Element 10.5 Review Risk Assessments.

5.0 Personal Development

In order to assess both NVQs and VQ's, it is necessary to have undertaken suitable training, developed a portfolio of evidence for assessment and for the developed portfolio to be assessed to a national standard. Back in 1995 I attended the NVQ portfolio development training and was ultimately successful in achieving the City and Guilds London Institute Assessor and Internal Verifier awards (D32, D33 and D34). Since that time the 'D' units have been superseded by a new suite of updated 'A' units. In view of the changes to the

Assessor/Verifier units I decided to attend additional training on the subject area in order that my competency levels could be deemed up-to-date. Having been involved with major hazardous installations for the last 35 years, I was all too aware of the requirement for a diverse and robust assessment methodology.

Prior to developing the assessment plans for the ten core hydrocarbon learning and development interventions, I spent many hours/days reading key HSE documentation, in particular, the 'Competence assessment for the hazardous industries: Research Report 086' (*Wright et al, 2003*). The decision to reference this document extensively was proved correct during my visits to the two UK hydrocarbon processing plants. The two organisations were in collective agreement that this competence assessment document represented the up-to-date HSE thinking regarding competence assessment within hazardous industries. From an analysis of my Assessor/Verifier and the research report entitled 'Competence assessment within hazardous industries' (2003) I was able to conclude that I required a range of assessment techniques that encompassed the following:

1. Examination of Outcomes (EO);
2. Formal Tests (FT);
3. Observation (O);
4. Photographic Evidence (PE);
5. Professional Discussion (PD);
6. Projects and Assignments (PA);
7. Questioning (Q);

- 8. Simulation (S);
- 9. Witness Statement (WS);
- 10. Written Evidence (WE).

The personal development undertaken for this project has enabled me to develop a range of diverse assessment criteria, 'fit for purpose' within a major hazardous installation. In addition, it has developed my own levels of competence onto a significantly higher plane.

6.0 Personal Advancement

The development and implementation of assessment criterion has enabled me to enhance my consultancy levels of competence, with regard to effectively and efficiently managing major change at a senior level within a major hazardous installation. The diversity of the issues I have encountered and the subsequent requirement to manage these to the full has tested my resolve on a personal and professional. In addition, it has allowed me a further opportunity to develop my analytical, problem solving, decision making and leadership skills and knowledge extensively.

As a direct result of my consultancy activities with Alpha Hydrocarbon, I have been able to secure additional work within a hydrocarbon process plant related field within the Persian Gulf area. I spent two months in Abu Dhabi, reviewing a competence assurance system for major marine offshore oil producer. It is pleasing to know that this final element of my thesis, the Professional

Development Portfolio section, was actually written under the beautiful sunshine of Abu Dhabi.

7.0 Self Reflection

When I commenced my consultancy activities at Alpha Hydrocarbon it was very evident that the organisation was in the depth of a severe crisis. The failure to develop an ICAF, underpinned by learning and development interventions had caused severe strain on all departments. Through a process of planned, structured and systematic organisational change via the development of a robust competence assessment criteria, it is clear that Alpha Hydrocarbon are now firmly back on track. There are still mountains to climb, given that competence assessment must be undertaken under full operations and that competence re-assessment must be undertaken in the future years to come.

8.0 Key Deliverables

Key deliverables include:

1. A bench-marked assessment criterion;
2. Competence assessment of core hydrocarbon process plant learning and development interventions;
3. Competence assessment of a scale of positive descriptors;
4. The assessment of individual competence, thereby ensuring that Alpha Hydrocarbon can supply product to the UK economy.

9.0 Introduction Project Two –

Risk Assessment Unit Workbook

In Chapter Seven I noted that due to time constraints on the part of the third party contractor, I was asked to compile a general risk assessment unit workbook that encompassed an experiential learning approach. This task afforded me a valuable insight into the development of experiential learning and development material. The workbook is shown in Appendix 1. I will now move on to explain how the execution of this task impacted on my continuing professional development.

10.0 Linking With Research

In Chapter Four I noted that David Kolb, with his colleague Roger Fry, developed the theory which is known today as 'experiential learning' (*Kolb & Fry, 1975*). They concluded that all learning consists of four distinct cyclical elements. These include concrete experience, observation and reflection, forming abstract concepts and testing in new situations. It was concluded that the learning and development cycle can begin at any one of the four points (*Kolb & Kolb, 2001*). It was suggested, however, that the learning process often begins with a person undertaking a particular action and then seeing how their action(s) affect the situation concerned. They then need to understand these effects in the particular instance, in order that, they can replicate that same action in the same situation.

From a personal perspective, I subscribe to the Kolb and Kolb (2001) theory that learning can commence at any point on the cyclical scale, however, this must be managed to the full particularly within a hazardous environment. For example, if an employee formed an abstract concept and then decided to test that concept at a hydrocarbon installation, then the end result could be catastrophic. Consequently, the learning cycle must begin at point number one in order that learning and development can progress in a safe and controlled manner.

With this thought process in mind I set about analysing how I could modify the Kolb and Kolb (2001) theory. Many hours of research led me to the work of Gibbs (1988). From an analysis of his work entitled 'Learning by doing: A guide to teaching and learning methods (1988) and that of Kolb and Kolb (2001) I was able to conclude that in order to achieve deep and meaningful learning and development we need to practice new behaviours and skills, receive ongoing constructive feedback and analyse the consequences of the new ways. In effect this is the only sure method of integrating new skills into our way of thinking and behaviour. In the words of that famous Confucius dictum around 450 BC, "tell me, and I will forget, show me and I may remember, involve me, and I will understand" (*Leaders, Digest, 2009*). This revised theory could be represented under four headings:

1. Planning;
2. Actioning;
3. Increasing awareness;
4. Reviewing and reflecting.

10.1.1 Planning

At the planning stage it was necessary to:

1. Develop action plans – trainees can review notes of learning and development initiatives and subsequently write an action plan for implementation;
2. Set key objectives – these can be set by both the trainee and the trainer before embarking on the learning and development path;
3. Design problems – allow trainees to reflect on potential issues and help them devise their remedial measures, rather than provide prescriptive guidelines. Of course the trainer must always intervene in the interests of health and safety;
4. Develop observation checklists – allow trainees to record key features during their experiential activity;
5. Assessment – discuss with learners the criteria that will be employed to measure key outcomes from the learning and development experiential activity.

10.1.2 Actioning

At the actioning stage it was necessary to:

1. Inspire learning and development – there is nothing worse or soul destroying than undertaking an exercise which has no real meaning. Therefore care must be taken to ensure consistency with the learning and development outputs required.

10.1.3 Increasing Awareness

At the awareness stage it was necessary to:

1. Maintain a learner's log – maintaining a logbook of events heightens and focuses on learning and development outputs;
2. Develop key listening skills – it is important that trainees develop effective listening skill in order that they can improve their attentiveness and recall ability;
3. Implement question and answer sessions – such sessions help with reflection and are a valuable link to concepts and generalisations;
4. Develop an increase awareness of feelings – this encourages trainees to become more aware of the impact of their emotions in general.

10.1.4 Reviewing and Reflecting

At the reviewing and reflective stage it was necessary to:

1. Maintain diaries – these are written after the event, unlike a log which is completed during the event;

2. Implement peer appraisal – this can be beneficial as it provides another source of feedback to the trainee;
3. Implement structured discussion – groups of trainees can benefit enormously by sharing their experiences with others. Care must be exercised on the part of the trainer by not allowing a silent minority to sit quietly in the corner;
4. Develop a process of structured and systematic debriefing – this ensures that learners move through the full experiential learning and development cycle. This includes description, feelings, evaluation, analysis, general and specific conclusions and personal action plans;
5. Implement a process of self assessment – by making this a formal requirement it is possible to ensure that trainees fully examine both their strengths and weaknesses;
6. Devise reflection checklists – reflective practice is something that we can all benefit from.

11.0 Personal Development

Prior to developing the unit workbook for general risk assessment, I spent many hours/days focusing on a variety of experiential learning and development material. In addition, I attended a training workshop on the topic area of experiential learning, run by MTA International. The founder of MTA international is Martin Thomson an experimental psychologist with a profound interest in experiential learning. The workshop was constructed around the following key areas:

1. The learner – they are central to the process, not the trainer or facilitator;
2. Facilitation must be light and subtle – trainees can and do learn without facilitation. The key is for trainees to reflect on their experiences, however, within a hazardous industry this must be within a controlled and safe environment;
3. Varied experiential learning and development opportunities – there is requirement to develop a ‘bank’ of activities;
4. Reaction to experiences – the key is not to pre-judge as you cannot predict the learning and development a trainee will take from a set activity;
5. Build confidence before developing attitudes and behaviour – developing basic skills in a controlled and safe environment is one thing, changing behaviour is an entirely different facet, and in particular, where someone has preconceived behavioural traits;
6. Activities must be real and engaging – the key here is for valuable memorable learning and development. I concluded earlier that there is nothing worse or soul destroying than undertaking an exercise which has no real meaning;
7. Adequate and meaningful reviews – large activities can be overpowering, an effective activity allows for learning and development to take place with as little distraction as possible;
8. Careful reviews are crucial – the learning review is a vital stage of every activity, it must be planned at the design stage and not just left to chance;

9. Accentuate the positives and not the negatives – it is all too easy for the trainer and trainee to focus on negatives, however, this can seriously undermine confidence;
10. Use stimulating questions – the key is to stimulate the thought process and thereby allow the trainee to draw their own conclusions;
11. Resist the temptation to give trainees the answers – an observer is in a privileged position and often sees elements that are missed by the trainee. Rather than give a professional answer develop a series of questions in order that the trainees can be led to the problem unconsciously;
12. Have faith in the trainees ability to learn for themselves – they can and will make experiential learning and development activities work for them;
13. Reinforce point number one – it is about the trainee and not the trainer – forget ego the success of the trainees learning and development is key;
14. Get started – it is vital to start living and breathing experiential learning.

The personal development undertaken for this project has enabled me to develop a greater insight into the wide ranging topic of experiential learning. It has allowed me to create training material 'fit for purpose' within a major hazardous installation. In addition, it has developed my own levels of competence onto a significantly higher plane.

12.0 Personal Advancement

The development and implementation of unit workbook for general risk assessment has enabled me to enhance my consultancy levels of competence, with regard to effectively and efficiently managing major change at a senior level within a major hazardous installation. The diversity of the issues I have encountered and the subsequent requirement to manage these to the full has tested my resolve on a personal and professional. In addition, it has allowed me a further opportunity to develop my analytical, problem solving, decision making and leadership skills and knowledge extensively.

As a direct result of my consultancy activities with Alpha Hydrocarbon, I have been able to secure additional work within the areas of learning and development in general. I was asked to write trainee learning and development material for a National qualification provider within the UK. The personal development I have undertaken, within the area of experiential learning, has afforded me a greater insight into the needs and requirements of trainees. What I have learnt is that egos can play a disproportionate part in the learning and development activity. The key message that came out of my own personal development was that the 'trainee is king'. There is no room for hyped Trainer/Facilitator egos within effective experiential learning and development activities.

13.0 Self Reflection

It is impossible for me to reflect on elements of my personal development without saying a few words regarding the Professional Doctorate as a whole. The doctoral programme is professional, well balanced and structured in its approach and it is the structure of the programme that I find most helpful. From a personal perspective, I cannot speak too highly regarding the professionalism and dedication of the staff, in particular Professor Eleri Jones and Professor David Brooksbank. This is the first time I have found an academic institution that caters for and exceeds the aspirations of mature students. This above all else has aided my professional development more than any other aspect. I am deeply indebted to both Eleri and David and to both of them I extend my sincere thanks.

From a personal perspective I am fully committed to ongoing professional development, in essence, this is my third academic degree since 1993. I have developed this internal desire for greater knowledge, understanding and more importantly wisdom. This can be summed up succinctly using the words of Peter F Drucker, the Father of modern management. He concluded that knowledge has to be improved, challenged, and increased constantly, or it vanishes (*Chandler & Chandler, 2007*).

14.0 Key Deliverables

Key deliverables include:

1. A benched marked design standard for experiential learning and development material;

2. A newly developed unit workbook on the topic area of general risk assessment;
3. The development of experiential learning and development exercises;
4. Delivery of learning and development interventions that have underpinned the development of individual competence, thereby ensuring that Alpha Hydrocarbon can now supply product to the UK economy.

Appendices – Professional Development Portfolio

Professional Development Portfolio

Appendix One –

General Risk Assessment Workbook

**Vocational Qualification (VQ)
In
Hydrocarbon Process Plant
Operations**

**Unit 10 –
General Risk Assessment Workbook**

Training Aim

The Aim of the training module **Unit 10: General Risk Assessment** is to:

1. Introduce delegates to the Health and Safety Executive (HSE) 5 steps to risk assessment (INDG 163 (rev2)) in order that they acquire suitable skills and knowledge to enable them to undertake risk assessment(s) prior to any task(s) being undertaken.

Training Objectives

At the end of the training delegates will be able to:

1. Understand the requirement to undertake 'suitable and sufficient' risk assessment;
2. Define the terms hazard, risk, and risk assessment;
3. Identify a range of hydrocarbon related process hazards;
4. Decide who may be harmed by the hazards and how;
5. Evaluate the risks from the identified hazards;
6. Evaluate current workplace precautions;
7. Decide on new workplace precautions where appropriate;
8. Record the findings from a risk assessment;
9. Review the risk assessments and update where necessary.

Program

Stage 10 – General Risk Assessment is a programme designed to deliver an informative introduction to hazard, risk and risk assessment. Your development in the business will follow a plan, agreed with your manager, and may include further process operation training.

Introduction

In addition to demonstrating compliance with regulations and standards, risk assessment can be viewed as a structured and systematic approach which aids the consistency of the management decision making process, and in the cost effectiveness of the allocation of organisational resources.

Since 1992, risk assessment has become the cornerstone of all harmonised legislation and standards. In addition to this legal requirement, risk assessment is vital for two reasons. Firstly, the level of risk determines the priority which should be afforded to it. Secondly, it aids the selection of the most appropriate risk control measure, in line with the level of risk identified. However, it must be borne in mind that an attempt to eliminate risks at source must be the first and foremost consideration where possible.

Risk assessment can highlight systematically how hazards occur and provide a clearer understanding of their nature and consequence. Assessment techniques range from simple qualitative techniques, which determine a risk rating of high, medium or low, through to the more sophisticated quantitative techniques, where risk is defined in terms, such as, 1 in 10,000 per person per year. Techniques such as Failure Modes and Effects Analysis (FMEA), Hazard and Operability Studies (HAZOP) etc that can determine risks in quantitative terms, falls outside of the scope of this Unit 10 General Risk Assessment workbook, and will therefore form the basis of additional specific risk assessment training, where appropriate.

The Requirement to Undertake Risk Assessment

Regulation 3 of the Management of Health and Safety at Work Regulations (MHSWR's) 1999 requires organisations to assess the risks to workers and any others who may be affected by their work or business. This will enable them to identify the measures they need to take to comply with health and safety law.

The risk assessment process should identify how the risks arise and how they impact on those affected. This information is needed to make decisions on how to manage those risks, so that the decisions are made in an informed, rational, structured and systematic manner. Any corrective action must be proportionate to the risk identified.

A risk assessment will involve identifying the hazards present and evaluating the extent of the risks involved, taking into account existing precautions and their effectiveness.

The purpose of the risk assessment is to help the organisation to determine what measures should be taken to comply with duties imposed by relevant statutory provisions e.g. Health and Safety at Work etc Act 1974 and associated delegated regulations.

The term 'suitable and sufficient' is not defined within the MHSWR's; however, it has been defined within the Approved Code of Practice and Guidance (L21). In practice a suitable and sufficient risk assessment means the following:

- *The risk assessment should identify the risks arising from or in connection with work. The level of detail in a risk assessment should be proportionate to the risk. Once the risks are assessed and taken into consideration, insignificant risks can usually be ignored, as can risks arising from routine activities associated with life in general, unless the work activity compounds or significantly alters those risks. The level of risk arising from the work activity should determine the degree of sophistication of the risk assessment process.*

HSE's Five Steps to Risk Assessment (INDG 163 (rev) 2006)

In 2006 the Health and Safety Executive republished their Five Steps to Risk Assessment guidance, which concluded that “a risk assessment is an important step in protecting your workers and your business, as well as complying with the law”. It helps you focus on the risks that really matter in your workplace – the ones with the potential to cause real harm. In many instances, straightforward measures can readily control risks, for example ensuring spillages are cleaned up promptly so people do not slip, or cupboard drawers are kept closed to ensure people do not trip.

For most, that means simple, cheap and effective measures to ensure your most valuable asset, your workforce, is protected. The law does not expect you to eliminate all risk, but you are required to protect people as far as ‘reasonably practicable’. This is not the only way to do a risk assessment, there are other methods that work well, particularly for more complex risks and circumstances. However, we believe this method is the most straightforward for most organisations.

Five Steps to Risk Assessment Definitions

Risk Assessment is defined as:

- *A careful examination of what, in your work, could cause harm to people, so that you can weigh up whether you have taken enough precautions or should do more to prevent harm occurring. As part of a good neighbour policy it would be worthwhile us broadening the scope of the definition to read harm to people, damage to property and the environment and/or a combination of all three.*

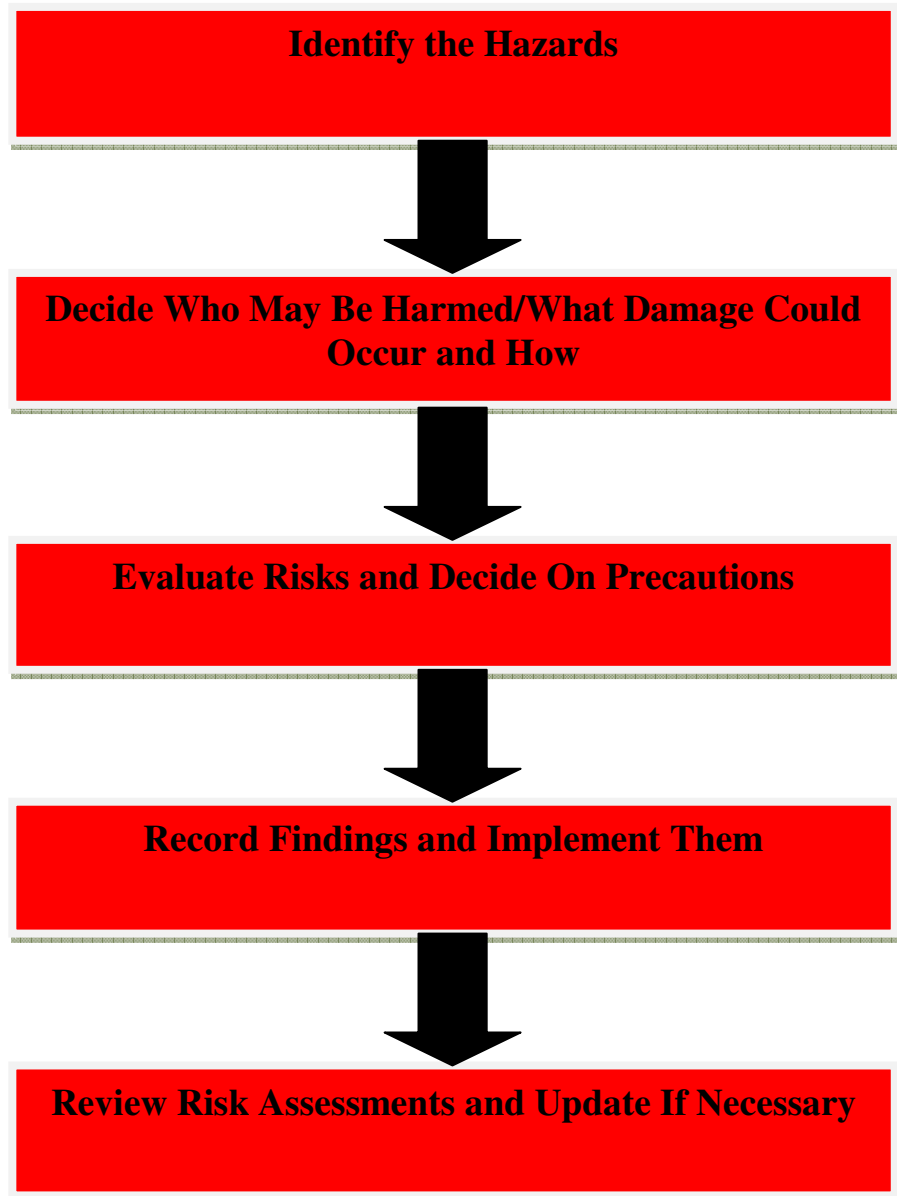
Hazard is defined as:

- *Anything that may cause harm.*

Risk is defined as:

- *The chance, high, medium or low, that somebody/something could be harmed/damaged by these and other hazards, together with an indication of how serious the harm/damage may be.*

Five Steps to Risk Assessment Requirements



Identify the Hazards

First you need to work out how harm/damage could occur. When you work in a place every day it is easy to overlook some hazards, so the HSE have put forward the following tips to help identify the ones that matter. Here are some examples:

- Walk around your workplace and look at what could reasonably be expected to cause harm/damage;
- Ask other employees or their representatives what they think. They may have noticed things that are not immediately obvious to you;
- Visit the HSE website (www.hse.gov.uk). The HSE publishes practical guidance on where hazards occur and how to control them. There is much information here on the hazards that might affect your business;
- Call the HSE Infoline (Tel: 0845 345 0055), who will identify publications that can help you;
- Check manufacturers' instructions or data sheets for chemicals and equipment as they can be very helpful in spelling out the hazards and putting them in their true perspective;
- Have a look back at your accident and ill-health records – these often help to identify the less obvious hazards;
- Remember to think about long-term hazards to health (for example, high levels of noise or exposure to harmful substances) as well as safety hazards;
- Contact your supervisor, manager or health and safety department for advice;
- Record your findings.

Candidate Activity 1:
Devise a Process Plant specific hazard checklist for use as an aide memoir, when undertaking a risk assessment.
You may find the following headings useful:

Mechanical Hazards	Hazard Description
Electrical Hazards	Hazard Description
Process Hazards	Hazard Description
Hazardous Substances	Hazard Description
Work Activity Hazards	Hazard Description
Work Environment	Hazard Description

Candidate Activity 2:

Using the hazard checklist, you have created, identify a range of hazards present:

Mechanical Hazards	Hazard Description
Electrical Hazards	Hazard Description
Process Hazards	Hazard Description
Hazardous Substances	Hazard Description
Work Activity Hazards	Hazard Description
Work Environment	Hazard Description

Decide Who May Be Harmed/What Damage Could Occur and How

For each hazard you need to be clear about who might be harmed/what damage may occur; it will help you identify the best way of managing the risk. That does not mean listing everyone/everything by name, but rather identifying groups (for example, people working in the warehouse, contractors, visitors, environmental pollution).

In each case, identify how they might be harmed/what damage may occur, i.e. what type of injury, ill health, damage may occur. For example, warehouse operators may suffer back injury from repeated lifting etc.

Remember:

- Some workers have particular requirements, for example, new and young workers, new or expectant mothers and people with disabilities may be at particular risk;
Extra thought will be needed to accommodate these groups;
- Visitors, contractors, maintenance workers etc, who may not be in the workplace all the time and are consequently unaware of day to day hazards;
- Members of the public, could they be affected by your activities?
- Record your findings.

From the hazards identified decide who may be harmed/what damage could occur and how:

Evaluate Risks and Decide on Precautions

Having identified the hazards, you then have to decide what to do about them. The law requires you to do everything based on the term 'reasonably practicable'. Compare what you are doing now with best practice solutions. Is the resulting risk high, medium or low?

So first, look at what you're already doing; think about what controls you have in place and how the work is organised. Then compare this with the good practice and see if there is more you should be doing to bring yourself up to standard. In asking yourself this, remember the **ERICPD** hierarchy, when controlling risks:

- **Eliminate (Priority Number 1);**
- **Reduce;**
- **Isolate;**
- **Control;**
- **Personal Protective Equipment;**
- **Discipline.**

Prior to implementing any of the above, a further risk assessment must be undertaken in order to evaluate whether any new hazard(s) have been created by the chosen ERICPD risk control measure. For example, if a hydrocarbon hazard is eliminated completely via the introduction of nitrogen purging, has an additional hazard been created?

In many instances, improving health and safety need not cost a lot. For instance, placing a mirror on a dangerous blind corner to help prevent vehicle accidents is a low-cost precaution considering the risks. Failure to take simple precautions can cost you a lot more if an accident occurs.

Involve staff, so that you can be sure that what you propose to do will work in practice, and will not introduce any new hazards.

Candidate Activity 4:**From the hazards identified, evaluate the risks and decide on the precautions:**

Hazard	Who May Be Harmed / What Damage Could Occur?	How?	Risk Rating: H, M or L	Precautions ERICPD

Record Findings and Implement Them

Putting the results of your risk assessment into practice will make a difference when looking after people and your business. Writing down the results of your risk assessment, and sharing them with others, encourages you to do this. When writing down your results, keep it simple.

The HSE do not expect a risk assessment to be perfect, but they must be suitable and sufficient. You need to be able to show that:

- A proper check was made;
- You asked who might be affected;
- You dealt with all the significant hazards, taking into account the number of people who could be involved;
- The precautions are reasonable, and the remaining risk is low; and you involved your staff or their representatives in the process etc.

If you find that there are quite a lot of improvements that you could make, big and small, don't try to do everything at once. Make a plan of action to deal with the most important things first. HSE Inspectors acknowledge the efforts of businesses that are clearly trying to make improvements.

A good plan of action often includes a mixture of different things such as:

- A few cheap or easy improvements that can be done quickly, perhaps as a temporary solutions until more reliable controls are in place;
- Long-term solutions to those risks most likely to cause accidents or ill health;
- Long-term solutions to those risks with the worst potential consequences;
- Arrangements for training employees;
- Regular checks to make sure that the control measures stay in place;
- Clear responsibilities – who will lead on what action, and by when.

Remember, prioritise and tackle the most important things first.

Candidate Activity 5: Record your risk assessment findings and indicate when these will be implemented:					
Hazard	Who May Be Harmed / What Damage Could Occur?	How?	Risk Rating: H, M or L	Precautions ERICPD	Implementation By When

Review Risk Assessments and Update If Necessary

Few workplaces stay the same. Sooner or later, you will bring in new equipment, substances and procedures that could lead to new hazards. It makes sense, therefore, to review what you are doing on an ongoing basis. Every year or so formally review where you are, to make sure you are still improving, or at least not sliding back.

Look at your risk assessment again. Have there been any changes? Are there improvements you still need to make? Have your workers spotted a problem? Have you learnt anything from accidents or near misses? Make sure your risk assessment stays up to date.

It is all too easy to forget about reviewing your risk assessment – until something has gone wrong and it's too late. Why not set a review date for this risk assessment now? Write it down and note it in your diary as an annual event.

During the year, if there is a significant change, don't wait. Check your risk assessment and, where necessary, amend it. If possible, it is best to think about the risk assessment when you're planning your change – that way you leave yourself more flexibility.

Candidate Activity 5:
Record your risk assessment findings and indicate when these will be implemented:

Hazard	Who May Be Harmed / What Damage Could Occur?	How?	Risk Rating: H, M or L	Precautions ERICPD	Implementation By When	Review Date

Appendices and Own Notes

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<p style="text-align: center;">Congratulations! You have successfully completed Stage 10: General Risk Assessment A 'Unit 10 Certificate' will now be issued.</p>		
Candidate	Name	Signature
Trainer	Name	Signature
Date		