Managing Value, Requirements and Risk in the Appraisal Stage of UK Construction Projects

Ehab Abduraheem A Mlybari

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Declaration

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract:

The construction industry in the United Kingdom has grown significantly and its ability to produce construction projects successfully has a significant impact on the whole economy's performance. This industry needs better performance and value for money improvement because of ineffective decision-making associated with the management of risks, uncertainties, and changes which are inherent in these projects, particularly at the early {appraisal} stage and its investment decisions.

Positioning this research within a wider body of international literature, including standards on managing projects, has made clear: the lack of VM, ReqM and RM approaches that address these methodologies comprehensively at different organisational levels; and the lack of a clear and proper linkage between these organisational levels.

This research clarifies the relationships between policy, strategy, portfolio, programme and project levels and their contribution within the appraisal stage of projects. It investigates the applications of value, requirements and risk management at different levels of an organisation; and subsequently develops an integration approach. This approach applies these methodologies together within investment decisions under uncertainty to appraise projects top-down and manage the organisational value chain through these organisational levels to successfully provide the right projects that align with corporate strategy, leading to improve performance and value for organisations in the construction industry.

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Abbreviations:

ACID	Authorise, Consult, Inform, Do
AIA	American Institute of Architects
APM	Association of Project Management
ARM	Active Risk Manager
AS/NZS	Australian/New Zealand Standard
BRE	Building Research Establishment
BSI	British Standards Institution
BSRIA	Building Services Research and Information Association
CFR	Code of Federal Regulations
CG	Corporate Governance
CIB	Chartered Institute of Building
CIRIA	Construction Industry Research and Information Association
CPM	critical path method
CSFs	Critical success factors
DEO{W}	Defence Estate Organization {Works}
DOORS	Dynamic Object Oriented Requirements System
eVM	Electronic value management
FA	Function analysis
FAST	Functional Analysis Systems Technique
FEMA	Federal Emergency Management Agency
FPM	Function priority matrix
FSD	Final sketch design
GEC	General Electric Company
GT	Grounded Theory
GVA	Gross value-added
HoC	House of Commons
ICE	Institution of Civil Engineers
IRM	Institute of Risk Management
IT	Information technology
IVM	Institute of Value Management
LCC	Life cycle costing
MPA	Major Projects Association
O&D	Orientation & Diagnostic
OGC	Office of Government Commerce
OPEX	Operating Expenditure

OPFAM	Office of Project and Fixed Asset Management
OSD	Outline sketch design
OVC	Organisational Value Chain
PBS	Product breakdown structure
PLC	Project life cycle
PM	Project management
PMI	Project Management Institute
POE	Post-occupancy evaluation
PPE	Post-project evaluation
PRINCE2	**PR**ojects **IN C**ontrolled **E**nvironments
PVC	Project Value Chain
REDReSS	Reorganisation, expansion, disposal, refurbishment, safety and security
RIBA	Royal Institute of British Architects
RM	Risk management
ReqM	Requirements management
SBU	Strategic business unit
SAVE	Society of American Value Engineers
SMART	Simple Multi-Attribute Rating Technique
SRS	Software Requirements Specification
SWOT	Strengths, weaknesses, opportunities, and threats
TAM	Total Asset Management
T/C/Q	Time/cost/quality
TF/EV/FA/AC	Technically feasible/economically viable/functionally acceptable/ Acceptable to the client
UK	United Kingdom
UM	Uncertainty management
USA	United State of America
VA	Value analysis
VE	Value engineering
VfM	Value for Money
VM	Value management
VMRs	Value management review
VP	Value planning
WBS	Work breakdown structure

1 CHAPTER ONE: INTRODUCTION:

1.1 Introduction:

This chapter gives an overview of the research. It includes: firstly, an illustration of the research context, a definition of the research problem and the need for this research; secondly, the research aim and objectives that are needed to achieve it; thirdly, the scope of the research; fourthly, the expected originality of the research and fifthly, a brief description of the research methodology that has been used to satisfy the specified objectives of the research. Finally, the breakdown of the chapters and the thesis structure are outlined.

1.2 Research Context, Problem and Need:

According to Bower (2003a p2), the construction industry involves different kinds of work. This is supported by a statement issued in the House of Commons (2008 p9) when it defines the construction sector as one that "*encompasses a range of different activities, covering the whole construction supply chain. It includes the mining, quarrying, production and sale of materials and products. It also covers construction contracting, be it house building, large-scale civil engineering, or repair and maintenance*". Furthermore, "*a whole range of professional services, including architectural, civil, structural, mechanical and electrical design, and project management are linked to construction, as well as allied services such as finance, IT and insurance*". The construction industry is a significant part of the economic development of any nation (Bower, 2003a p2). The UK construction industry is one of the three largest in Europe and generates 15.3% of revenue behind Germany's 16.5% share (Datamonitor, 2006 p3). It employs a minimum of 2.8 million people and is significant because of: its size, which in 2006 represents one twelfth of the UK economy's gross value-added {GVA}, which is at least double the combined GVA produced by energy, automotive and aerospace industries; its output {the built environment} which underpins most other economic activity, as well as contributing to the achievement of the Government's social and environmental goals. Moreover, its ability to produce successful projects in terms of cost, time and quality has a significant influence on the whole performance of the economy (HoC: House of Commons, 2008 p8; Male, 2008 p28).

However, with rapid advancement in the construction industry and due to its complexity, the nature of the business activities, process, environment, organisation, and involvement of several parties as well as many other uncontrollable external factors such as weather and inflation, risk is an inherent part of construction projects, as are uncertainties and changes and these projects have a bad records for coping with the negative influence of these issues. This can be seen as an inability to balance cost, time and quality (Akintoye and MacLeod, 1997 p31; El-Sayegh, 2007 p1; Haynes, 1996 p68; Hendrickson, 2000; Hiley and Paliokostas, 2001 pp1-3; Kapila and Hendrickson, 2001 p186; Merna, 2003 p109; Othman, 2005 pp23-24; Philips, 2002 p67; Smith, 2002a p100; Smith, 2003e

pp40-41; Smith et al., 2006 p1; Tah and Carr, 2000 p107; The Highways Agency, 1999 p5; Thevendran and Mawdesley, 2004 p131). Furthermore, the construction industry faces problems that are classed as: demand issues, supply issues, and some common issues such as poor management and an adversarial culture. However, there is a consensus that compared with other industrial sectors, the construction industry has been proven to produce low and unreliable returns because of low performance in terms of cost and time overrun and poor durability (Bower, 2003a p9). In 1997, The British Property Federations conducted a survey of major UK clients, which reveals that many clients are dissatisfied with contractors' performance in their work in cost and time limitations, in resolving defects, and in delivering the pre-identified level of quality for the project. In addition, they are also dissatisfied with consultants' work performance in co-ordinating teams, design and innovation, producing a fast and reliable service, and in providing better value for money (DTI: Department of Trade and Industry, 1998 p8). Nowadays, the construction sector is getting better at providing a quality product for the client, and the percentage of projects finished on time has increased, but there remains great room for improvement in delivering projects on time and within budget (HoC: House of Commons, 2008 p43).

Therefore, the balance between cost, time and quality should be considered in all management decisions (Dick, 2004 p4). In fact, a significant number of decisions made for managing projects are made under risk and uncertain conditions (Merna, 2003 p109). Moreover, the critical decisions which influence the economy, efficiency, timing, functional content, appearance and mainly the project value are made at the appraisal stage {early stage} (Smith et al., 2001 p122). Nevertheless, clients often face difficulties at this stage in making decisions and providing a good project strategy, not least a 'brief' (Latham, 1994 p13; Smith et al., 2001 p122).

As a result of these facts, it can be seen that the performance of the UK construction industry is still developing and needs more improvement. This could be done through improving decision-making, especially in the appraisal stage of the project under the greatest uncertainty (Wood and Ellis, 2003b p257). This is mainly because there is a strong link between improving investment decisions in the appraisal stage and good business performance as evidenced by Macmillan (2000 p2). Moreover, in order to deliver the right project at the right time within budget, there is a need to improve decision-making, particularly at the appraisal stage (Bower, 2002a p9; Smith and Bower, 2008 p7; Smith and Male, 2007 p2). Many projects are undertaken in a multi-project context and are managed through programme and portfolio structures (Blismas et al., 2004 p357; Payne, 1995 p163; Turner, 1993 p485, 2009 p323). Consequently, the appraisal stage and its decisions may start at organisation policy and strategy levels and continue to be managed throughout portfolio and programme levels until the front {early stage} of project particularly in large organisations (Kelly et al., 2004 pp159-163; Male, 2002a p13; Smith and Male, 2007 p2).

According to Macmillan (2000 p2), decision-making[1] has become an important research area in the last four decades with many published works. Nevertheless, most of them produce broad insights into this field with very few dealing with investment decisions particularly in complex business environments with great risk and uncertainty and large expenditure without return for many years. However, the appraisal stage and its decisions can be managed by managing value, risk and requirements as this is where requirements should be thought through cautiously and made clear and it is also the gestation period for establishing value and risk parameter as argued by Smith and Male (2007 pp1-4). Moreover, value, risk and requirements management help and contribute in decision-making (Alexander and Stevens, 2002 p1; BSI, 2000b p6; De Leeuw, 2001 p11; Godfrey, 1996 pp16-17; Hillson, 2002 p235; OGC, 2003h pp5-6, 2007j pp7-8; Smith and Male, 2007 p3; Smith et al., 2006 pp1-3; Soderholm, 2004 p512; Zwikael and Tilchin, 2007 p52).

Macmillan (2000 p5) argues that in reality each methodology which is used in decision-making has limitations, leading to limited knowledge gained from it by the decision taker. Thus, she emphasises the use of a combination of these methodologies to provide optimum insight for the decision maker and thereby encourage more informed decisions. Therefore, the integration of value management {VM}, requirements management {ReqM} and risk management {RM} would mainly provide a robust base for decision-making under uncertainty and manage the organisational value chain to improve performance and organisational value while providing other benefits.

1.3 The Research's Aim and Objectives:

According to the above argument, this research aims to:

Investigate the application of VM, ReqM and RM and their integration within the appraisal stage of UK construction projects at different organisational levels to enhance decision-making under uncertainty and manage the organisational value chain which improves performance and organisational value.

To achieve this aim, the research focuses on a number of objectives as follows:

O1: To review and investigate current construction projects and their appraisal stage including its upper organisational levels of policy, strategy, portfolio and programme to clarify their relationships, structuring, management, problems, and required skills for each level.

O2: To review and investigate VM, ReqM and RM to understand their application, timing, processes, participants, required skills to manage them, tools and techniques in UK construction as discrete disciplines.

O3: To capture and understand the linkages existing and potential between VM, ReqM and RM especially in the appraisal stage and at different organisational levels.

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[1] Decision-making is defined as: "*to make a choice or judgment about something, especially after considering all the possibilities or arguments"* {Longman Dictionary, 2003 p406}.

O4: To develop an approach for integrating these three methodologies within the appraisal stage at different organisational levels based on the literature and fieldwork data.

1.4 Scope of this Research:

The research focuses on the VM, ReqM and RM methodologies and their integration. It will concentrate on the appraisal stage of projects as it is very important stage which involves key investment decisions under great uncertainty. This stage is managed and its investment decisions are undertaken at different organisational levels of policy, strategy, portfolio, programme and project and thereby these levels will be also investigated within the scope. In this research, the fieldwork data will be collected within the UK only due to time and budget availability while the literature will be reviewed from the UK and compared with other countries where possible. Additionally, the research focuses theoretically and practically on the construction industry due its importance and problems while ReqM literature will be fed also from information technology sources due to the shortage of construction literature in this area. Moreover, the research concentrates on construction projects of small to large sizes {not major} as they can be undertaken by a single organisation and within its normal delivery which fit within the regular activity; day-to-day operations; or 'business as usual' of the organisation. In order to address companies' operating project structures: portfolio and programme implications and their impact on the use of ReqM, VM and RM will also be addressed. In this respect, the research targets those large scale client organisations that have portfolio, programme and project structures in place within the UK construction industry. Furthermore, the research fieldwork is conducted within the regulated private sector {which involve private organisations regulated and funded by government} as it is found to be the best choice to be targeted since it is structured and is a combination of the public and private sectors. Insights will be utilised from not only regulated organisations but also those large consultancy firms that deal with clients within that sector.

1.5 Original Contributions of this Research:

This research will make three main original contributions which are: firstly, it provides an understanding and clarification of construction projects and their appraisal stage including the linkages between policy, strategy, portfolio and programme levels as there is confusion in the literature and the field. Secondly, it provides an understanding of VM, ReqM and RM as discrete disciplines as well as identifying and understanding the linkages between them, particularly in the appraisal stage and at different organisational levels. Thirdly, it provides a comprehensive approach to integrate them within the appraisal stage at different organisational levels.

1.6 Outline of Research Methodology that is used in this Research:

In general, research follows several steps, which are mainly: research problem formulation; research design; sampling; collecting the data; analysis of the data; and finally the report writing. Figure 1.1

shows these steps in more details which guide the structure of this thesis and the logical order of its chapters as can be seen in the next section.

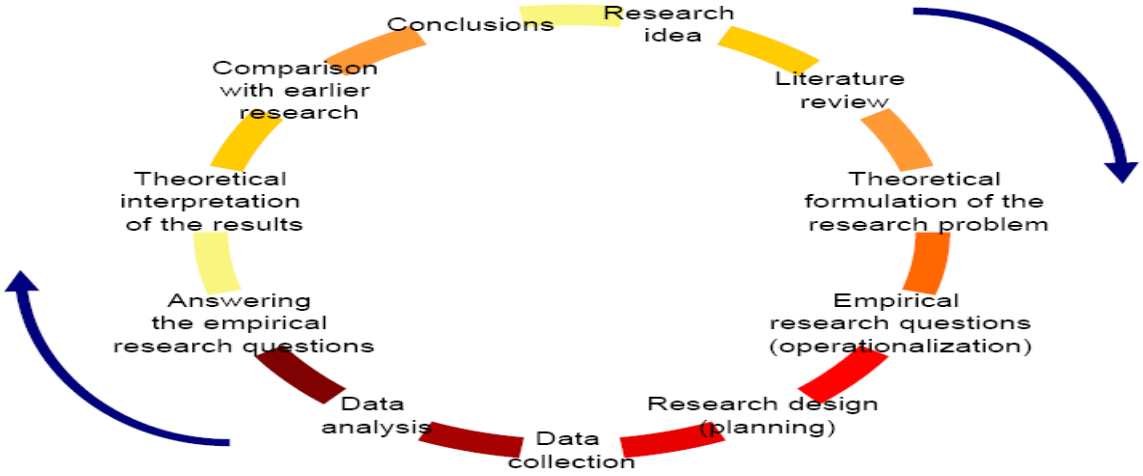

Figure 1.1: The research process {source: (Mamia, 2006 p15)}

Following the above stages, an extensive literature review was undertaken to conceptualise an approach for the integration, which was necessary to focus fieldwork on the main aspects that should be covered during the data collection; and to lead to the development of the research approach. Next, data was collected mainly using interviews and documents. This qualitative data was analysed, using the techniques traditionally associated with this type. The findings from clients, consultants and the IVM Seminar (2010) were compared and merged together into one overall interpretation and presented as a cross-case comparison in Chapter 8. These findings were then combined with the literature to develop the integrated approach for the appraisal stage at different organisational levels. The approach was developed and validated incrementally, besides ensuring quality of the case studies and trustworthiness of the research, contributed to achieving the overall validity of this research. Finally, conclusions and recommendations were drawn and the thesis was written up. Figure 1.2 gives brief information on the research methodology, which was used in this research.

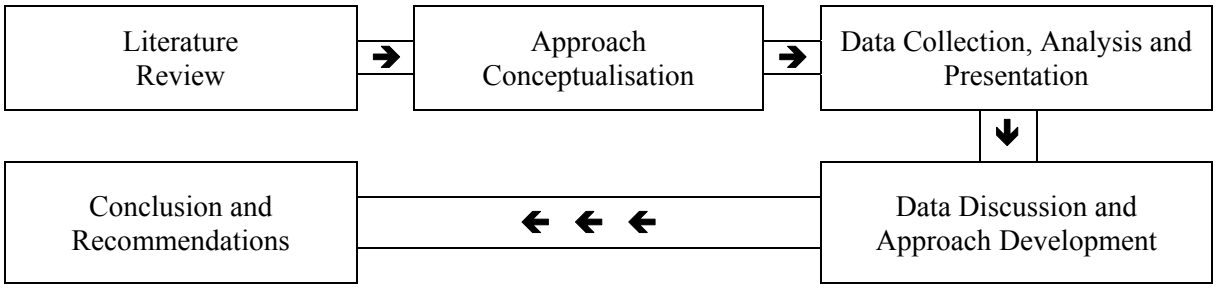

Figure 1.2: Research methodology outline {source: The Author}

The research has been conducted using a qualitative approach through a case study strategy with an exploratory and descriptive multiple-case {holistic} design. The rationale for this approach is the

complexity of the research problem, which calls for an in-depth holistic understanding within a real-life context and using informative, detailed data.

The small qualitative sample was selected on the basis of purposive sampling. This was aimed at including appropriate case studies which provided valuable data for investigating the regulated organisations' investment processes and the relationship between organisational levels as well as their applications of VM, RM, and ReqM within those levels. Three very large client organisations plus seven consultant ones were accessed successfully. 12 semi-structured interviews were conducted with expert and senior practitioners within each organisation and documents were provided by some interviewees. Furthermore, an Institute of Value Management {IVM} Seminar and focus group discussion (2010) was conducted on the research concept which provided feedback from nine expert practitioners.

1.7 Chapter Breakdown and Structure of this Thesis:

The thesis comprises the following chapters:

Chapter Two: Projects and their Management:

This chapter provides a critical review of projects, programme and portfolio structures, organisation strategy and their management within an organisation. The chapter highlights the relationships between these organisational levels and their contribution within the appraisal stage of projects. It refers to projects as being the result of the strategic management processes through a series of investment decisions undertaken within those levels. Moreover, it introduces the concept of the project value chain and how a project adds value for its organisation and contributes within its organisational value chain. Finally, it concludes with lessons to be considered in conceptualising the approach.

Chapter Three: Value Management:

This chapter provides a critical review of VM. The chapter identifies the VM CSFs, participants and skills required to undertake VM. It identifies the key VM intervention points at project level, the importance of using VM at the early stages and the ability to use VM at high levels. Additionally, it highlights the VM job plan within VM stages, identifying some common techniques to be used at the early stages. Finally, it concludes with lessons to be considered in conceptualising the approach.

Chapter Four: Requirements Management:

This chapter provides a critical review of ReqM. The chapter identifies the inputs, participants and skills required to undertake ReqM. It identifies ReqM as a continuous process over the project life cycle {PLC}, indicating the importance of its early application. Additionally, it highlights the common ReqM activities, identifying some common techniques to be used at each one. Finally, it concludes with lessons to be considered in conceptualising the approach.

Chapter Five: Risk Management:

This chapter provides a critical review of risk and its management. The chapter clarifies the term 'risk' and then identifies RM's CSFs, participants and skills required to undertake RM. It identifies RM as a continuous process over the PLC, indicating the importance of its early application and the need to use RM at all organisation levels. It also highlights the need to consider stakeholders and their requirements within the RM process at all stages. Additionally, it highlights the RM formal activities and stages, identifying some common techniques to be used at each. Finally, it concludes with lessons to be considered in conceptualising the approach.

Chapter Six: Synthesis and Approach Conceptualisation:

This chapter synthesises and brings the literature together. The chapter clarifies the relationship between organisational levels, organisational and project value chain, conceptualising a general organisation structure for that. It argues the possibilities for VM, ReqM and RM integration through capturing their linkages and identifying an appropriate logical sequence to integrate them. Then, it conceptualises a series of integrated studies. Moreover, it clarifies this studies' series through conceptualising a process diagram for these integrated studies. It identifies the current approaches for integration and uses them to conceptualise an integrated study approach.

Chapter Seven: Research Methodology:

This chapter consists of two parts. Part one is a general review of research methodologies including their features, strengths and weaknesses. It covers research approaches, strategies, data collection methods, and tests their suitability to achieve the research objectives. Whereas, the second part discusses the adopted methodology for this research with its justification.

Chapter Eight: Findings:

This chapter provides a presentation of the cross-case analysis for the collected fieldwork data from clients, consultants and the IVM Seminar (2010) as findings. Also, the lessons that have been learnt from these findings are extracted and summarised at the end of the chapter.

Chapter Nine: Discussion and Approach Development:

This chapter involves a discussion of the findings, comparing them with the literature that leads to the development and presentation of the research approach to integrate VM, RM, and ReqM within the appraisal stage at different organisational levels.

Chapter Ten: Conclusions and Recommendations:

This chapter draws the research conclusions and gives recommendations for further studies.

Figure 1.3 illustrates the structure of this thesis, indicating the logical sequences of its chapters.

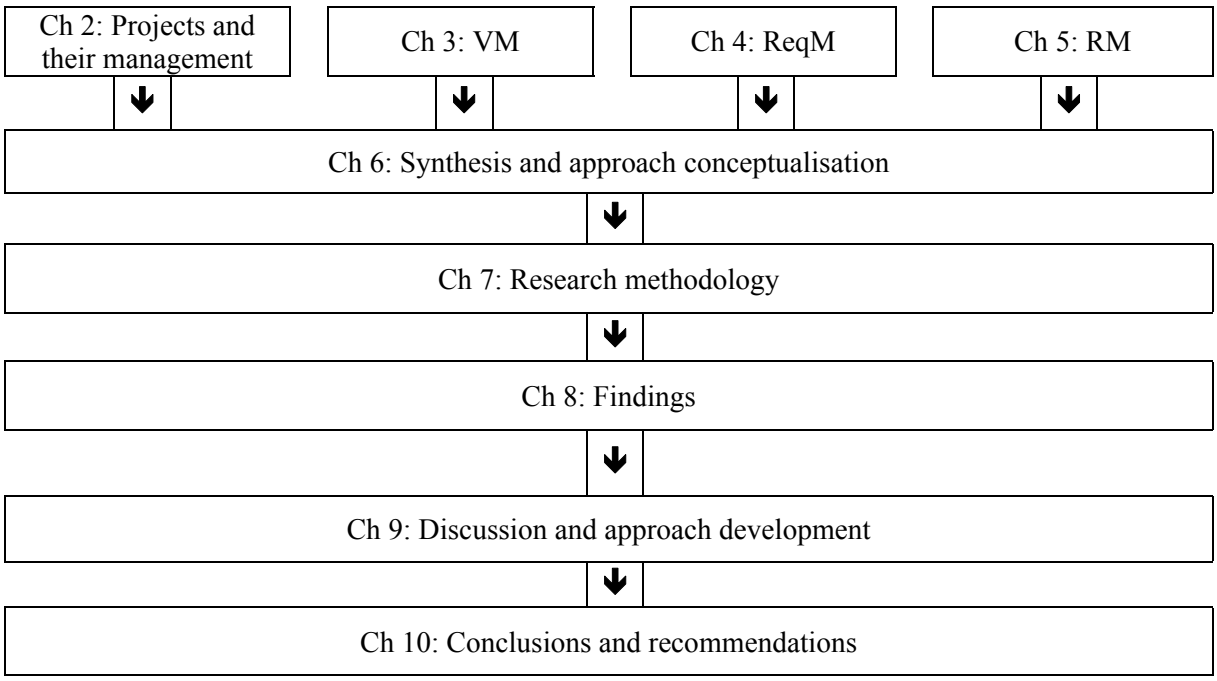

Figure 1.3: Thesis structure {source: The Author}

2 CHAPTER TWO: PROJECTS AND THEIR MANAGEMENT:

2.1 Introduction:

An individual project forms only a part of the whole investment for an organisation, and usually in its appraisal stage there are alternative projects which are competing for the available resources, based on their priorities. The progress of any one of those projects is referred to as the investment decisions by the parent organisation before it is allowed to proceed (Smith, 2002b p30, 2008a p35). Therefore, projects whether individual or as a group come from organisations' strategies as a result of a strategic management process and therefore, they have to be related to that process (Kelly et al., 2004 p159) which is clear in Figure 2.1. These indicate that projects should fit and contribute to the organisation's strategy to be approved. However, in many organisations today these investment decisions and strategic alignment processes are done through several levels to provide strategic changes from organisational strategy through portfolio and programme structures to the start of project, as shown in Figure 2.2. This figure shows the difference between strategic change and operational change throughout organisational levels and the relations between these levels.

This chapter defines and reviews organisational strategy, portfolios, programmes and projects and their management to clarify their meaning and relationships and how organisations create and manage their investments. The chapter starts by introducing strategies, their management and flow throughout other levels. Then, projects and their management are defined and reviewed as projects are the result of a strategic management process. After that, the chapter discusses the multi-project contexts and how strategy and project levels are currently linked via portfolio and programme in organisations. This leads to defining and reviewing portfolios and programmes and their management as well as clarifying their relationships. Furthermore, the project value chain is introduced as it links to organisational levels and clarifies how projects add value for their organisations.

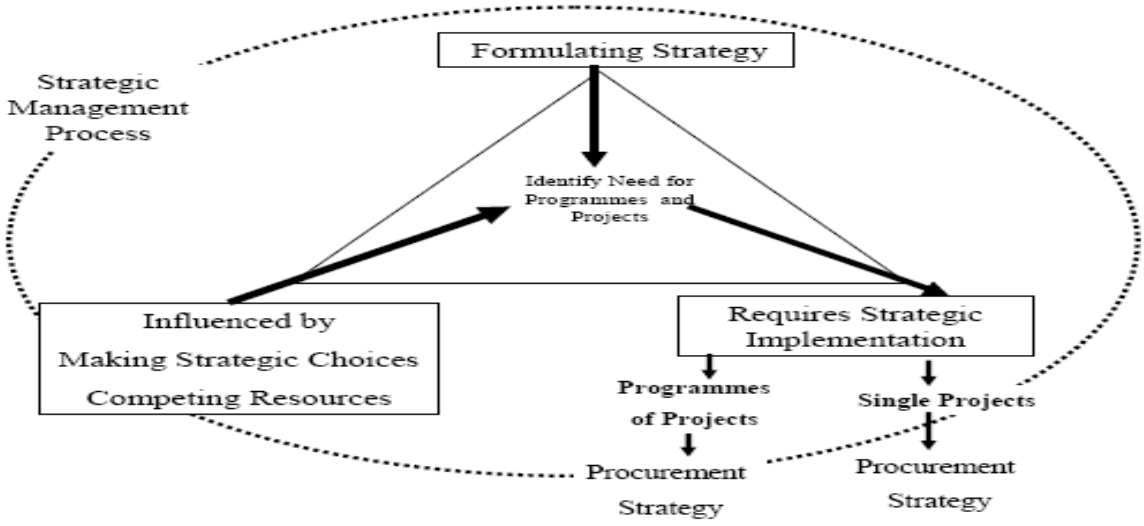

Figure 2.1: The strategic management process, programmes and projects {source: (Male, 2008 p41)}

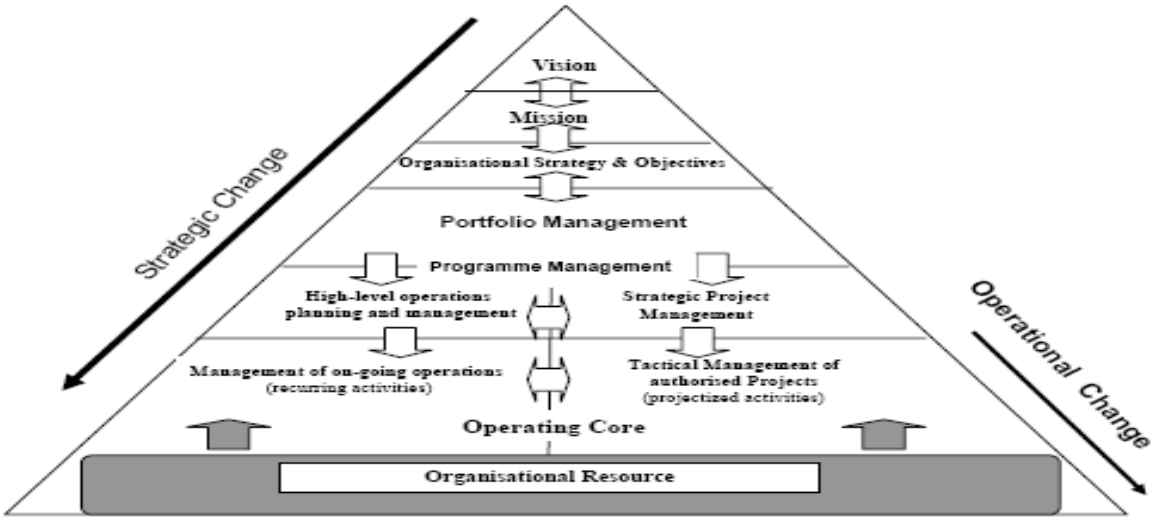

Figure 2.2: The organisational context of portfolio and programme management {source: (Male, 2008 p12)}

2.2 Strategy and its Management:

2.2.1 Strategy:

Using mission, vision and strategy is significant in most organisations today. Mission represents the cause of the organisation's existence {what it does and why}. Vision is the ideal situation of the organisation in the future (Naaranoja et al., 2007 p659).

However, there are diverse perspectives on strategy in the literature, which has led several authors to provide a number of definitions. Mintzberg (1987) tried to reconcile the diverse perspectives on strategy by providing the 5p's definition. First, plan, which is seen as a consciously intentional course of action. Second, ploy, which is a certain kind of plan and concentrates on the dynamic and competitive concepts of strategy. Third, pattern, which is seen as a consistency in behaviour. Fourth, position, which is seen as a means of locating an organisation in its environment. Fifth, perspective which is seen as intention and behaviour in a collective sense (Langford and Male, 2001 pp65-66; Moussa, 1999 pp115-116; Woodhead, 1999 p117). Strategy identifies the way in which to get to the ideal case that is provided in the vision (Naaranoja et al., 2007 p659).

2.2.2 Strategic Management Definition and Process:

In the context of this research, the following definition of strategic management was adopted as its concept was used within several key literatures.

> Defining of the future target and assigning resources to match this target through decisions and actions to formulate and execute strategies which will produce a competitively superior fit between the organisation and its environment in order to achieve its goal and deal with changing situations and the challenges of the business environment (Daft, 1991 p152; Graham and Male, 2003 p216; OGC, 2005g p10).

The strategic decisions are made according to the long-term directions of the organisation, and these are usually specified in terms of objectives (Langford and Male, 2001 p65). Projects are the result of a series of strategic decisions (Kelly et al., 2004 p159). Johnson and Scholes (2002 p16) stated that strategic management is concerned with taking strategic decisions about the major issues facing the organisation and ensuring that a strategy is put into action. Furthermore, strategic management is a process that answers questions such as what the organisation has to be doing and why, and where it should be going in the future and why (Daft, 1991 p152; Graham and Male, 2003 p215). Moreover, strategic management includes making choices and managing change (Graham and Male, 2003 p215).

Graham and Male (2003 p217) argued that strategy can be made simply through a strategic management process by following several steps: environment analysis; target planning; strategy planning {the means and how}; and strategy executing. Figure 2.3 shows a model of the strategic management process which accommodates these steps.

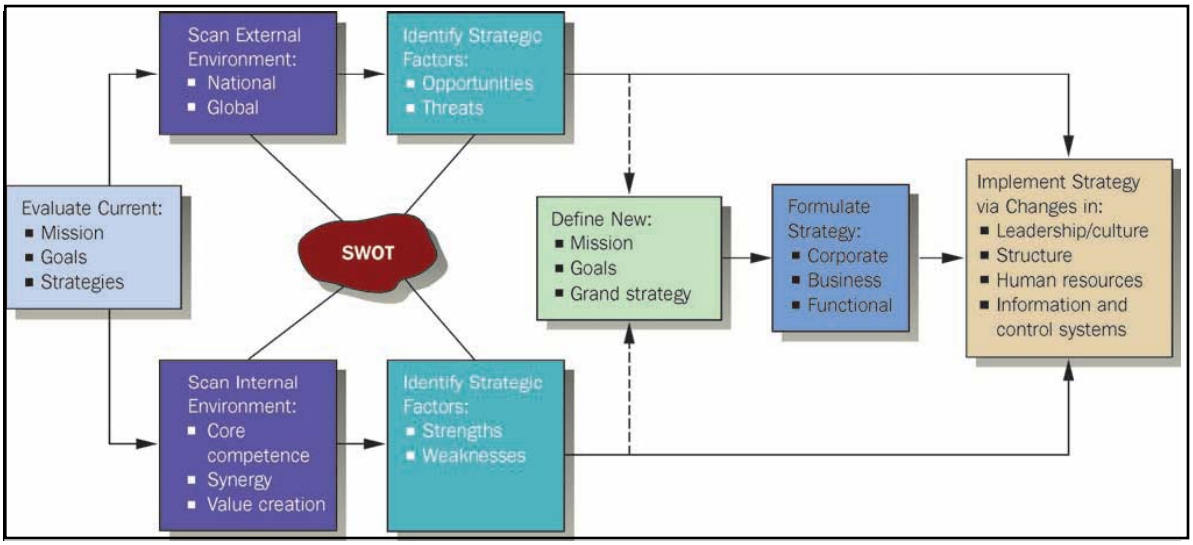

Figure 2.3: Strategic management process {source: (Daft, 2008 p246)}

2.2.3 Strategic Management Hierarchy:

Strategies exist at several levels in an organisation which form a hierarchy. There is a fair agreement on three levels of strategy which are corporate, business and functional strategies. (Daft, 1991 p154, 2008 p244; Ghobadian et al., 2007 p318; Hofer et al., 1984 p12; Johnson et al., 2008 p7; Kelly et al., 2004 p155; Langford and Male, 2001 p68; Quinn, 1996 p4).

Ghobadian et al.(2007 p318); Grant (1988 cited in Moussa, 1999 p117); and Hofer et al. (1984 pp12-17) add another forth level of strategy to be considered before the corporate one. Table 2.1 shows all these strategies as a four-level hierarchy. This four-level hierarchy is adopted here because it is evident in the theoretical and empirical publications in which managers and scholars usually discuss strategy in an organisation (Ghobadian et al., 2007 p318; Grant, 1988 cited by

Moussa, 1999 p117). Furthermore, it is linked with forms of organisation which distinguish between single and multi-market organisations in considering different levels of strategy.

Table 2.1: Strategy levels {source: (Grant, 1988 cited by Moussa, 1999 p117)}

Strategy levels	**Forms of Organisation**	
	Single-market organisation	Multi-market organisation
Collective or inter-institutional	Competitive coalitions and co-operative alliances	
Corporate	Integrated strategy	Portfolio and organisational issues
Business		Divisional positioning in industry sector
Functional	Departmental operations	Departmental operations

The top level includes collective strategic behaviour between organisations, institutions and governments that might be engaged in either collaborative or competitive actions (Astley, 1984 cited by Moussa, 1999 p117).

The corporate level unit in the organisation is responsible for comprehensive identification of objectives, executive choosing and resource assigning (Grant, 1988 cited by Moussa, 1999 p117). In large or multi-market firm, this strategy concerns portfolio strategy for its various activities, which pertains to the mix of the strategic business unit (Daft, 1991 p161; Langford and Male, 2001 p68; Lorange, 1980 cited by Moussa, 1999 p117). It identifies the organisation's market domain (Bourgeois, 1986 cited by Moussa, 1999 p117). In single-market organisation, such selections tend to be integrated with the business level selections, including the means of competition (Grant and King, 1992 cited by Moussa, 1999 p117).

The business level strategy is concerned with improving the competitive position of a firm's product or service in a certain industry or market segment (Wheelen and Hunger, 1984 cited by Moussa, 1999 p117). Large or multi-market firms usually set up strategic business units {SBU} which have the authority to take their own strategic decisions within the corporate guidelines which will cover a certain product, market, client or geographic area (Daft, 1991 p159; Langford and Male, 2001 p68). The SBU is derived from the corporate strategy and it is concerned with survival and raising value but it is concentrated on its particular market area, usually a programme of projects (Merna, 2003 p105).

The concentration of functional strategy is about supporting the business strategy and optimising the resources' productivity (Daft, 1991 p155; Hofer and Schendel, 1978 cited by Moussa, 1999 117). The major functional departments within large organisations include: Marketing; Production; Finance; Personnel; and Research and Development (Daft, 1991 p169, 2008 p257; Ghobadian et al., 2007 p318; Hofer et al., 1984 p17).

Furthermore, there is another level of strategy which is a project strategy and can be defined as a target in a project which leads it to success within the project environment (Artto et al., 2008 p8). Moreover, the project strategy contains several sub-strategic areas that need to be examined in detail by the client and therefore suitable decisions could be made as to which sub-strategy should be

adopted (Masterman, 2002 p7). In summary, strategies exist at all levels of an organisation which should be considered and managed.

2.2.4 Strategic Management Team {the Board}:

Organisations should be headed by Boards which are responsible for the success of the organisations (Knell, 2006 p63). This is the highest level of governance (Rathmell et al., 2004 p5; Turner, 2009 p367). Sometimes they have a different name such as board of directors, executive board or management board but is often simply referred to as 'the Board' (APM, 2006 p99; OGC, 2006d p4; Turner, 2009 p367).

The Board owns the organisation's strategies and objectives and sets corporate plans (OGC, 2006d p5). Moreover, they take an interest in the key projects carried out within the organisation (Turner, 2009 p367). Others roles and responsibilities can be found in Knell (2006 pp63-64) and Rathmell et al. (2004 p5). According to Rathmell et al. (2004 p5), the basic duty of the Board is corporate governance which is reviewed in the following section.

2.2.4.1 Corporate Governance {CG}:

Cadbury (1992 p2) defines CG as "*a system by which companies are directed and controlled*". This definition is common in the CG literature and has been adopted by several authors such as Hilb (2006 p9); Rathmell et al. (2004 p5) and Shaw (2003 p23).

The CG identifies the rights and responsibilities between different stakeholders in the organisation and specifies the procedures and rules for taking its corporate decisions. This also produces the structure to set and achieve objectives of the organisation and monitoring its performance (Shaw, 2003 p23). du Plessis et al. (2011 p17) found several evidences to argue that good CG can improve performance and value of the organisation and has long-term impact on them.

CG covers several issues which involve directors; remuneration; accountability and audits; and relations with shareholders (OGC, 2007x p3). These issues can be seen in Figure 2.4 as the main aspects of CG. The Figure shows the structure of CG, indicating its relation with internal control and risk management. The CG structure should ensure the strategic guidance of the organisation, the effective management by the Board and the Board's accountability to the organisation and its shareholders. In order to archive this, the Board should ensure the integrity of the organisation's accounting and financial reporting systems, including independent audit, and that the suitable internal control systems are in place (Lam, 2010 p13; OGC, 2007x p3; Rathmell et al., 2004 pp6-7).

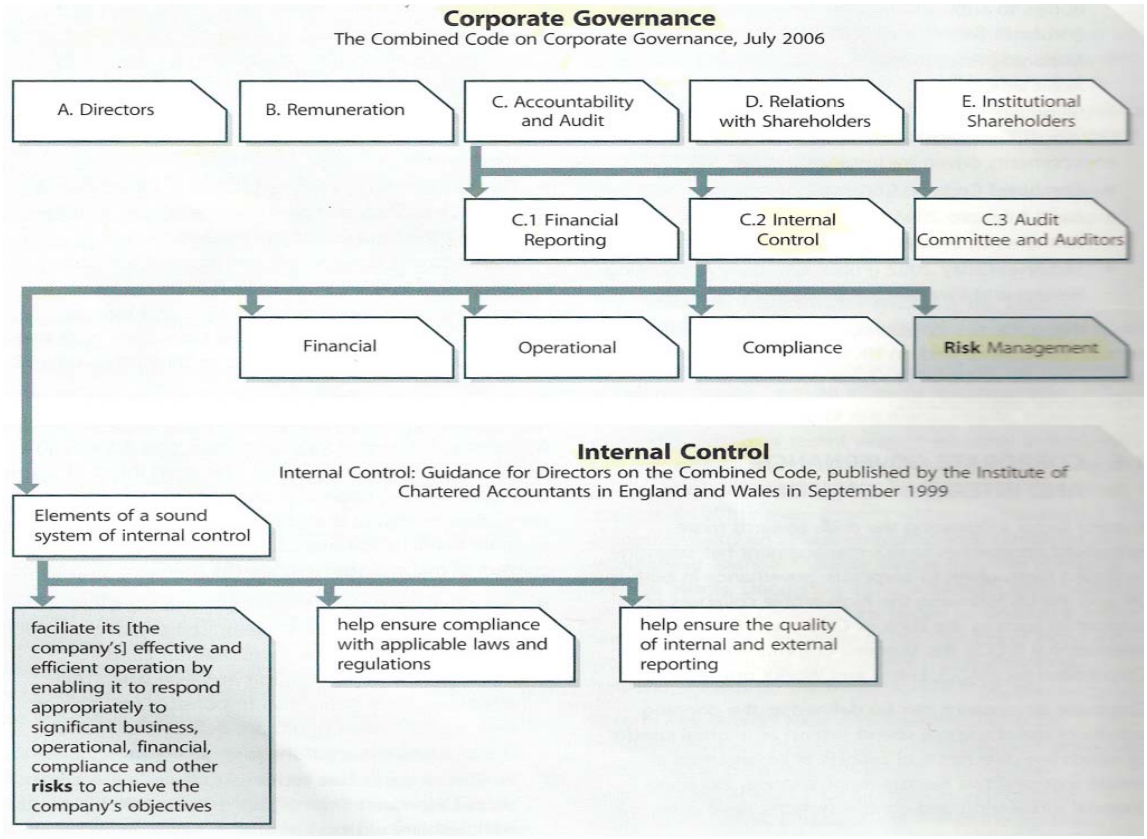

Figure 2.4: Corporate Governance and Internal Control {source: (OGC, 2007x p4)}

Having the strategy and its management discussed and identified, the next stage is to discuss projects, as they are a product of that.

2.3 Project and its Management:

2.3.1 Project Definitions and Features:

Different authors and institutes have different definitions for the term 'project'. However, some major institutions of project management defined project in the following ways: firstly, the PMI (2008 p5) defined a project as "*A temporary endeavour undertaken to create a unique product, service or result*". Secondly, the APM (2006 p2) defines project as "*unique, transient endeavours undertaken to achieve a desired outcome*". Thirdly, the BSI (2002 p2) define a project as "*A unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constraints of time, cost and resources*". This has been amended by the BSI (2006 p5) to be defined as an *"overall system and processes that will deliver a product"*.

From the above key definitions and according to the definitions that have also been provided by Borjeson (1976) cited by Kelly and Male (2001 p2); Gilbert (1983 p189); Morris and Hough (1987 p3); Turner (1993 p355, 2009 p2); Munns and Bjeirmi (1996 81); Oberlender (2000 p4); Kelly and Male (2001 p2); Merna (2003 p106); Cardinal and Marle (2006 p226); Turner (2006a p1); Kerzner

(2006) cited by Zwikael and Tilchin (2007 p51), there is no one agreed definition but all are similar. Therefore, as a combination, a project can be defined in this research as:

> A temporary unique investment of inputs/resources {information, people, material and finance} for outputs/return {profit, service, product or change} under the constraints of time, cost, and quality.

Regarding project features, there are several attempts by many authors to identify some main features of a project. These attempts can be found in Bower (2002a p3), PMI (2004 p5), Smith and Bower (2008 pp2-3), Turner (2006a p1), Turner and Speiser (1992 p196). However most of these features are extracted from the project's definitions. These features raise the difficulty of project delivery and implementation.

Having defined and characterised the project, the next section gives some examples of projects, shows their key types and which one was considered by this research.

2.3.2 Examples and Types of Projects:

Projects can be anything that people do and they touch all their lives, in working and social environments (Turner, 1993 p3, 2009 p2). In order to identify the suitable methods of effective project management, projects might be classified by various approaches (BSI, 2002 p47).

There are many examples of projects such as; developing a new product or service; effecting a change in structure in terms of staffing or style of an organisation; designing a new vehicle; constructing a new building or facility; running a campaign for political office; implementing a new business procedure or process (Bower, 2002a p2; Smith and Bower, 2008 pp1-2).

Turner (1993 pp482-483, 2009 p324) categorised projects by size as: small to medium projects, large projects and major projects. Regarding small to medium-sized projects, they are projects which can be undertaken by a single organisation and which share resources from a common pool. Large projects are those that can be still undertaken by a single organisation but warrant a dedicated resource for a considerable period of time. Major projects are those that are beyond the capability of a single organisation because no organisation has enough resource or capability to undertake them due to the significant mix of skills and/or risks within these types of projects. Therefore, the implementation of this type of project forces organisations {contractors and/or suppliers} to collaborate in a partnership or joint venture. Major projects are defined by Morris and Hough (1987 p14) as large, complex or difficult projects which need a special level of management and are very important for their organisations. They are high risk projects and are particularly demanding because of their size, complexity, schedule urgency, demand on available resources, or know how. The Major Projects Association {MPA} (2008 pvi) stated that these projects are "*inherently complex, long in gestation and often subject to scope change and expansion, political interest and external influences. With large and sophisticated management and corporate structures governing*

the oversight and outcomes, understanding the investor and project board requirements presents a major challenge for the project team".

However, this research focuses on construction projects of small to large sizes as they can be undertaken by a single organisation and within the normal delivery, as will be evident later.

Having identified examples and types of projects, the next section discusses the project objectives.

2.3.3 Project Objectives:

All projects have three primary objectives which are time, cost and quality (Bower, 2002a p10, 2003c p61; Grennberg, 1993 p68; Smith and Bower, 2008 p8). These objectives are explained as follows:

Time can be defined as *"a dimension that represents an opportunity to perform some useful activities such as adding to the wealth of an individual, a corporation or societies as a whole"* (Kelly and Male, 2001 p4). Time here refers to the project delivery duration (Grennberg, 1993 p68; Kelly and Male, 2001 p4).

Cost can be defined as *"the monetary amount paid for labour, plant, material, overheads and profit"* (Kelly and Male, 2001 p4). In the context of the project time above, the cost here refers to the capital cost or cost that is invested by the client (Grennberg, 1993 p68; Kelly and Male, 2001 p4). However, there is another cost that should be considered which is the operational cost that will be taken into account in the development stage of the project (Kelly and Male, 2001 p4). It is important to distinguish cost from price, as cost is the cost which is directly related to an element of work, containing direct overheads such as supervision, while price is the cost of an element of work, plus allowance for general overheads, insurance, taxes, finance and profit (Smith, 2002c p107, 2008b p115).

Quality can be defined as *"the degree to which the stated objectives, characteristics and/or attributes have been met"* (Kelly and Male, 2001 p4). It is the specification of the end product, the functions, the steadiness of the functions and the dues of the product (Grennberg, 1993 p68). It is used to make sure that the specified criteria of performance are achieved (Merna, 2008b p49; Merna, 2002b p45). However, it is hard to measure quality, which is related to an individual subjective evaluation (Kelly and Male, 2001 p4).

The client has to decide the relative significance of these primary objectives for the finished project. Normally, an enhancement in one can only be achieved at the cost of another (Bower, 2003c p61). They should be balanced according to client requirements using the time, cost, and quality triangle {see Figure B.2 in Appendix B} as it is most unlikely to meet all of them (Bower, 2002a p10; Smith and Bower, 2008 p8). However, many projects had time or cost over-run, or quality under-run because these objectives were not kept constantly in view by the manager. Nevertheless, projects have secondary objectives like: involving clients in management, producing jobs, early inclusion of

the contractor, use of capital and an early knowledge of real cost, whereas, the impact of these objectives should be minimised as they frequently conflict with the primary ones (Bower, 2003c p61).

In summary, identifying the above objectives of a project is very important and can be enhanced through methodologies like those discussed in the following chapters.

Having identified the project objectives, the next section presents the project's phases which are undertaken to achieve the objectives.

2.3.4 Project Life Cycle {PLC}:

A project is divided into different phases to produce better management control with suitable links to the progressing operation of the performing organisation. These phases are known as the project life cycle {PLC} which connects the project from start to finish, and they can also overlap (APM, 2006 p81; Bower, 2002a p4; PMI, 2008 p15; Smith and Bower, 2008 pp3-4). Each phase of the PLC has a predetermined purpose and scope of work. There is a decision point at the end of each phase where progress to date could be checked and next actions identified and this point is known as 'the gateway' (Smith et al., 2006 p15).

The PLC can range from 2 to 14 phases. The former was divided into product development and implementation while the latter has been developed by Royal Institute of British Architects {RIBA} as; pre-brief phase {a, b}; briefing phase {A, B}; concept design phase {C, D}; detailed design phase {E, F, G, H}; site operation {J, K, L, M} (Male et al., 1998a p12; Smith et al., 2006 p15).

The RIBA life cycle informed the development of a generic process protocol for the construction industry (Kagioglou et al., 1999a p4; Nelson et al., 1999 pp6-7). Such protocol uses experiences of manufacturing as a datum and maps the whole project process from the emerging of client's need through to operations and maintenance. The process protocol life cycle is divided into 10 phases which were classified into 4 broad stages of pre-project, pre-construction, construction and post-construction stages as seen in Figure 2.5 (Aouad et al., 1999 p1; Cooper et al., 1998 p6; Kagioglou et al., 1998 p4; Kagioglou et al., 1999a p4; Kagioglou et al., 2000 p148; Lee et al., 2000 p3; Nelson et al., 1999 p7). At the end of each phase, phase reviews are undertaken for reviewing the work done in the phase, approving movement to the next phase, and planning the resourcing and implementation of the next one. There is a need for 'conditional-go' decisions at phase gates, to include concurrency aspects. Phase gates are categorised as either soft or hard, with the 'soft gates' allowing the potential for concurrency in the process whilst making sure that the important decision points are respected, as illustrated in Figure 2.5 (Cooper et al., 1998 p3; Kagioglou et al., 2000 p147).

In any project, the process protocol categorises the participants into 'activity zones'. These zones are multi-functional and stand for structured sets of tasks and processes that direct and support the

work towards a common purpose {e.g. to produce a suitable design solution} (Cooper et al., 1998 p8; Kagioglou et al., 1998 p6; Kagioglou et al., 1999b p6; Wu et al., 2000 p6; Wu et al., 2001 p6). The specific project task and/or process implemented is used to determine participation of the 'zones' (Kagioglou et al., 1998 p6). The nine activity zones are shown in Figure 2.5.

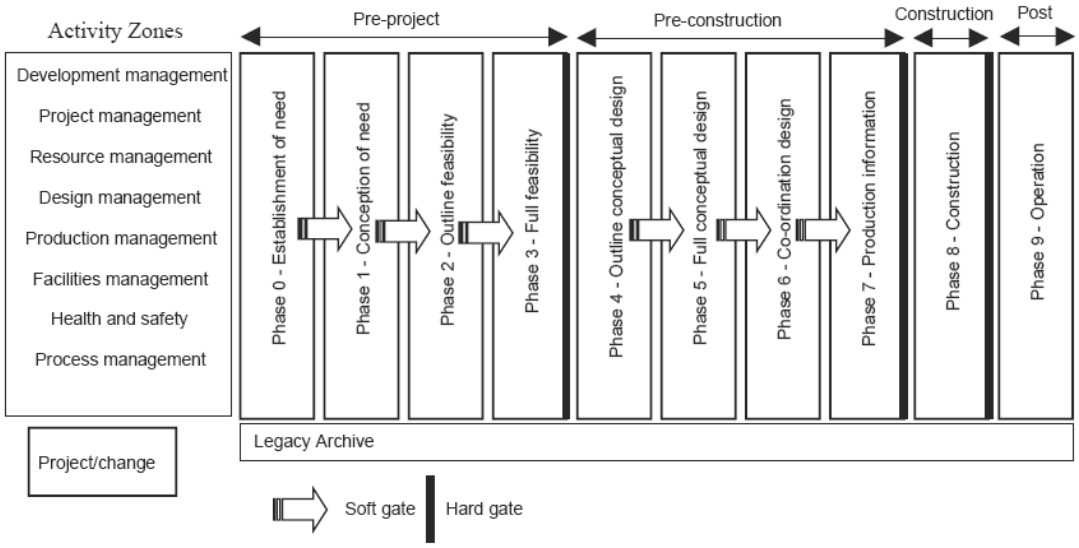

Figure 2.5: The process protocol elements {source: (Aouad et al., 1999 p5)}

However, different industries, business sectors, organisations, project managers and authors provide different terms for the project phases (APM, 2006 p80; BSI, 2002 p5; PMI, 2008 p15; Smith et al., 2006 p15). The BSI (2002 p5) states that all projects tend to have a similar life cycle. Graham (2000 p9) supports this fact when he concluded that there is no consensus on the PLC contents. Smith et al. (2006 p15) argue that accurate terminology is not significant and while there are differences in terminology, the essence in all situations is the same. Figure A.1 in Appendix A shows a comparison between the life cycles of different projects that have been found in the key literature which indicate their overlaps. Therefore, any phases can be chosen and the RIBA life cycle is adopted for this research This is because it is the most detailed life cycle that is provided by a professional institute for construction industry (Smith et al., 2006 p16); it can be linked easily with the most common VM intervention points {these are discussed in the next chapter}; it differentiates between pre-brief and briefing phases and this can be linked to requirements and its two key documents {user requirements document or strategic brief which is about understanding the stakeholders' needs and system requirements documents or project brief which is mainly focused on functional requirements and performance specification}.

In summary, there is no single right answer in naming the phases of the PLC and the RIBA life cycle is adopted for this research which is compared and linked with other life cycles as shown in Figure A.1.

2.3.4.1 The Important Stage in the PLC:

The expenditure rate fluctuates sharply as the project moves from early phases to the final phase. This means there is a significant expenditure before the benefits of using the finished project can be accrued to the promoter (Smith, 2002b p30, 2008a p35). The critical decisions which influence the economy, efficiency, timing, functional content, appearance and mainly the project value are made at the early stages {strategic stage}(Smith et al., 2001 p122). Clients often face difficulties at the early stages of the construction project in making decisions and providing a good project strategy, not least a 'brief' (Latham, 1994 p13). At the early stages, the greatest opportunity exists for affecting the project objectives and outputs as well as to reduce cost or add value to the project, and hence these stages are the most appropriate to explore options and make changes {see Figure 2.6} (Bower, 2002a p9; Smith and Bower, 2008 p7). It is evident from the above that the early stages are very important and should be given sufficient attention and resources to be undertaken conscientiously (Smith et al., 2001 p122).

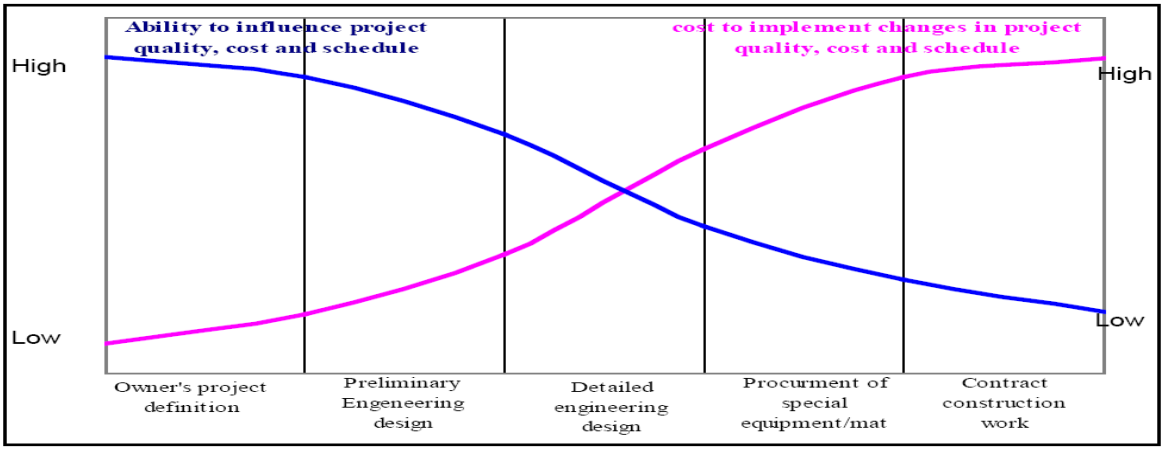

Figure 2.6: Importance of project definition during the early phases of a project {source: (Oberlender, 2000 p39)}

However, there are barriers to this such as the organisation's culture, especially in the construction sector where projects are essential as clients usually ask for a fast solution (Hunter, 2006 p66). Furthermore, the early stages are often fuzzy, messy, and ill-defined. The 'appraisal stage' represents these early stages, which extends from 'inception' to 'sanction'. Furthermore, it can be extended earlier to involve a pre-brief or pre-concept/inception stage with an obvious relationship with business strategy and investment decisions. Thus, it includes viability decision {linked to the investment decision as a business project and its right definition} and feasibility decision {linked to the most appropriate technical option as a technical project} (Smith, 2003b p8; Smith and Male, 2007 p2). This can be seen in Figure A.1 in Appendix A. Kelly et al (2004 pp162-163) argue the difficulties in identifying start and finish dates for this stage which can range from six months to three years. They differentiate between the start of a project and its strategic/appraisal stage as this stage may start at corporate strategic level and then be managed at other levels particularly for large organisations.

In summary, it is clear that more attention should be paid to the early stages of the project, which is the appraisal stage. Therefore, this research will concentrate on this stage.

Having discussed projects, their features, objectives and life cycle, the next stage is to review project management as its role is to set out a suitable mechanism for planning and controlling to deliver projects which effectively and efficiently achieve their objectives.

2.3.5 Project Management Definitions and Features:

The concept of 'management' is defined by Gilbert (1983 p189) as *"working with and through individuals and groups to accomplish organisational goals"*. Furthermore, Daft (1991 p5) defined it as "*The attainment of organisational goals in an effective and efficient manner through planning, organising, leading, and controlling organisational resources*".

However, in the same way as the definitions of a project, different authors and institutes have different definitions for project management. Ratcliffe (1985) cited by Graham (2000 p8) supported this view when he discovered over 20 definitions for project management. Oisen (1971) cited by Atkinson (1999 p337) references views from the 1950s which might have been one of the early definitions and defined project management as "*The application of a collection of tools and techniques {such as the critical path method and matrix organization} to direct the use of diverse resources toward the accomplishment of a unique, complex, one-time task within time, cost and quality constraints. Each task requires a particular mix of these tools and techniques structured to fit the task environment and life cycle {from conception to completion} of the task*".

Furthermore, some major institutions of project management {PM} defined it as the following: firstly, the PMI (2008 p6) defined PM as "*The application of knowledge, skills, tools and techniques to project activities to meet project requirements*". Secondly, the APM (2006 p2) defined PM as "*the process by which projects are defined, planned, monitored, controlled and delivered such that the agreed benefits are realised*". Thirdly, the BSI (2000a p2) defined PM as "*The planning, monitoring and control of all aspects of a project and the motivation of all those involved to achieve the project objectives on time and to cost, quality and performance*".

As so many definitions of project management exist, it may be considered that there is no need for a further one, but it is thought that a definition of it in the context of research will help to provide a deeper understanding of its nature (Graham, 2000 p9).

From the above definitions and according to the definitions that have been provided by Oberlender (2000 p8), Graham (2000 p8) and the OGC (2006d p5), PM can be defined as:

> The process of planning, organising, staffing, directing, controlling of resources {information, people, material and finance} as well as leading and motivating workers during the project life cycle to deliver a project that is fit for its purpose within time, cost, quality constraints for specific criteria.

From the above definitions of management and project management and according to Morris (1994) cited by Hunter (2006 p61), project management differs from other styles of management because it is applied through a predetermined life cycle. Furthermore, Turner (1993 p93, 2009 p65) argued that good project management has five principles: managing through a work breakdown structure; focusing on outcomes, i.e., what one wants to achieve, not the way of achieving it; balancing outcomes through the work breakdown, between areas of technology and people as well as systems and organisations; preparing an organised contract between all parties who are involved in the project by highlighting their roles, responsibilities and working relationships; adopting an obvious and simple structure for reporting. However, Graham (2000 p8) summarised the project management characteristics that he found in the literature as shown in Table 2.2. Although, this list seems to be comprehensive, it missed some key features such as managing risks which is an integral part of PM as discussed in Chapter 5.

Table 2.2: Summary of project management features {source: (Graham, 2000 p8)}

No.	Feature	Sources
1	It is a distinctive management style.	(Barnes, 1988; Gorog and Smith, 1999; Kelly, 1982; Kerzner, 1989; Marshall, 1991; Morris, 1982; Patzak, 1979; Ratcliffe, 1985; Saynisch, 1979 ; Silverman, 1976; Waterhouse, 1991 ; Woodward, 1991)
2	It involves planning.	(Hamilton, 1990; Munns and Bjeirmi, 1996; Ratcliffe, 1985)
3	It involves controlling.	(Hamilton, 1990; Middleton, 1967; Munns and Bjeirmi, 1996)
4	It is a process of co-ordination and integration.	(Ratcliffe, 1985; Saynisch, 1979)
5	It is change-orientated.	(Cooke-Davies, 1990; Leong, 1991)
6	It is simultaneously an art and a science.	(Moder, 1983)
7	It is an enabling mechanism.	(Cooke-Davies, 1990)
8	It is the opposite of functional management.	(Frankel, 1990)
9	It involves innovation.	(Cooke-Davies, 1990)
10	It involves organising.	(Hamilton, 1990)
11	It is goal-orientated.	(Hamilton, 1990)
12	It involves decision-making.	(Hutchenson, 1984)
13	It requires human resource management.	(Leong, 1991)
14	It involves accountability.	(Leong, 1991)
15	It involves procurement.	(Reid, 1995)

2.3.6 Project Management Activities:

Having identified a project and project management; highlighted their features and discussed the project objectives, it is important to know things that are managed in the project. Construction PM is concerned mainly with controlling its primary objectives within the project functionality context (Alalshikh, 2010 p53; Kelly and Male, 1993). However, these objectives and others issues should be managed in the projects as follows (Alalshikh, 2010 p53; Woodward, 1997):

- Time setting: identify a project timetable and how it will be implemented;
- Cost setting: what is the budget and how will it be managed?
- Quality setting: determination of standards and their observance;
- Scoping: what is the project and how is it defined?

- Procurement choosing: which kind of contractual and organisational route will be used?
- Planning and progressing: analyse the project and set a plan of action to therefore control its progress;
- Participants: individual managers and project teams;
- Risk: highlight risks, who carries them, and how can they be mitigated?
- Project success or failure;
- Facilities: the use and maintenance of capital assets.

Furthermore, from the PM definition, a project can be managed through the ongoing process of using six functions which are: firstly, planning, which is analysing and formulating the actions and the work to implement the project (Munns and Bjeirmi, 1996 p82; Oberlender, 2000 p10; The Chartered Institute of Building, 1991 p1; Turner, 1993 p20, 2006b p94, 2009 p24). Secondly, organising, which is assigning the required resources to do the planned work (Munns and Bjeirmi, 1996 p82; Oberlender, 2000 p10; Turner, 1993 p20, 2006b p94, 2009 p24). Thirdly, staffing, which is assigning the planned work to the appropriate people (Oberlender, 2000 p10; Turner, 1993 p20, 2006b p94, 2009 p24). Fourthly, directing, which is guiding the work to deliver a project by grouping people into an effective team (Oberlender, 2000 p10). Fifthly, leading, which is using power to motivate people to achieve objectives (Daft, 1991 p7; Gilbert, 1983 p189; Turner, 1993 p20). Sixthly, controlling, which is monitoring the work progress and correcting deviations from the plan (Daft, 1991 p9; Munns and Bjeirmi, 1996 p82; Turner, 1993 p20, 2006b p94, 2009 p24).

However, different authors have argued different activities within the PM process which can be found in Merna (2003 p108); Munns and Bjeirmi (1996 p82); Spring and Wearne (2003 p49); and PMI (2008 p6).

So, the above manageable things are managed through the PM activities but also can be enhanced by applying PM related methodologies like those discussed in the following chapters.

Having highlighted things to be managed and the functions to manage them in this section, the next section presents the benefits of doing that.

2.3.7 Project Management Advantages:

Over the past three decades, it has been recognised that PM is an effective technique for carrying out complex and novel tasks and activities (Munns and Bjeirmi, 1996 p81). Moreover, good PM can effectively manage change over the project life and help senior management to achieve the following: direct scarce resources to what are judged to be the most preferable objectives; concentrate suitable management skills on certain activities; secure commitments to provide outcomes from those wishing to proceed with the project; direct main business components without being submerged in detail; keep control of a large number of projects that are running in parallel; make sure that issues such as quality and safety are considered at the design stage of projects;

extend the experience of employees that are working on projects and help prepare them for more responsibilities; and identify and manage risks (BSI, 2002 p8).

However, PM is an effective tool for managing single projects which still needs improving and it will be of continual use in the future (Lycett et al., 2004 p289; Smith, 2002f p357,363, 2008d pp358-362).

Having reviewed the PM benefits, the next section reviews the key people that are involved in the project and its management.

2.3.8 People in Projects:

Some people deliver projects in order to satisfy other groups of people. Therefore, it is important to understand their roles, influence and responsibility for the project as follows:

2.3.8.1 Parties' Responsibilities for the Project:

There are several parties in any project such as client/owner, designer, contractor, sub-contractor, consultant, and supplier and so on.

The owner, designer and contractor are the main parties in a project and each one of them has a responsibility to achieve in the different phases of the project. Usually, a team approach between them should be established with a cooperative relationship in order to deliver the project in the most efficient way. However, too often an opposite relationship might be developed which does not satisfy the best interests of anyone. Therefore, the responsibilities of everyone should be clear: the role of the owner is to establish the operational criteria for the finished project as well as to highlight its objectives and constraints; the role of the designer is to produce design options, computations, drawings, and specifications which satisfy the owner's needs and wants; the role of the contractor is to perform all the work in accordance with the contract documents which have been provided by the designer (Oberlender, 2000 pp6-7).

It can be seen from the above that there are roles and responsibilities for each of the project parties that should be specified in the contract documents and referred to in case of any conflict or dispute.

2.3.8.2 Project Team:

De Leeuw (2001 p5) argued that the reason for the teamwork is that together everyone achieves more. Team is defined by Tancred and Tancred (1992 p36) as "*a group of people that can effectively take on any task which it has been set up to do*".

In a project context the task is the project itself and therefore, a project team is a group of people who collaborate to achieve the project goals and perform its activities under the project manager's supervision (BSI, 2006 p5; Haynes, 1996 p3; Huczynski and Buchanan, 2001 p384; Turner, 1993 p432, 2009 p85). The typical team of a construction project usually consists of the project manager, client, design team, consultant, contractor and subcontractors (The Chartered Institute of Building, 1996 p6).

2.3.8.3 Project Manager:

The project manager is the person who manages the project. He can come from any pertinent discipline (Ceran and Dorman, 1995 p67).

The standards used to evaluate the project manager can be summarised as quality management, project acquisition, work plan of the project, control of the project, financial objectives, change of orders, relationship with clients, sub-consultant management, partnering, closing the project, employee management, professional and social activities (Ceran and Dorman, 1995 p67).

The project manager has three general groups of roles and responsibilities which are: responsibility to the parent organisation, to the project, and to project team members (Merna, 2003 p106). However, Wrapp (1979 pp8-9) identified some roles as: producing a continually increasing stream of profits; instilling a sense of urgency; ensuring new product flow; getting staff to work together; and identifying and developing topflight employees. Turner (1993 p425) argued that the project manager is responsible for carrying out the management functions while Oberlender (2000 pp12-14) indicated that the project manager has a variety of roles within these functions.

In order to achieve his role in the most effective manner, the project manager should have several skills such as: keeping open many pipelines of information; focusing on a limited number of essential issues; providing a sense of direction with open-ended goals to the organisation; and spotting opportunities and relationships in the stream of operating decisions (Wrapp, 1967b p98, 1979 pp7-8). Other skills can be found in (BSI, 2006 p11; Daft, 1991 pp15-17; El-Sabaa, 2001 pp1-2; Goodwin, 1993 pp221-224; Turner, 1993 p427; Wrapp, 1967a pp1-16).

The project manager owns the project management plan which brings together all plans for a project and documents the outputs from the planning process and produces a reference document for managing the project. It ensures the agreement among the sponsor, project manager and other stakeholders (APM, 2006 p24).

2.3.8.4 Project Sponsor:

"Project sponsorship is an active senior management role, responsible for identifying the business need, problem or opportunity" (APM, 2006 p12).

Each project should have one sponsor who is a person or a group from the client or user department that champions the project, provides strategic leadership, leads the project during the selection process till formally approved, contributes significantly in developing initial scope, approves resources, authorises changes, and makes go/no-go decisions for gate reviews (APM, 2006 p12; PMI, 2008 p25; Turner, 2009 p314). Furthermore, he should solve issues beyond the project manager's control and identify and realise the benefits (APM, 2006 p12; Turner, 2009 p314).

In order to achieve his role in the most effective manner, the sponsor should be a business leader and decision maker; able to work across functional boundaries; advocate for the project; commit enough time, effort and support for the project and its manager; maintain a continuous dialogue

with the project manager and have enough PM experience to see whether the project is managed efficiently (APM, 2006 p12).

Whereas the above argument is developed for project sponsorship, it can be extended to a programme, as OGC (2006d p4, 2007y p36) positioned the sponsor over the programme level. Male (2008 p13) agrees with that and argued that the sponsor requires a 360 degree skills orientation requirement which includes vertical understanding of business requirements, together with an appreciation of technical delivery requirements and horizontal understanding of cultural, political and stakeholder management issues attached to the programme and project management. He also found that the right sponsor skills need wide experience to be developed.

The sponsor owns the business case which produces justification for carrying out a project/programme, in terms of assessing benefits, cost, and risk of different options and rationale for the most appropriate one. It aims to provide management commitment and investment approval in the project/programme. It should be updated during the life cycle of the project/programme (APM, 2006 p68; OGC, 2007y p105).

2.3.8.5 Stakeholders:

Stakeholders are those people who are external or internal to the organisation, who have any interest in the project and are influenced by, or who can influence the project (BSI, 2006 p5; Daft, 1991 p100; Healy, 2002 p176; Moodley, 2002a p127, 2008b p320; Olander, 2007 p279; Olander and Landin, 2005 p321).

Failure to recognise them is likely to create difficulties in planning, approval and execution. The success of the project depends on the primary stakeholders. However, even the secondary stakeholders may influence the project through policies, legislation and regulation. Primary {internal} stakeholders are those parties that have an immediate influence on or are influenced by the project, whereas secondary {external} stakeholders are those that are not directly related to the core of the project (Moodley, 2002a pp127-129, 2008b p320; Olander, 2007 p279).

Furthermore, other classes of stakeholders depend on the distribution of their attributes: dormant stakeholders own power to impose their wants, but do not have any legitimate relationship or urgent claim; discretionary stakeholders own the attribute of legitimacy, but they do not have power or an urgent claim; demanding stakeholders own an urgent claim, but do not have power or a legitimate relationship; dominant stakeholders are both powerful and legitimate; dangerous stakeholders lack legitimacy, but own power and urgency; dependent stakeholders have urgent and legitimate claims but do not have power; definitive stakeholders are those that own power, legitimacy and urgency (Mitchell et al., 1997 pp874-879; Olander, 2007 p279).

Construction projects affect stakeholders in two ways: the positive effect through better communication, better housing or higher standards of living; the negative effect by deterioration of

the physical environment. However, negative behaviour in the construction project by its stakeholders can obstruct its execution (Olander and Landin, 2005 p321).

It is necessary, therefore, to have an exhaustive listing of the stakeholders. This will enable the team to understand them and to design environments that meet their needs. This can be done through the stakeholders' management process for several reasons: to determine the way in which the stakeholders are likely to react to project decisions; to know what effect their reaction will carry; and to know how they might interact with each other and the project manager and professionals to affect the opportunity for project strategy success (Cleland, 1986 cited by Olander, 2007 p277).

Having reviewed strategy and its management as well as the individual project and its management, the next sections discuss how those two levels can be linked in an organisation. According to Turner (2009 p326), a project-based organisation has three levels of governance which are at: the Board level; the project level; and within the organisation's context linking the Board to projects which are portfolio and programme structures.

2.4 Multi-Projects and its Management:

Project management has been dominated by techniques such as work breakdown structure and a network diagram as well as a methodology such as PRINCE2 {**PR**ojects **IN** **C**ontrolled **E**nvironments} which is a process-based method for effective project management (Aritua et al., 2009 p72; PRINCE2.com, access on 23/3/2010). As these approaches are well suited to single project management, there is no surprise that the project and construction management literature is dominated by a single project paradigm (Aritua et al., 2009 p72; Blismas et al., 2004 p357). However, there are many organisations carrying out several projects at any given point in time (Blichfeldt and Eskerod, 2008 p357). Moreover, in practice, many projects in the industry are carried out in a multi-project environment (Blismas et al., 2004 p357). By value, it was estimated that a maximum of 90 percent of all projects are undertaken in a multi-project context (Payne, 1995 p163). Turner (1993 p485, 2009 p323) stated that by their definition, small to medium-sized projects occur in a special environment where there are many projects competing for resources from a common, limited resource pool and this is the case of multi-project management, whether in a programme or a portfolio.

Whereas, there are a large number of clients carrying out work within a multi-project context, the research on this area is still limited. Publications on multi-projects and programme management are generally limited to areas outside the construction industry, which leads to a lack of a comprehensive guide in managing construction multi-projects (Blismas et al., 2004 p358; Patanakul and Milosevic, 2009 p216). This lack of research in the area of construction multi-projects is mainly because of incorrect thinking that principles in a group of projects are the same as those in a single project (Blismas et al., 2004 p358). Managing multi-projects produces challenges that are significantly different from managing single projects (Aritua et al., 2009 p72). Blismas et al. (2004

p358) concluded a view from a number of researchers which is managing multi-projects and programme is not basically an accumulation of individual projects' efforts and therefore need unique approaches, tools and techniques. Also, they argued that many researchers confirm that scheduling and resource allocation is more complicated than that of individual projects. Furthermore, they found while there are sufficient differences among single and multi-projects to question the straight application of project management approaches, traditional individual project management approaches are usually adopted for managing programmes and portfolios which resulted only in limited success and therefore different techniques should be developed to deal with the additional issues and complexity of them. Aritua et al. (2009 p72) argued the need for new approaches, processes and techniques appropriate for multi-projects which needs a change in mind-set at the first stage.

The main managerial activity in multi-project environments is to dedicate resources across all these projects as well as management (Blichfeldt and Eskerod, 2008 p357). Platje et al. (1994 p100) argued that simultaneously, multi-projects are applied because of the rise in the project orientation of organisations. Gareis (1991 p71) distinguishes the need for multi-project management by arguing that the project network is an area requiring additional management attention. Furthermore, Zika-Viktorsson et al. (2006 p385) stated that this is the most effective manner for an organisation to use human resources by using scarce resources in many projects. Moreover, they argued that the feature of multi-project management is that many projects are carried out at the same time. In other words, projects are applied in parallel, sharing the same human stock and the same management system. Turner (1993 p496) identifies the requirement for effective management of the environment for multi-projects as: steps for prioritising projects in accordance with business objectives, obviously defining roles and responsibilities for establishing and reviewing the projects' priority, effective programme management systems, and effective project management information systems.

Over time some issues have emerged within multi-projects when they are carried out by organisations, which include issues that: there is a risk of a bad influence on efficiency and effectiveness because of the lack of coordination and comprehensive control; there is a confusion regarding responsibility for managing the multiple demands of staff; in some cases, a matrix structure organisation might diffuse authority, preventing the manager from carrying out their responsibilities (Lycett et al., 2004 p289) summarised from (Kerzner and Cleland, 1985; Senior, 1997; Van Der Merwe, 1997). These issues increase the need for a new management direction for project management which differs from that carried out in a single project context and commonly referred to as programme management (Lycett et al., 2004 p289). Turner and Speiser (1992 p196) indicated that most of the related small-to-medium sized projects {projects less than £30 million in value} are carried out within programmes.

Several terms such as multi-projects, portfolio, programme, macro-project, mega-project, super-project, meta-project and combinations of these terms are usually used to describe multi-project management; often interchangeably and synonymously providing the impression they have similar meanings (Aritua et al., 2009 p75; Ferns, 1991 p148; Gray, 1997 p5; Guerrero, 2006 p8; Martinsuo and Lehtonen, 2007 p56; Patanakul and Milosevic, 2009 p217; PMI, 2008 p7; Turner, 2009 pp323-324). Since definitions are often connected to mindsets and philosophies, such inconsistency has consequences for communication in practice and research (Aritua et al., 2009 p75). Because of different and usually interchangeable uses of common terms related to a project it is significant to identify how multi-projects, portfolio and programme are used in research (Blismas et al., 2004 p358). Therefore, these terms were reviewed and defined for this research in order to understand its context. For this research and following Male (2008 p53), the 'multi-project environment' term is used to indicate a number of generally separate projects which might be created and managed independently or grouped together and managed for ease of delivery.

In summary, traditional project management is not enough to manage in a multi-project context and therefore other management approaches are used for that, which are discussed in the following section.

Having multi-projects identified and discussed, the next section discusses programme and portfolio management and the difference and relationship between them.

2.5 Programme and Portfolio Management:

2.5.1 Project vs. Programme vs. Portfolio:

The literature indicates that there is a lack of clarity over the concepts and the priority among portfolio and programme (Male, 2008 p11). In most instances, there is a misunderstanding resulting in a mixed and overlapping use of terms as sometimes a project is called a programme and vice versa (Reiling, 2008 p1). Also, the term portfolio is sometimes used to indicate a programme and vice versa (Haughey, 2001 p6; Platje et al., 1994 p100; Reiling, 2008 p1). Like portfolios, programmes do not have a uniform homogeneous definition and the 'portfolio' term has been used for a while, throughout diverse sectors and within several and different organisations which indicate that it has a multiplicity of meanings (Aritua et al., 2009 p75). This is a field that has changed significantly since the last decade as people did not differentiate between portfolio and programme (Turner, 2009 p324). Rose (2006 p59) stated that programmes are not portfolios. However, in the context of this research, two different definitions for the two are used following and adopting key authors and PM bodies' approaches such as PMI, APM and OGC.

An approach to link between project, programme and portfolio is to think in terms of a pyramid hierarchy with portfolio at the top of the pyramid, then programme and then project (Reiling, 2008 p1). This view is similar to Male's (2008 p12) pyramid diagram {Figure 2.2}. Project and programme management should feed portfolio management with accurate, up-to-date information,

especially on status, including risks as well as arguing about their project or programme needs throughout the portfolio recourses allocation process (Morris et al., 2006 p469).

To clarify the relationship and differences between project, programme and portfolio, Figure 2.7 shows the relationship between project, programme and portfolio which indicate some crossover between them. Also, programme and portfolio are reviewed in some detail, as shown in the following two sections.

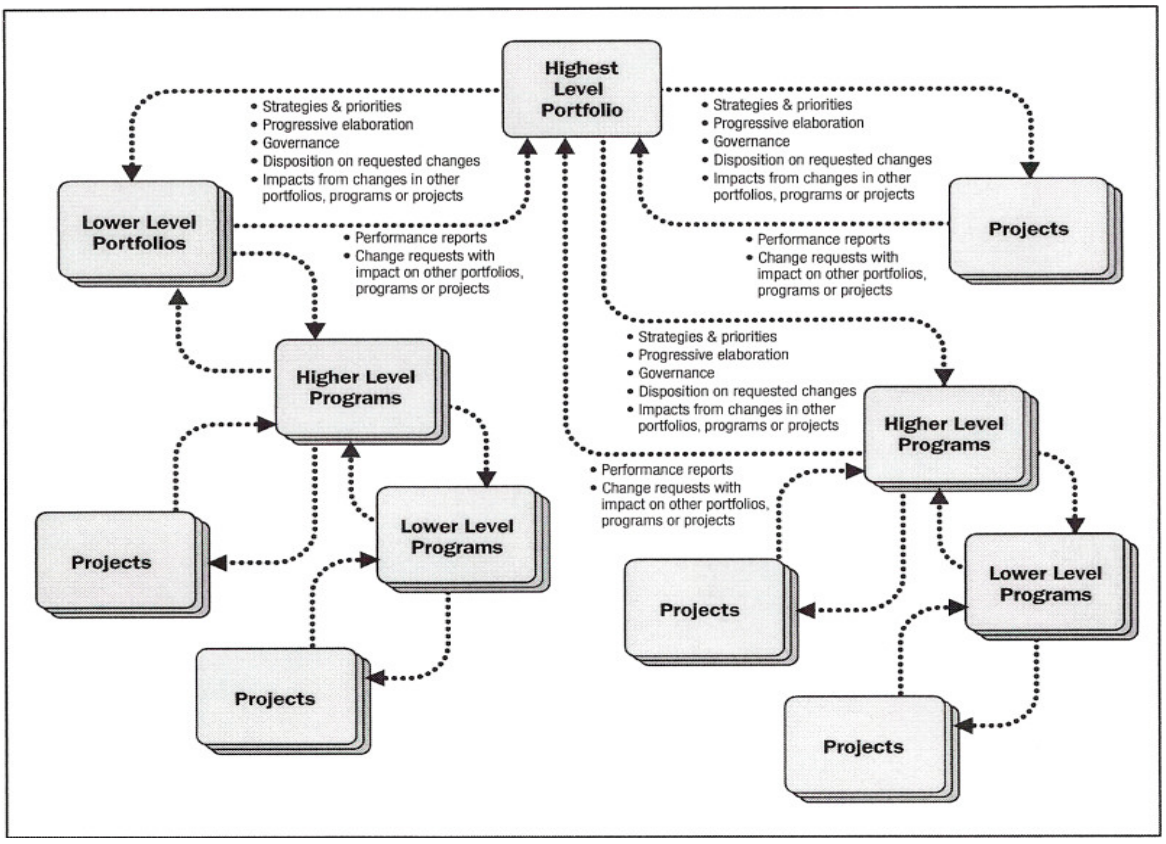

Figure 2.7: Portfolio, programme, and project interactions {source: (PMI, 2008 p8)}

2.5.2 Programmes and their Management:

2.5.2.1 Programme Definition:

In the project and business management context, the word 'programme or program {US spelling}' is rarely defined. It has no convenient definition and has several variances which include large {macro} projects, very long {more than two years}, groups of related projects, and all projects that are carried out by the organisation {multi-projects environment} (Ferns, 1991 p148; Graham and Male, 2003 p219; Male, 2008a p136; Thiry, 2002 p222).

All the above terms are commonly used especially in the last two decades, but the accurate definition could be inconsistent with the loose approach in which the terms are used and this loose definition of the programme has led to a lack of understanding of programme management advantages (Ferns, 1991 p148).

Therefore, in the context of this research, it is thought that the best way is to define a programme following most key authors and PM bodies such as PMI, APM and OGC:

> The grouping of related projects which may include related business-as-usual projects that contribute to a shared higher order objective to be managed together in a coordinated way to gain more benefits and provide better control that cannot be gained if the projects are managed separately (APM, 2006 pxv; Ferns, 1991 p149; Guerrero, 2006 p11; Haughey, 2001 p6; OGC, 2007y p4; Pellegrinelli, 1997 p142; PMI, 2008 p9; Turner, 1993 p355, 2009 p324; Turner and Speiser, 1992 p197).

Whereas empirical research indicates that organisations also apply programmes to generate projects, the creation of projects are not addressed within key definitions (Male, 2010 p25; Pellegrinelli, 1997 p141). Therefore, this should be investigated and added to the programme definition if proven. Programmes are designed to deliver a range of business objectives or business areas within an organisation and therefore, large organisations which have a variety of business areas might have several programmes (Ferns, 1991 p150).

2.5.2.2 Programme Management Definition and Advantages:

There is no unambiguous or universally accepted definition for programme management (Graham and Male, 2003 p220; Male, 2008a p136). However, in the context of this research, a programme management definition should also follow key authors and PM bodies to be aligned with the above definition of programme. Therefore, it can be defined as:

> The coordinated management of a group of related projects which may include related business-as-usual projects in order to provide more benefits and meet changing business needs (APM, 2006 p6; Ferns, 1991 p149; Graham and Male, 2003 p220; Guerrero, 2006 p12; Haughey, 2001 p6; Lycett et al., 2004 p289; OGC, 2006d p5, 2007y p4; PMI, 2008 p10; Turner, 1993 p355; Turner and Speiser, 1992 p197).

Programme management's key feature is the business sponsorship and therefore programmes are sponsored by business needs usually based on decisions made at portfolio management level (Reiling, 2008 p1).

Turner (1993 p356) stated that programme management can provide many benefits which include delivering more strategic objectives, increasing efficiency and reducing risk. Furthermore, Graham and Male (2003 p217) argued that programme management can provide information, not data, in supporting the core business of an organisation as well as ensuring that the strategic delivery of each project is consistent with that of the other projects and their own strategies. However, Lycett et al. (2004 p290) categorise the main goals of programme management as efficient and effective goals and business focus goals which are illustrated in Table 2.3 as follows:

Table 2.3: Programme management goals categories {source: (Lycett et al., 2004 p290)}

Goal	Description	Literature
Efficiency and effectiveness goals		
Improved co-ordination	Assist in identification and definition of project interdependencies and thereby reduce the incidence of work backlogs, rework and delays.	(OGC, 1999; Pellegrinelli, 1997)
Improved dependency management	Reduce the amount of re-engineering required due to inadequate management of the interfaces between projects.	(OGC, 1999; Pellegrinelli, 1997)
More effective resource utilisation	Improve the effectiveness and efficiency of the allocation of shared resources. Assist in providing justification for specialist resources that deliver an overall improvement to programme delivery and/or business operations.	(McElroy, 1996; OGC, 1999; Pellegrinelli, 1997)
More effective knowledge transfer	Provide a means to identify and improve upon transferable lessons. Facilitate organisational learning.	{Mentioned in Pellegrini and Bowman (1994) but otherwise not developed in the literature}
Greater senior management visibility	Enable senior management to better monitor, direct and control the implementation process.	(McElroy, 1996; OGC, 1999; Pellegrinelli, 1997)
Business focus goals		
More coherent communication	Improve communication of overall goals and direction both internally and externally to the programme. Target management attention clearly on the realisation of benefits that are defined and understood at the outset and achieved through the lifetime of the programme and beyond. Assist in keeping personal agendas in check.	(OGC, 1999; Pellegrinelli, 1997)
Improved project definition	Ensure that project definition is more systematic and objective, thereby reducing the prevalence of projects with a high risk of failure or obsolescence. Enable either the unbundling of activities in a strategic project-set into specific projects. Enable the bundling of related projects together to create greater leverage or achieve economies of scale.	(Grundy, 1998; Pellegrinelli, 1997)
Better alignment with business drivers, goals and strategy	Improve the linkage between the strategic direction of organisations and the management activities required to achieve these strategic objectives. Provide an enabling approach for the realisation of strategic change and the ongoing alignment of strategy and projects in response to a changing business environment {via project addition/culling, etc.}.	(McElroy, 1996; Pellegrinelli, 1997)

2.5.2.3 Programme Management Parts:

Three parts have been identified for programme management as: selecting projects; assigning priorities for resources; and coordinating those projects by managing their interfaces. The first two parts are the more significant and need an interaction with and knowledge of strategic management (Graham and Male, 2003 p220; Male, 2008a p137). However, the three parts are reviewed as follows:

Projects selection: In order to decrease the interfaces between programmes, organisations might categorise projects that share objectives, resources or types of skills, engineering or software technology, markets or products and contractors (Turner, 1993 p356). In addition, the selection criteria should include questions such as: Does the project gain benefits from an organisational strength? Does it avoid dependence on a known organisational weakness? Does it offer a chance to

take competitive advantage? Does it contribute to internal consistency? Does it present an acceptable level of risk? (Graham and Male, 2003 p223). However, techniques for making this selection are still in the development stage and the methodology highlighted in the next chapter can contribute in this process (Graham and Male, 2003 p223; Male, 2008a p139; Turner, 1993 p357).

Assigning priorities for resources: One of the most significant focuses when scheduling projects in a programme is the sharing of scarce resources between them. This is called 'capacity planning' and is done through six steps which are indicated in Turner (1993 pp358-359) and Turner and Speiser (1992 p197).

Interface coordinating: An interface can be defined as: a connection between work components in the work breakdown structure for more than one programme, project or sub-project (Turner, 1993 p357). This connection or link can be a common deliverable, with shared resources, shared information and shared technology (Turner, 1993 p357; Turner and Speiser, 1992 p197). The interface can be between one level in a WBS and the next, or between the same levels for different WBS in different projects (Turner, 1993 p357). The steps of managing an interface can be derived from its definition and can be found in Ferns (1991 p149); Turner (1993 p357); and Turner and Speiser (1992 p197). However, the key relationships in programme management are those between programme and project, projects within programme and individual projects, and the goals of the wider business as shown in Figure 2.8.

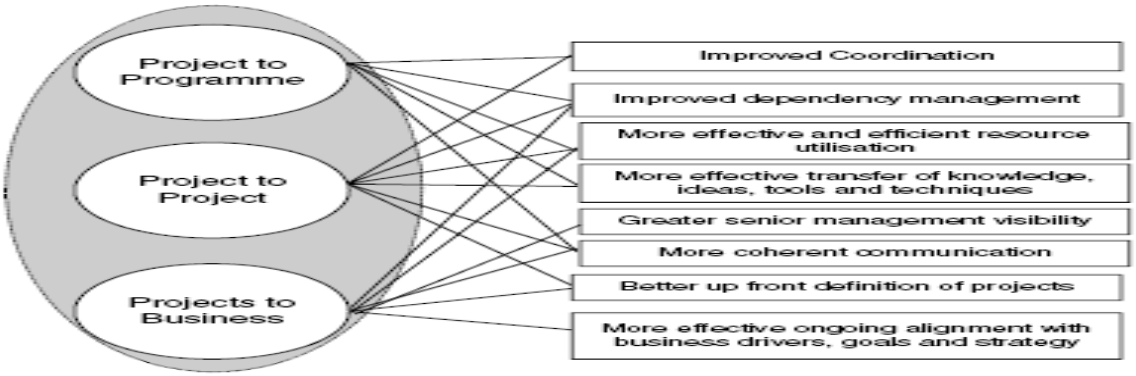

Figure 2.8: Programme management relationships {source: (Lycett et al., 2004 p296)}

2.5.2.4 Programme Management Activities and Life Cycle:

Several tasks have to be implemented at the programme management level. However, the most common that have been found in the literature are: setting the baseline; agreeing roles and responsibilities; planning; project prioritising; monitoring and controlling; configuration and change management; risk management; issue management; benefit management; stakeholders' management; quality management; progress reporting; and programme closure (APM, 2006 pp6-7; Haughey, 2001 p7; Lycett et al., 2004 pp292-293; Pellegrinelli, 1997 pp147-148; PMI, 2008 p10).

Lycett et al. (2004 p291) argued that the general stages in the programme life cycle for most approaches are programme identification {initiation}; programme planning {definition}; project delivery {execution}; programme renewal and programme closure {dissolution}.

This research focuses on the strategic stage and programme identification and planning are located at this stage and concern strategic issues. Programme identification defines "*the overall objective for the programme and positions the programme within the organisation's corporate mission, goals, strategies and other initiatives*" (OGC, 1999 p69); and the need for a new programme and the advantages which might be gained from its establishment (Pellegrinelli, 1997 p146). Whereas, programme planning is where the programme designing occurs (Haughey, 2001 p12). It is defining how the programme can add value (Pellegrinelli, 1997 p146). It covers the refinement of the vision and objectives of the programme, establishing the programme approach; and creation of the procedures and support structure needed to facilitate the programme management (Lycett et al., 2004 p292). Moreover, it includes assigning responsibilities; creating effective communication; prioritising projects; and finishing the planning of the project (Haughey, 2001 p12). However, details on the later stages of programme life cycle can be found in Haughey (2001 p12); Lycett et al. (2004 p292); and Pellegrinelli (1997 p146). All these stages are shown in Figure 2.9 which are ordered on a timeline.

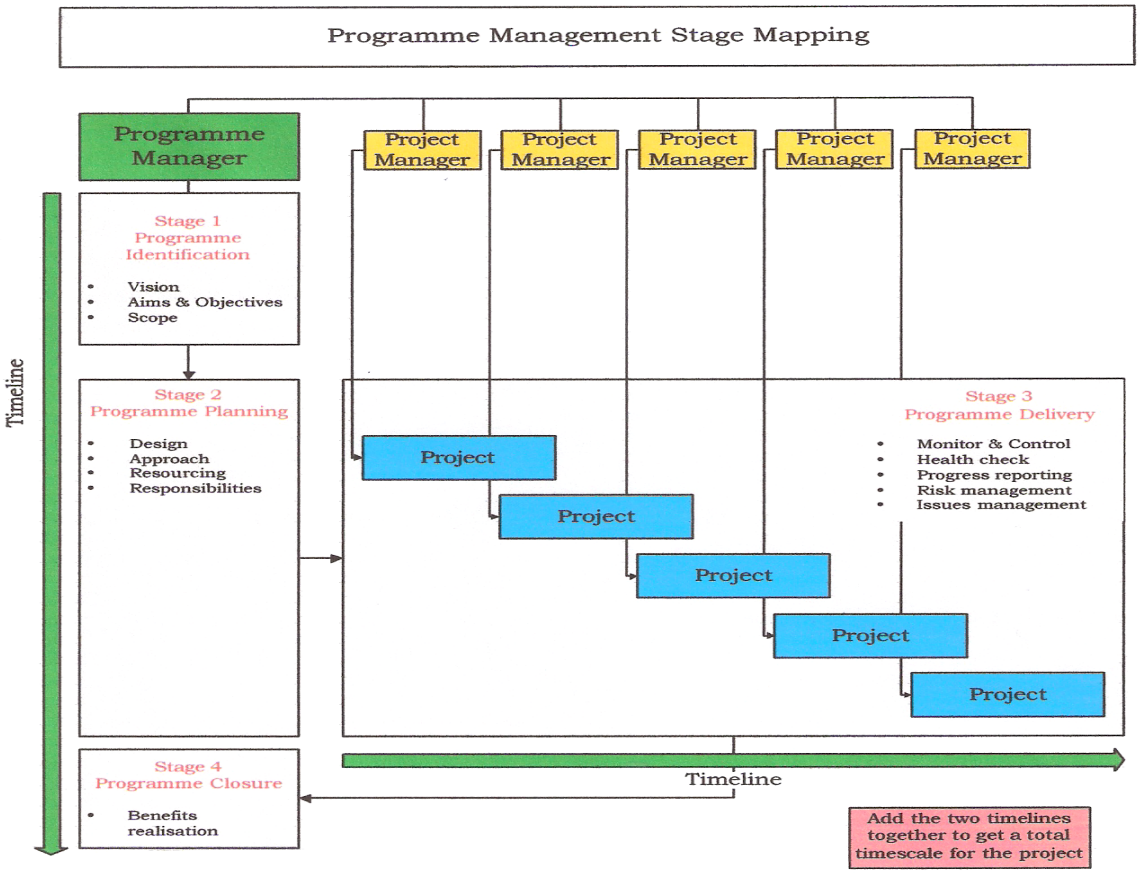

Figure 2.9: Programme management life cycle {source: (Haughey, 2001 p11)}

2.5.2.5 Programme Management Parties:

There are three different types of parties in programme management: project managers who are responsible for managing individual projects; department heads {resource managers} who are responsible for the most efficient and effective use of their resources over different projects; and programme managers who are responsible for the realisation of all programme objectives with the most efficient and effective use of a certain amount of available resources as well as providing support and guidance on individual projects by interacting with their managers. The first two parties collaborate to form the programme management team, which is led by the programme manager (Platje et al., 1994 pp101-102; PMI, 2008 p25). A list of the programme manager's responsibilities and key skills can be found in OGC (2007y pp31-32).

2.5.3 Portfolio and its Management:

2.5.3.1 Portfolio Definition:

Generally, the word 'portfolio' can be used in two ways in the project management field. Firstly, it could be a group of projects sharing common resources. Secondly, it could be the total investments of an organisation including all of its programmes and projects which can be referred to as investment/high level portfolio (Turner, 2009 p326). However, most authors and key PM bodies such as PMI, APM and OGC focus more on investment/high level portfolio which is the case in this research unless the fieldwork indicates otherwise. Therefore, portfolio has a more comprehensive meaning than a programme, which can be defined as:

> The collection of all programmes, projects and other work within an organisation which are categorised together and represent a comprehensive picture of the organisation's commitment of programme and project resources and investment (APM, 2006 p8; Guerrero, 2006 p33; Haughey, 2001 p6; OGC, 2004b p2, 2011 p11; PMI, 2008 p8).

Although, portfolio covers programmes and projects, the creation of programmes and major projects are not addressed within key definitions (Male, 2010 p25). Therefore, this should be investigated and added to the portfolio definition if proven.

2.5.3.2 Portfolio Management Definition and Advantages:

Portfolio management can be defined, also following key authors and PM bodies, as:

> The selection and management of an organisation's programmes, projects and other work in order to achieve the organisation's strategic objectives considering resources limitations (APM, 2006 p8; Guerrero, 2006 p34; Haughey, 2001 p7; OGC, 2004b p2, 2006d p5, 2011 p11; PMI, 2008 p9).

Portfolio management's key feature is a process that is obviously characterised by business leadership alignment (Reiling, 2008 p1).

Haughey (2001 p7) argued that portfolio management provides a comprehensive view of all projects and initiatives which take place across the organisation in order to allow a better

understanding of them, concentrate on what is significant, help avoid duplication, and inform strategic decision making. A list of portfolio management advantages can be found in OGC (2004b pp2-3, 2011 p13).

2.5.3.3 Portfolio Management Activities, Process and Key Stages:

At the portfolio management level, the concentration is on the organisation's direction as a whole, not just on individual programmes or projects and the tasks that are usually undertaken here are: checking strategic alignment; risk management; and progress reporting (Haughey, 2001 p7).

The portfolio management process and key stages are shown in Figure 2.10 and Figure 2.11 respectively.

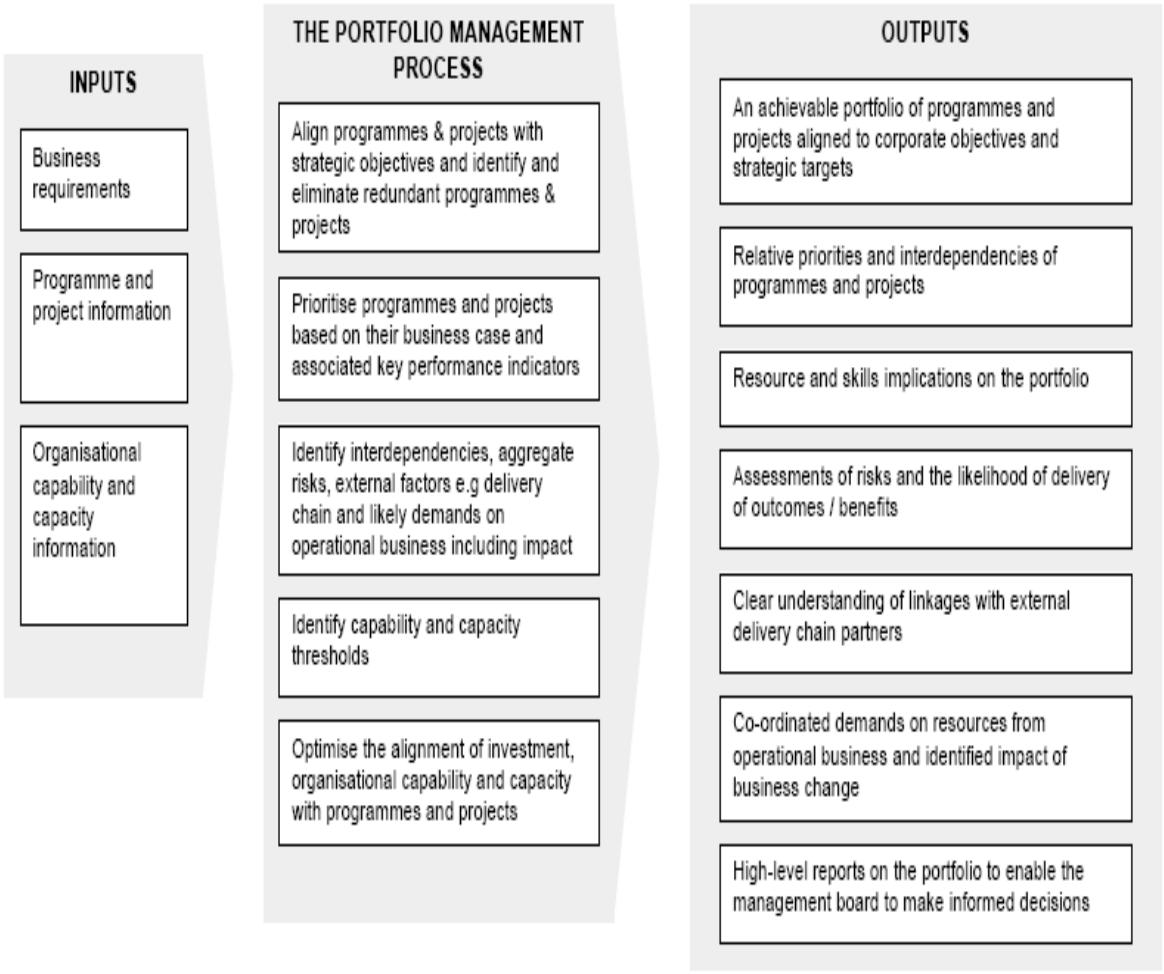

Figure 2.10: Portfolio management process {sources: (OGC, 2004b p4)}

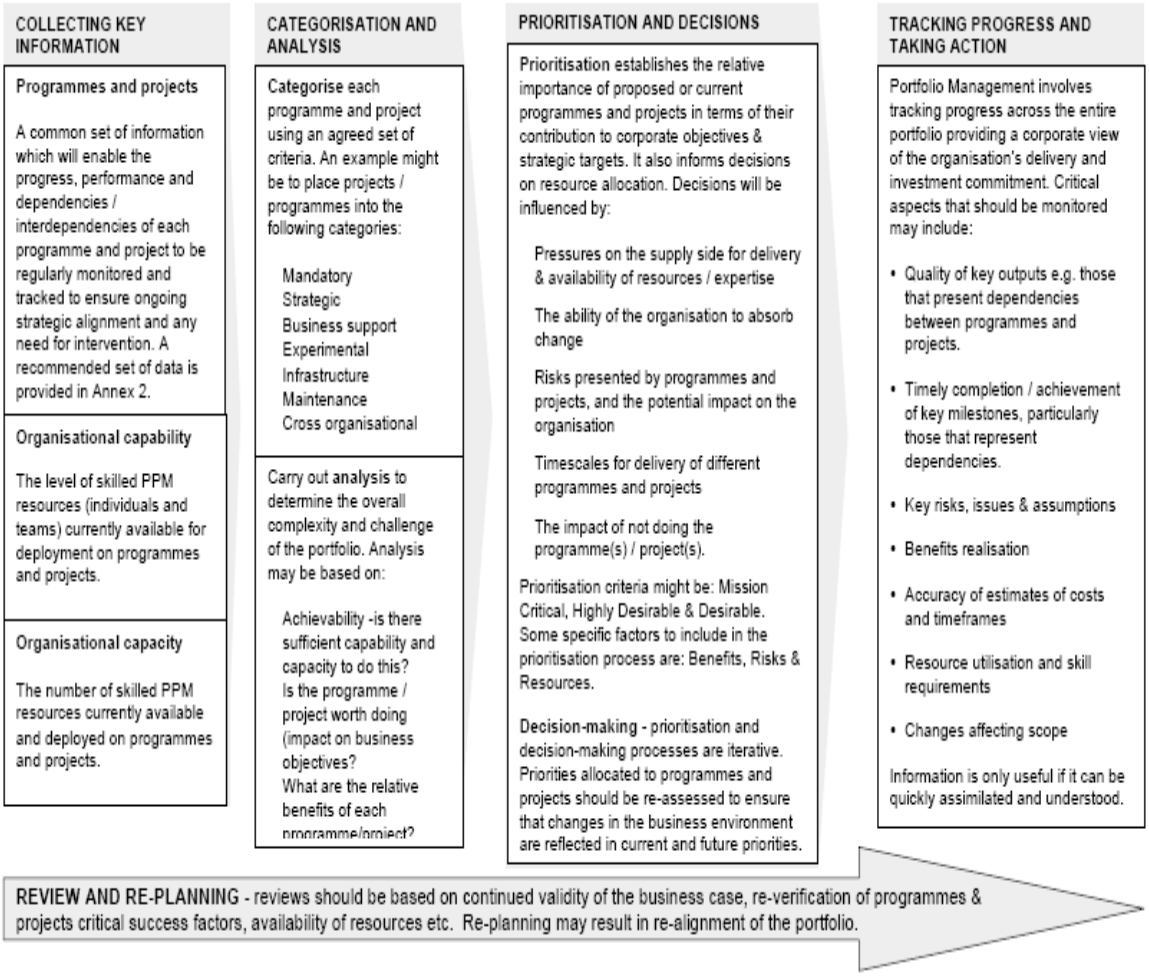

Figure 2.11: Portfolio management phases {source: (OGC, 2004b p6)}

2.5.3.4 Portfolio Management Parties:

Portfolio management is the responsibility of an organisation's senior managers or senior management teams (APM, 2006 p9; PMI, 2004 p17). The portfolio management staff may be managed or coordinated by the portfolio manager who is responsible for the high level governance of a portfolio (PMI, 2008 p25). A detailed list of his responsibilities can be found in OGC (2011 p102).

At this level, there is a need for more than PM skills scaled up as the portfolio manager needs all the generic leadership qualities. This includes: effective communication at executive level, align action to strategy, direct on major change, evaluate the effect of external factors and deal with risk and uncertainty (JISC InfoNet, access on 3/10/2011 p12; PMI, 2006 p12).

Table 2.4 indicates that projects, programmes and portfolios have different approaches by showing a comparison of project, programme and portfolio views across several criteria of scope, change, planning, management, success, monitoring. These criteria are used as they are considered domains by PMI (2008 p8).

Table 2.4: Comparative overview of project, programme, and portfolio management {source: (PMI, 2008 p9)}

	Projects	Programmes	Portfolios
Scope	Projects have defined objectives. Scope is progressively elaborated throughout the PLC.	Programmes have a larger scope and provide more significant benefits.	Portfolios have a business scope that changes with the strategic goals of the organisation.
Change	Project managers expect change and implement processes to keep change managed and controlled.	Programme managers must expect change from both inside and outside the programme and be prepared to manage it.	Portfolio managers continually monitor changes in the broad environment.
Planning	Project managers progressively elaborate high-level information into detailed plans throughout the PLC.	Programme managers develop the overall programme plan and create high-level plans to guide detailed planning at component level.	Portfolio managers create and maintain necessary processes and communication relative to the aggregate portfolio.
Management	Project managers manage the project team to meet the project objectives.	Programme managers manage the programme staff and the project managers; they provide vision and overall leadership.	Portfolio managers may manage or coordinate portfolio management staff.
Success	Success is measured by product and project quality, timescale, budget, compliance and degree of customer satisfaction.	Success is measured by the degree to which the programme satisfies the need and benefits for which it was undertaken.	Success is measured in terms of aggregate performance of portfolio components.
Monitoring	Project managers monitor and control the work of producing the product, services or results that the project was undertaken to produce.	Programme managers monitor the progress of programme components to ensure the overall goals, schedule, budget and benefits of the programme will be met.	Portfolio managers monitor aggregate performance and value indicators.

Having reviewed and identified organisational levels and their relationships, the next section reviews the value flow through these levels to deliver value for the organisation.

2.6 Project Value Chain {PVC}:

Projects can be aligned with their higher levels through ‘a value thread’ which is transmit, transfer and maintain value through different organisation levels to ensure achieving value for money as an outcome of the strategic management process for an organisation (Bell, 1994) cited by (Kelly et al., 2004 p159-160).

According to Kelly and Male (1993 p75) and Standing (1999 p122), the value chain derived by Porter (1985) illustrates the major activities which are undertaken within an organisation, contributing to the transformation of inputs into outputs and creating value for the customer. Whereas, a project value chain {PVC} is a series of inputs and outputs forming value, aligned to the client (Bell, 1994, cited by Standing, 1999 p122). It is a series of value-adding activities that have their own origins and appear from the client’s business need (Male, 2003 p198).

The PVC consists of three major value systems: client value system; multi-value system; and the user multi systems which are considered as the strategic phase, tactical phase and operational phase

respectively. These systems consist of seven value transitions, namely: corporate; business; feasibility; design; construction; commissioning; and operational value which are interrelated to ensure a good flow of information and value thread within project development. Each value transition should add value until the complete project forms an asset for the organisation to meet a corporate need. The outcomes of the strategic phase help to decide whether to construct the project or not. If it is to build, it is important to ensure that the client value system is defined clearly in this stage (Standing, 1999 pp122-162). The transferring of the work flow from one transition to another should be done efficiently and smoothly without delays or deficiencies in order to conserve value (Gray, 1996 p47; Standing, 1999 p162).

The PVC is detailed in Figure 2.12, which may consist of the programme network, where applicable, and/or the individual project with value transition points of: corporate value - identifies the value requirements which exist at corporate level within a diverse organisational structure; business value - identifies the value requirements which exist within a business unit as part of a corporation or as a single business entity; feasibility value; design value; construction value; commissioning value; and operation value occur within the project phases (Kelly et al., 2004 p162; Male, 2002a p21; Standing, 1999 pp158-169).

The PVC forms a part of the organisational value chain {OVC} as the latter highlights the value flow in an organisation from its corporate value at corporate level to use value at project level (Kelly et al., 2004 pp175-177; Male, 2002b p275, 2008b p266). Also, because the project activities are superimposed on the organisation's usual operating activities and this concludes that the project adds value to the organisation through its phases (Male, 2002b p275, 2008b p266).

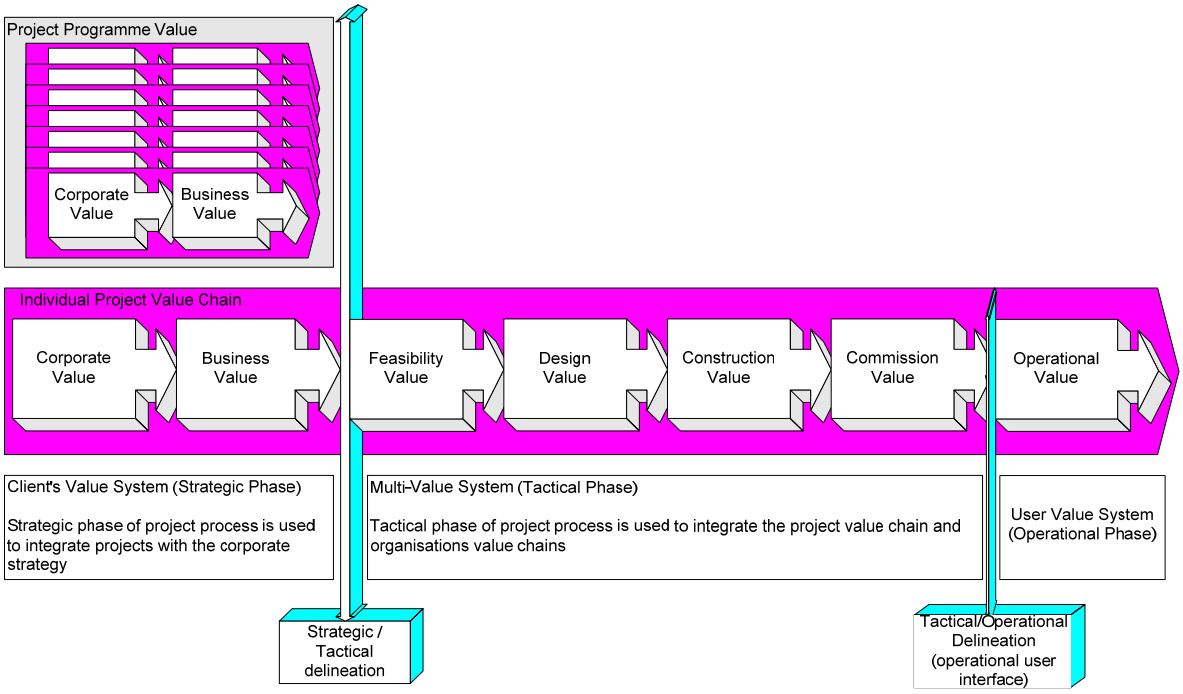

Figure 2.12: Programme level value and the PVC {source: Standing (1999 p161)}

2.7 Chapter Summary:

At their early stages, projects derive from organisational strategies through a series of investment decisions and strategic alignment processes which are undertaken through different organisational levels to create strategic change in the organisation. Therefore, this chapter reviewed these organisational levels and their management and highlighted their relationship with construction projects, their management and appraisal stage. Also, it has reviewed the value chain and its role in aligning projects with their upper levels to deliver value for the organisation. However, to conclude, the following lessons were learned.

Organisations use missions to express why they exist; visions to state their targeted situations; and strategies to state their approaches to reach their targets. At corporate level, visions, missions, and strategies are owned and managed by the Board's members who should be properly skilled to do that and to undertake their strategic responsibilities such as corporate governance. Strategies exist at several levels such as corporate level {concern about portfolio}, business level strategy {concern about programmes} and project level {concern about project}. These strategies should be considered and managed at each organisational level.

There are many similar definitions for projects and these were combined to define a project in the context of this research as a temporary unique investment of inputs/resources for outputs/return under the constraints of time, cost, and quality. Projects have several types and sizes and this research focuses on construction-based small to large projects as they can be undertaken by a single organisation and within the normal delivery.

Project objectives are very important, particularly the primary ones. Therefore, they should be identified and agreed by the key stakeholders and balanced according to their requirements. This should be done particularly at an early stage of PLC where there is the greatest ability to influence the project objectives while it is less so in the later stages. However, the methodology highlighted in the next chapter can do that as well as providing alternatives to achieve project objectives.

There is no one right way in naming the phases of the PLC and the essence in all life cycles is the same as shown and compared in Figure A.1. Therefore, any phases can be chosen and the RIBA life cycle was adopted for the purpose of this research. This research focuses on the appraisal stage of projects as they are very important and enough time and attention should be paid to it. This stage starts at the corporate strategic level and then be managed at other levels, particularly for large organisations.

Practically, most projects are undertaken in a multi-project context. The management of multi-projects is different from single ones and therefore programme and portfolio management is used to undertake multi-projects because traditional project management is not enough to manage this type. In the context of this research, the researcher distinguishes between programmes and portfolios by following key authors and PM bodies such as PMI, APM and OGC. A programme is considered as

a group of related projects. However practically, a programme is used to create projects while this is not addressed within key definitions and therefore, this is considered in this research which should be investigated and added to the programme definition if proven. As programmes are designed to deliver a range of business objectives or business areas, large organisations which have a variety of business areas might have several programmes. A portfolio has a more comprehensive meaning than programme which is a collection of all programmes, projects and other work within an organisation. Whereas, the creation of programmes and major projects are not addressed within key definitions and therefore, this is considered in this research which should be investigated and added to the portfolio definition if proven.

The relations and differences between project, programme and portfolio was clarified using Table 2.4 which shows a comparison between them against several domains. Figure 2.7 shows their relationships which indicate some crossover between them. However, the best way to clarify their relationship is in terms of a pyramid with portfolio at the top, then programme and then project.

Stakeholders exist at different organisational levels and should be managed as they can influence the organisation and its projects either positively or negatively. Portfolios, programme and projects are managed by managers who should have several skills to be able to undertake these roles properly. Projects and also programmes should have a sponsor as the business leader who is accountable for it. This person should have 360 degrees horizontal and vertical skill requirements to undertake the role properly. The business case justifies the investment in a project/programme and is owned and developed by its sponsor.

The value chain highlights the value flow in an organisation from its corporate value at corporate level to use value at project level. It goes through three value systems, which are the client value system, multi-value system and user value system. These different systems are considered as strategic phase, tactical phase and operational phase respectively. However, it should be kept unbroken to align the project with its higher levels and deliver value for the organisation as a whole. Figure 2.12 clarifies the concept of the value chain and its contribution within the corporate value of the whole organisation.

Having reviewed organisational levels, their management and the PVC, the next stage is to review the methodologies identified by this research to see how they are carried out within organisation levels and how they can integrate for more benefits. This will be done in the following chapters.

3 CHAPTER THREE: VALUE MANAGEMENT:

3.1 Introduction:

The previous chapter reviewed projects, their appraisal and management within organisational levels which can be improved by using the four project based methodologies investigated in this research. This chapter investigates the first methodology {VM} and its potential for integrating with other methodologies. Therefore, the aim of this chapter is to produce a critical appraisal of VM as a structured method by introducing and discussing the academic literature on the subject.

Initially, the value concept is identified. Then, VM's historical development is established and its terminologies, definitions and features are reviewed. After that, projects that need VM are discussed. Then, the strengths and weaknesses of applying VM in projects are reviewed. In addition, there is a discussion of who should participate in the VM study as well as who should manage it. Furthermore, critical success factors, inputs and outputs of VM studies are identified. Also, the VM timing and methodologies in the different institutes and research literatures are reviewed. In addition, there is a review of the VM process and its common tools and techniques, particularly for the early stages of PLC. Finally, a discussion takes place on how improvements are possible.

3.2 Value Philosophy:

De Marle (1992a p3) stated that value is mistakenly seen as a property of goods or services, a concept which has its origins in ancient Greece philosophy. The Greeks believed that specific primary or essential fundamentals existed in our environment and gave value to the elements they inhabited. Thus, ethics contained 'the good'; religion, 'the holy'; and aesthetics, 'the beautiful'. When the indwelling principle was present, the object had value and when it was absent, the object was worthless. However, value here can be defined as "*the equivalence of an item expressed in objective or subjective units of currency, effort, exchange, or a comparative scale that reflects the desire to obtain or retain the item. Whether in monetary units or not, the measurements of objective or subjective measures are often translated into a monetary value as a meaningful means of expression*" (Kelly and Male, 2001 p6).

Value is represented as 'satisfaction of need/use of resources' (BSI, 1997 p3, 2000b p6; IVM, access on 5/2/2007 p2). However, in practice within construction, use of resources is often expressed in terms of the whole life cost of a project under review and therefore, value is represented as 'satisfaction of needs/whole life cost' (Beardsall, 2005 p20). Othman (2005 p25) argues that enhancing the needs or reducing the cost of meeting them can improving value. According to Dallas (2006 p14), value is usually referred to as value for money {VfM} because the use of resource often comes down to money. Moreover, when considering the value of an item, the

value is viewed as ‘function/cost’ by the seller and ‘function/price’ by the buyer (Hamilton, 2002 p131).

There are four different types of value often noted which are: use value {need} which is a value received from the delivered function; esteem value {want: but could be a need under certain circumstances} which encompasses our feelings towards the item that we are purchasing; exchange value {worth} which is the amount that we are wishing to accept in trade for an item; cost value {cost} which is the amount of money that we are wishing to incur to provide an item (Zimmerman and Hart, 1982 p60). Furthermore, Parker (1985) cited by (Hamilton, 2002 p131) adds another type to the list which is price value {price} and it is the charged price for an item.

Certain criteria are used to determine the value of an item and must be judged by the purchaser, by each individual, by the owner and especially by the design firm involved in the project. These criteria are initial cost, energy cost, profit return, functional performance, reliability, operability, maintenance ability, quality, saleability, regard for aesthetics and environment, owner requirements and safety. The significance of these criteria varies depending on the owner and his terms of ownership (Zimmerman and Hart, 1982 pp62-63).

Having identified the concept of value, the next section discusses how the management of this concept began and spread throughout the world.

3.3 Value Management Background:

Value Engineering {VE is a part of VM as discussed later in terminologies} was established in the manufacturing sector of North America and value thinking began in the late 1940s when the shortages of strategic material forced, initially General Electric Company {GEC}, to consider alternatives which performed the same function with the lowest cost (Dallas, 2006 p11; De Marle, 1992b p251; Fong, 1999 p446; Hayden and Parsloe, 1996 p3; Kelly and Male, 1993 p4, 2002 pp77-78; Norton and McElligott, 1995 pp3-6; Philips, 2002 p68; Zimmerman and Hart, 1982 p10). It was soon found that many of these alternatives provided the same or better quality at a reduced cost, which led to the first value analysis definition, being: *“value analysis is an organised approach to providing the necessary functions at lowest cost”* (Kelly and Male, 2002 p78).

The important VE milestones can be found in Younker (2003 pp5-8). However, Zimmerman and Hart (1982 p15) stated that VE was first used in the USA construction industry from 1963 to 1965 by the General Services Administration, when a contractor’s sharing clause was added to construction contracts.

In the same decade {1960s}, VE started in the UK manufacturing sector which led to the establishment of the Value Engineering Association in 1966. In 1972, the name of this organisation was changed to the Institute of Value Management {IVM} (Kelly and Male, 2002 p78).

The term VM is the common name in European countries {except France where the term VA is used} to describe the service. In the UK construction industry, VM became popular in the early to mid 1990s (Kelly and Male, 2002 p78).

In their benchmarking {comparing (Eaton, 2002 p59)} study, Male et al. (1998b p26) attributed the spread of VE globally to activities of American practitioners and multinational manufacturing companies. Furthermore, VE went to Australia in the 1960s via the multinational companies as well. In Germany, the Value Society was established in 1974, and in 1978 in France. Japan, India and South Korea adopted the SAVE International model of practicing and certification. In addition, Fowler (1990) stated that in the early 1960s Japan picked up VA, and each organisation there now has a value analysis system. However, Dallas (2006 pp12-13) argued that the focus of VM has been changing over time and this can be seen in Figure 3.1.

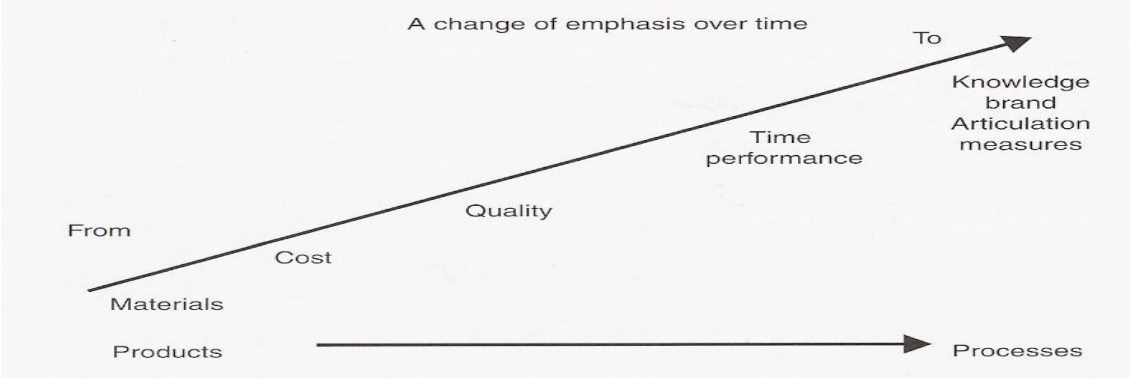

Figure 3.1: The evolution of VM {source: (Dallas, 2006 p13)}

Having reviewed the VM history, the next stage is to explore its associated terminologies to identify which one is used for this research.

3.4 Value Management Terminology:

Kelly and Male (1993 p4) have adopted the term value management {VM} instead of value engineering {VE} since the former has spread and is used throughout Europe as well as being used by the European community in its strategic programme for innovation and technology transfer as an important business procedure.

VM and VE are the most commonly used terms in the literature. Nevertheless, there are other terms in use such as value analysis {VA}, value planning {VP}, and value methodology {this is the name of value management in the USA} (Kelly et al., 2004 p29). However, VM is the most acceptable term for the UK construction industry (Kelly and Male, 1988).

Connaughton and Green (1996 p7) described the relationship between VM and VE as VE being a special case of VM {see Figure 3.2}. Furthermore, Hayden and Parsloe (1996 p5) mentioned that VE is usually considered a subgroup of VM. Moreover, OGC (2003h p6, 2007j p8) supports this view by stating that VE is a part of VM that considers specific aspects of design, construction, operation, and management. Kelly et al. (2004 p51) argued that, strategic and organisational issues

are the VM domains while the technical issues including space, elements and components are the VE preserve. However, Hammersley (2002 p2) argued that VM is used to get the right project whereas VE is done to get the project right.

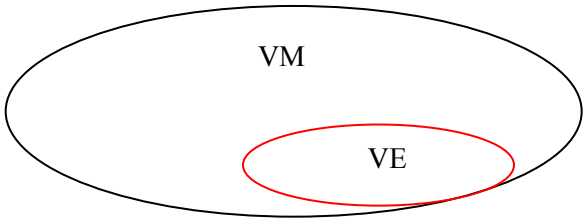

Figure 3.2: VM and VE relationship {source: (Connaughton and Green, 1996 p7; Hayden and Parsloe, 1996 p6)}

Fong (1999 p446) argued that VM is one of the most misunderstood management concepts and this is because of the various terminologies. Woodhead and Downs (2001) cited by (Hunter, 2006 pp42-43) supported this when they found that a common criticism of VM was the jargon associated with it. They mentioned that "*value is defined by the context in which it is used"* and they named this as 'Value Ecology'. Furthermore, they argued that the dominant paradigms in the VM study situation would identify what value is in order for VM to improve it. Therefore, VM is a methodology to be adapted to the environment of the study and the values of significance to the owner (Hunter, 2006 p43).

Some people might use different terms and therefore, the value manager should become familiar with the terminology that is used in the organisation within which he is working so that he uses the terms that are suitable for people in this organisation (Dallas, 2006 p13).

However, as this research focuses mainly on strategic issues in UK construction projects, VM is adopted because it is considered the most appropriate one for that.

3.5 Value Management Definitions and Features:

VM does not have any universally accepted definition and characteristics (Green and Liu, 2007 p654; Merna, 2008a p14; Merna, 2002a p16). Therefore, it should be defined and characterised in the context of this research as follows.

There are many definitions which exist for VM. However, the VM framework's definition is used for this research as it was developed from an international benchmarking exercise and it addresses the concept of value through function analysis {FA} by defining VM as: *'a proactive, creative, problem-solving or problem-seeking service which maximises the functional value of a project by managing its development from concept to use. The process uses structured, team-oriented exercises that make explicit and appraise existing or generated solutions to a problem, by reference to the value requirements of the client'* (Male et al., 1998a p11). Although this definition focuses on the project, the BSI (2000b p6) definition indicates that VM should be applied at different organisational levels to improve value for money and performance to the whole organisation and therefore, it is not limited to projects.

Additionally, there are many features, which can be associated with VM. In this section, they will be summerised as follows. VM could apply to the value process study during the whole life cycle of the project or at any stage from concept to operational stage (Merna, 2008a p14; Merna, 2002a p16). It is not about getting the project right but rather, about gaining the right project (Hammersley, 2002 p2).

In order to clarify its features, VM is a systems oriented and multidiscipline team approach; life cycle oriented; a proven management technique; function oriented. On the other hand, it is not: a design review; a cheapening process; a requirement done on all designs; a quality control; a cost reduction exercise; standardisation exercise (De Leeuw, 2001 pp1-2; Zimmerman and Hart, 1982 pp4-5).

There is confusion between VM and cost reduction exercises; while their procedures have some similarities, the methodologies, aims and outcomes are different (Hiley and Paliokostas, 2001 p3). VM is much more than a cost reduction technique (Philips, 2002 p68). Cost reduction aims to gain the lowest total cost of the project, even if this means a sacrifice in value (Norton, 1992) cited by (Hiley and Paliokostas, 2001 p3). However, VM differs from cost reduction in certain key points, as some scholars have already highlighted (Connaughton and Green, 1996 p6; H M Treasury, 1996 p2; OGC, 2003h p6, 2007j p8):

- VM is positive, focused on value rather than cost. Furthermore, it aims to balance time, cost and quality;
- VM is structured and accountable;
- VM is multi-disciplinary. Moreover, it aims to maximise the creative potential of all departmental and project participants working together.

Kelly et al. (2004 p48) concluded that the value system, team-based process and FA are the core features that distinguish VM from other management services.

Regarding the previous point mentioned, value management is not only for reducing cost but also about function and optimum value for money even if that means increasing the cost of the project. It is an ongoing process, and usually it is better to make a periodic review of customer needs relative to project aspects.

3.6 Projects that need Value Management Studies:

Norton and McElligott (1995 pp15-16) suggested using a VM study in the case of costly projects, complex projects, where there is repetitive cost, unique projects {with few precedents or new technology}, projects with very restricted construction budgets, projects with compressed design programmes, and in high visibility projects.

Furthermore, projects that have an estimated cost of 20 million US dollars or more should have at least one VM study. Nevertheless, a VM study can still be used for projects of less than 20 million US dollars in cases of projects with cost overrun, complex projects, projects where VM is requested

by their manager, projects with high right of way costs, and projects and processes with unusual problems (CFR: Code of Federal Regulations, 2005 p5).

However, the primary reason for using VM is because of poor value which might emerge from many factors that can be found in Dell'Isola (1997 pxx); Hayden and Parsloe (1996 p4); Merna (2002a pp20-21); Merna (2008a pp17-18); Norton and McElligott (1995 pp15-16); Younker (2003 p30); and Zimmerman and Hart (1982 p6).

The above argument indicates specific situations when the use of VM should be mandatory but this should not limit its application to these cases as VM can be used in all projects for many advantages and to provide many benefits, as discussed in the next section.

3.7 Advantages of Value Management:

Through the use of VM, trained value improvement team leaders conduct thousands of studies per annum to provide an annual saving of between one to three billion dollars for the USA (Younker, 2003 p4).

VM usually delivers value for money to the organisation when applied correctly and methodically. VM do that by enables the client, key stakeholders, and the end user to discover and achieve their needs and wants through the workshop and create a balance between their priorities for the project (OGC, 2003h pp5-6, 2007j pp7-8). So, VM enhances value by clarifying objectives and requirements, establishing better communication and preventing conflicts between key stakeholders (Hiley and Paliokostas, 2001 p5). According to OGC (2003h p2, 2007j p4), VM also seeks to improve value by identifying the most appropriate way for satisfying the stakeholders' needs and wants.

Applying a VM study might produce a better definition and clearer understanding of quality, functionality, briefs, and can reduce many wasted resources. In addition, VM can reduce capital funds, and try to improve operational efficiencies (TAM: Total Asset Management, 2001 p7). VM is a very useful methodology for decreasing the unnecessary and wasteful processes in the project to increase efficiency (OGC, 2003h pp5-6, 2007j pp7-8).

If VM is applied properly, it should result in better business decisions by giving a sound basis for decision takers, depending on their choice (IVM, access on 5/2/2007 p3).

Furthermore, VM is a good methodology for ensuring that money and effort are used in the most appropriate place for them (H M Treasury, 1996 p2). Moreover, it is fair to say that one advantage of VM is the flexibility in applying it. In other words, it can be applied at any point during the project development. It is used in planning, controlling, and developing the project through a team building approach (Philips, 2002 p72,74).

Other advantages can be found in De Leeuw (2001 p11); BSI (2000b p6); and OGC (2007w p3). However, the client, society and community, municipal entities and the consumer are the parties

that usually benefit from the application of VM studies (Pasquire and Maruo, 2001 cited by Hunter, 2006 p50).

3.8 Disadvantages of Value Management:

VM is an effective methodology for increasing the value of the project. However, it is still improving and developing and thus has some shortages and disadvantages.

One of the disadvantages is the cost of the study because many small clients do not have enough time and money to carry out a VM study and most clients want to reduce the workshop time to keep the study cost as low as possible (Gronqvist and Male, 2007; Kelly et al., 2004 p141).

Another disadvantage of VM is that it is hard for the value manager to choose a good team with the right participants and appropriate skills mix as well as creating a suitable environment for them, unless he is an expert at this. However, the value manager needs to discuss his choice of team with the client, as any failure in choosing the right team may lead to the failure of the study (Hiley and Paliokostas, 2001 p3; Kelly et al., 2004 p274; Tantawy, access on 7/2/2007 p2).

Furthermore, much of the literature states that in the VM study, many professionals have to leave their workplace for a couple of days in order to execute the workshop and usually this costs the client a lot of money and time (Gronqvist et al., 2007 p3; Kelly and Male, 2002; Kelly et al., 2004).

Moreover, the confused and inconsistent use of VM terminology and the lack of standard definition are considered as weaknesses as well as barriers to its widespread application (Green, 1999a cited by Hiley and Paliokostas, 2001 p3).

Having identified the history, concepts, features, strengths and weaknesses of VM which indicated what VM is, the next five sections discuss how and when this methodology can be used.

3.9 Value Management Team:

There is no definite number for VM team members, only the range. This is mainly because VM team sizes can vary between 5 and 30 and mostly are 10 to 20, with the characteristics of the team and its size dependent on factors such as size, nature, type and complexity of the project (De Leeuw, 2001 p8; Kelly et al., 2004 p84; O'Donnell, 1994).

A large team can lead to poor communication between the team members. In addition, with a big team, there is difficulty gaining consensus on ideas and the decisions will take more time to reach. In order to solve this problem a large team should be divided into sub-teams of between five to seven members (Kelly et al., 2004 p84; Norton and McElligott, 1995 p34). Also, this problem can be solved by bringing in more than one value manager because two value managers are better than one for keeping the momentum going to a greater degree (Male et al., 1998a p19). In addition, it is helpful to bring a full-time recorder because his attendance is important for taking notes during the workshop and is useful in providing the workshop report (Male et al., 1998a p61).

It is recognised in the literature that VM requires appropriate teams to be selected at an appropriate time for each intervention point by the value manager in conjunction with his client, and the ACID test {see Kelly et al. (2004 pp89-90)} exists to do this.

However, it is important to ensure that there is a suitable set of skills and skills mix to address issues and problems correctly (Male et al., 1998a p22). Finally, each value opportunity point has a range of potential participants which should be more senior at the early stages, as indicated in Male et al. (1998a pp32-45).

3.9.1 Internal or External Team:

Ashworth and Hogg (2000 p75) mentioned that there is a significant consideration when choosing a VM team which is whether to use internal design team members or an external independent team. In addition, they put forward some benefits from the internal team: fewer difficulties with the implementation of 'outsiders' ideas; lower cost; saving in time because of the existing knowledge state of the project. Norton and McElligott (1995 p42) added the benefit of better communication between the different participants which can uncover discrepancies between the design team and client perceptions.

On the other hand, the HM Treasury (1996 p9) highlighted some disadvantages of using an internal team: they may not be able to evaluate their work critically; they might not be able to generate truly fresh and innovative ideas; they may confirm that their original method is the best one.

In contrast, the advantages of using an independent team are the converse of the above while the main disadvantages are: there may be conflict with the design team; the external team needs time to become familiar with the project; the extra cost of the external team; delay and disruption to the design process during the review; the independent team might feel they should come up with a cost saving proposal to justify their appointment and fees (Connaughton and Green, 1996 p42; H M Treasury, 1996 p9).

However, there is a consensus of using the internal team in the UK and Australia. Whereas in the USA an external independent team is the most common approach on government contracts, the use of internal teams is much more common in the private sector (Kelly et al., 2004 p97; Male et al., 1998b p34; Norton and McElligott, 1995 pp39-42). Furthermore, it is commonly acknowledged internationally that the internal team should carry out the study and external experts should be brought in if needed (Kelly and Male, 2002 p85).

3.9.2 Facilitation:

Facilitation means controlling and leading the team through a process by using analytical, arbitration, guiding, and influencing skills (Kelly et al., 2004 p90).

3.9.2.1 Internal or External Value Manager:

Kelly et al. (2004 pp91-92) argued that there are three types of value managers: internal to the project team, external to the project team but internal to the practice or company, and a totally external value manager. De Leeuw (2001 p7); Kelly et al. (2004 pp91-92); and Male et al. (1998a p19) believe the third type is the preferred option for the following reasons:

- It is good for organisations that do not have sufficient experience for in-house facilitation;
- The external value managers bring in broad experiences;
- They can identify hidden agendas;
- They question and summarise; they provide direction;
- They establish good interpersonal relationships within the team; and
- They are likely to pose probing and challenging questions without fear of sounding less knowledgeable.

3.9.2.2 Value Manager's Role and Skills:

Some roles, such as setting agendas and managing the study process should be carried out by the value manager (De Leeuw, 2001 p7). Kelly et al. (2004 pp92-94) added other roles. These roles can be concluded as applying the VM study at the right time, with the right team through the right approach and using the most appropriate techniques.

However, in order to undertake these roles, the value manager should have several features and skills. Male et al. (1998b p36) conclude the following attributes as key ones:

- Experienced;
- Independent, whether external to the organisation or in-house but not directly participating with the project;
- Having appropriate training in the VM process and its associated tools and techniques;
- Having a variety of management skills particularly in human dynamics and team management;
- Having leadership quality; and
- Be appointed by the client or the sponsor for a certain purpose.

Dell'Isola (1997 p64) emphasises that the value manager's skills should be more creative, organisational, and motivational than technical. Also, there are many other skills mentioned in BRE: Building Research Establishment (2000 p3) and Connaughton and Green (1996 p54).

3.10 Value Management Inputs:

Like any effective process, VM requires some considerations before it can begin. In other words, some conditions should be fulfilled and checked to make sure that VM is working smoothly. Some of these conditions are related to people's involvement and the venue for the workshop (Male et al., 1998b p39). On the other hand, documents are needed as well.

Connaughton and Green (1996 p10) argued that the client should do some things in order to get an effective VM which are: be committed at the senior level to the VM introduction and

implementation; address their strategic goals; know when to use VM, what to expect and who to involve.

Several authors provide a number of critical success factors {CSFs} such as those mentioned in Hammersley (2002 pp12-13) and Simister and Green (1997 p124). However, Male et al. (1998a p12) list some CSFs which for they found a consensus among the literature and practice. They mentioned that some VM practitioners stated that a VM study could fail unless all these CSFs were present.

Regarding the documents that are required for the VM study, Dell'Isola (1982 pp62-63) identified documents which are required before the workshop such as: background reports; cost and time data. Moreover, West Virginia Division of Highways {WVDOH} (2004 p2.4) added other technical documents to the list. This information should be reviewed by the value manager in the document analysis activity in order to give a better view of the project and this will help to choose the appropriate techniques for the study. Nevertheless, most of these documents seems to be more technical and suitable for later stages in the PLC rather than for early ones and this issue should be considered when adopting them in the research. However, for a successful VM study, it should be done properly and correctly with consideration of the CSFs and the required documents.

3.11 Value Management Timing:

VM has been carried out successfully within different sectors, across many activities and at different organisational levels (Dallas and Clackworthy, 2010b p7). Therefore, VM can be used for most activities such as policy making, programme, project, service reviews or product redesign. Moreover, it should be used during the investment life cycle and its decisions by carrying out formal studies at key decision stages with a different focus (Dallas and Clackworthy, 2010a p8). This is supported by Afila and Smith (2007 p63) who argued that before the investment decision is taken, VM is used in the project appraisal at the corporate level to highlight the stakeholders' needs and at the business level to analyse alternatives that could satisfy the users' needs.

To achieve a successful VM process**,** it is crucial to identify the point in the life cycle of the investment. Before the value manager can start the VM process, it is necessary to identify the intervention point that has been reached in order to apply the appropriate techniques for the workshop. However, it is clear from the literature that VM in construction is usually done at the project level and different authors and institutions suggest different stages where VM might be carried out in the PLC and these are illustrated in Table 3.1. The table lists the stages of key intervention opportunities suggested by the literature. It is supposed that having undertaken VM at these stages helps the sponsor to make informed decisions to gain the most benefits from VM studies. The table indicates the significance of using VM in the early stages as most authors/institutions suggest interventions at these stages while the number reduces for later stages.

Table 3.1: Different VM timing provided by leaders in the field {source: The Author}

Author or institution	PLC Phases in which VM should be applied	Sources
Merna	Concept; pre-feasibility; scheme design {feasibility}; detailed design {appraisal}; implementation; commissioning/operation; decommissioning/end of asset	(Merna, 2008a p20; Merna, 2002a p23)
BRE	Business strategy; concept and development; design; construction	(BRE: Building Research Establishment, 2000 p8; Male et al., 1998b p30)
ICE	VP1 {early concept}; VP2 {end of concept}; VE1+ {post brief}	(Male et al., 1998b p30)
CIRIA	Concept; feasibility; outline/scheme design; detailed/final design	(Connaughton and Green, 1996 p13)
BSRIA	Similar manner to CIRIA	(Hayden and Parsloe, 1996 p11)
HM Treasury	Option appraisal and business case; outline design; final sketch plan; detailed design; construction; handover	(H M Treasury, 1996 p4)
BSI	Inception; concept; feasibility; implementation; use	(BSI, 2000b p25)
NHS Estates	In the private sector: concept; feasibility; design	(NHS Estates, 1996 p43)
OGC	In government projects VM should be applied at key decision points at PLC as: VM0 {need verification}; VM1 {project definition}; VM2 {brief development}; VM3 {VE}; VM4 {handover review}; VM5 {post-occupancy review}	(Green and Liu, 2007 p652; OGC, 2007w p6)
IVM	Same as OGC	(IVM, access on 17/4/2008 pp1-2)
Dallas	Same as OGC	(Dallas, 2006 p16)
SAVE International	Schematic stage and design development	(Male et al., 1998b p31)
AS/NZS	Project concept; client brief; site selection; design proposals; material selection; construction programs; construction methods; facility management	(Male et al., 1998b p31)

Therefore, Male et al. (1998b p32) concluded that there is a consensus on four value opportunities where the VM process can be applied to gain maximum effect on any engineering project during its life cycle. These are: [1] pre-brief study to develop a strategic brief through structuring the problem, ensuring the project is the best solution for the problem at hand and gaining a consensus amongst stakeholders about the project's strategic objectives; [2] brief study or project brief to develop the project brief through articulating the strategic brief into performance specifications and design and construction terms; [3] concept design study to review the brief and improve the concept design; [4] detailed design study to fine-tune the design through element function analysis. Moreover, they argued that there are some differences in opinion on whether VM should be applied at a later stage than the detailed design because of low cost reduction and the high cost of change and high change resistance as shown in Figure 3.3.

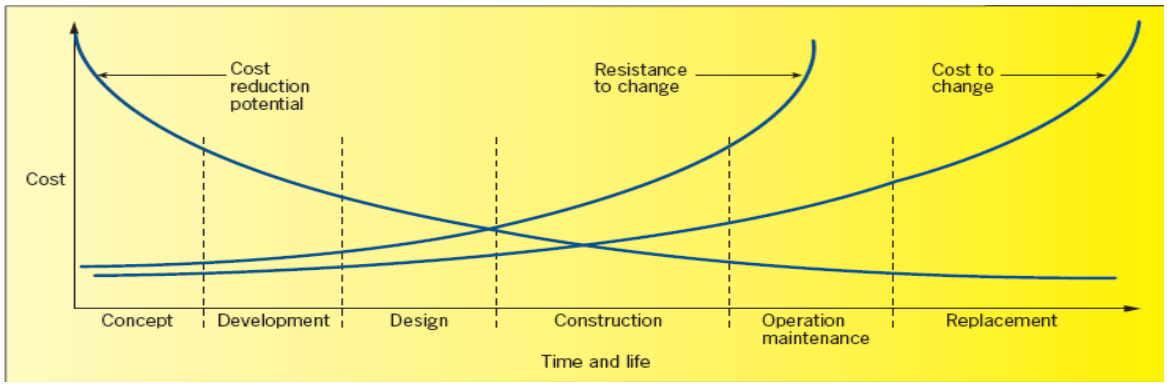

Figure 3.3: Opportunities & potential savings via VM {source: (BRE: Building Research Establishment, 2000 p8)}

Nevertheless, the research that was undertaken at the University of Leeds on using VM/VE in the construction stage has indicated that big savings can still be achieved at this stage. As a result, it is beneficial to add a further opportunity point for VM which is [5] the site operations study, that converts design into components and constructional operation sequences, and is undertaken as construction work is about to commence (Male et al., 1998b p32). These five opportunities have been illustrated clearly, as shown in Figure 3.4 which is applied in this research.

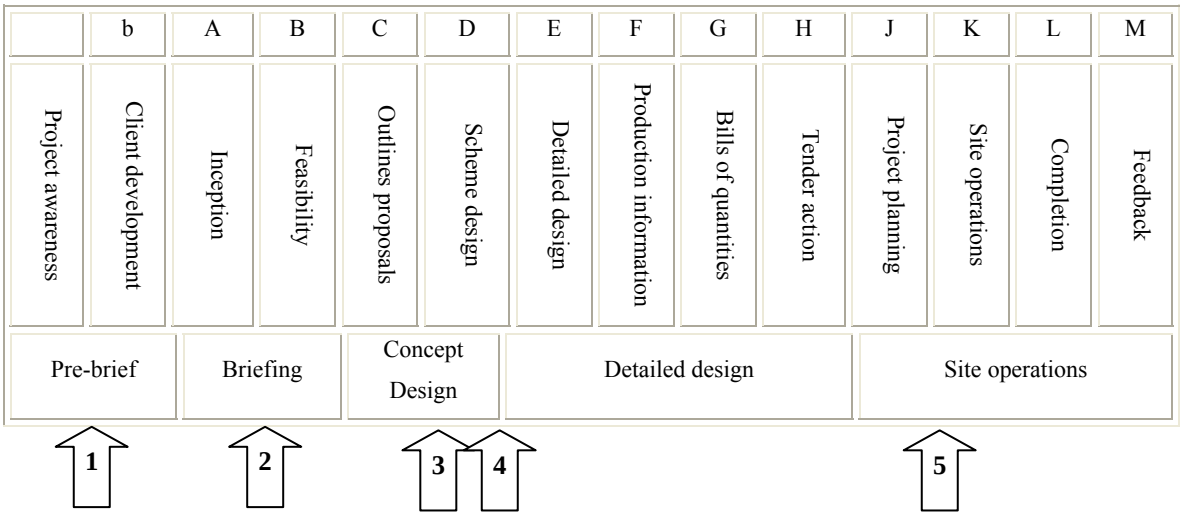

Figure 3.4: Value opportunities on a modified RIBA plan of work {adapted from (Male et al., 1998a p16)}

Although, there is evidence from the literature which suggests to undertake VM studies at later phases after the construction phase, there is no or insufficient practical evidence to support that, and yet this does not mean they are not important as it might indicate that few studies are carried out at these phases (Male et al., 1998b pp32-33). However, there is no right approach to VM and it can be applied at any point in the PLC from concept to use. The value opportunity point can vary from one project to another as needed (Male et al., 1998a p28; Merna, 2008a p19; Merna, 2002a pp22-23; Philips, 2002 p72). However, there is a general consensus that it is better to commence the VM study as early as possible to obtain optimum effectiveness and for further savings (Kelly and Male, 1999 p3; Palmer, 1992 cited by Hiley and Paliokostas, 2001 p3; Philips, 2002 p72). Kelly et al.

(2004 p173) support this as they argue that value can be added at any stage of the project development while the effectiveness of VM is higher in the early stages as shown in Figure 3.5.

The number of VM studies in a project will vary according to the situation and it is noted that too many studies can disrupt and delay the project process while too few can lose the chance of improving definition as well as the effectiveness of the design proposals (Merna, 2008a p19; Merna, 2002a p23; OGC, 2003h p17, 2007j p19).

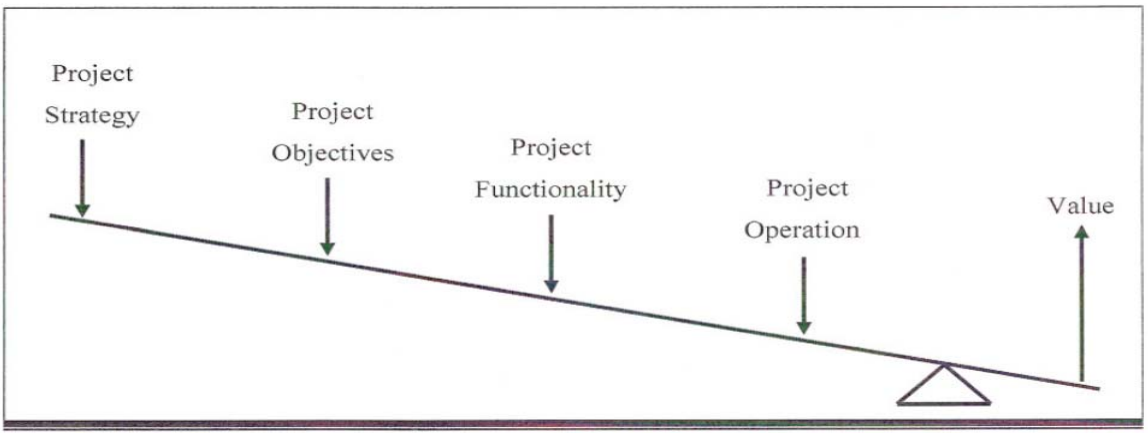

Figure 3.5: The lever of value {source: (Kelly et al., 2004 p173)}

The review of Dallas and Clackworthy (2010a pp27-42); Kelly et al. (2004 pp51-66); and Male et al. (1998a pp32-47) indicate that the principles of VM {e.g. job plan, multi-disciplinary team, expert independent value manager}; most of the preparation activities; and standard techniques {e.g. issue, stakeholders, value and function analysis as well as brainstorming} are used similarly for all VM studies whether at different organisation levels or within different project phases. The studies differ mainly in their focus, participants, workshop durations and the detailed tools and techniques.

3.12 Value Management Process {Job Plan}:

VM is a systematic method, which consists of three generic phases that are orientation and diagnosis, workshop, and the implementation phase (Kelly et al., 2004 p102). In addition, in order to achieve a successful VM process, it should be carefully structured. Usually the VM study follows a sequence which is called the 'job plan' (Walker and Greenwood, 2002 p68). The job plan can be defined as "*a logical and sequential approach to problem solving, which involves the identification and appraisal of a range of options, broken down into its constituent steps and used as the basis of the VM approach*" (H M Treasury, 1996 p12).

Zimmerman and Hart (1982 pp32-34) argued that the benefits of a job plan are that it provides an organised approach, forces a concise purpose description, identifies high cost areas, has an objective and universal approach. Furthermore, Kelly et al. (2003 p329) added that it is used to produce a logical sequence of tasks to satisfy the client value system. There are several forms of job plans that have a similar approach. These forms are outlined in Table 3.2.

Table 3.2: Job plan forms {source: The Author}

Name	Job plan phases	Sources
EPA- 6 phase job plan	Information**;** creative; analytical; investigation; recommendation; implementation	(Zimmerman and Hart, 1982 p35)
Standard- 5 phase job plan	Information; creative; judgment; development; recommendation	
GSA- 8 phase job plan	Information; functional; creative; judgment; development; presentation; implementation; follow-up	
H M Treasury- 7 job plan	Orientation; information; speculation; evaluation; development; recommendation; implementation and feedback	(H M Treasury, 1996 p14)
BRE- 5 job plan	Information; analysis; creativity; judgement; development	(BRE: Building Research Establishment, 2000 p2)
OGC- 7 job plan	Orientation/identification; information; speculation/generation; idea evaluation; idea development; recommendation/decision/implementation; feedback	(OGC, 2007j p20)
SAVE International- 6 job plan	Information; function analysis; creativity; evaluation; development; presentation	(SAVE International, 2006 p5)

The above job plans are derived from Mile's job plan which was not entirely created by him but uses a scientific approach developed by Anaxagoras, a Greek Philosopher {500-428 BC} which combines logic with creative thinking (Bone, 1993 cited by Kelly et al., 2003 p329). In practice, the job plan has developed into three different stages of pre- workshop {orientation and diagnostic}; workshop and post-workshop {implementation} activities, all of which concentrate on structured problem definition and problem solving (Hannan, 1994 p1; Hiley and Paliokostas, 2001 p3). Male et al. (2005 p12) summarises the various stages as illustrated in Figure 3.6 which was adopted in this research as it links the job plan phases with their relevant stage. In the VM process, there are a set of tools and techniques, which are used in the different phases, which vary depending on type, size, and nature of the project as well as the stage in the PLC. These tools and techniques will be reviewed as they first appear in phases as shown in Figure 3.6.

The whole duration of the VM stages is not based on any hard or fast rule but is usually from four to six weeks; this allows enough time for the necessary preparatory work, workshop, analysis and reporting (TAM: Total Asset Management, 2001 p10).

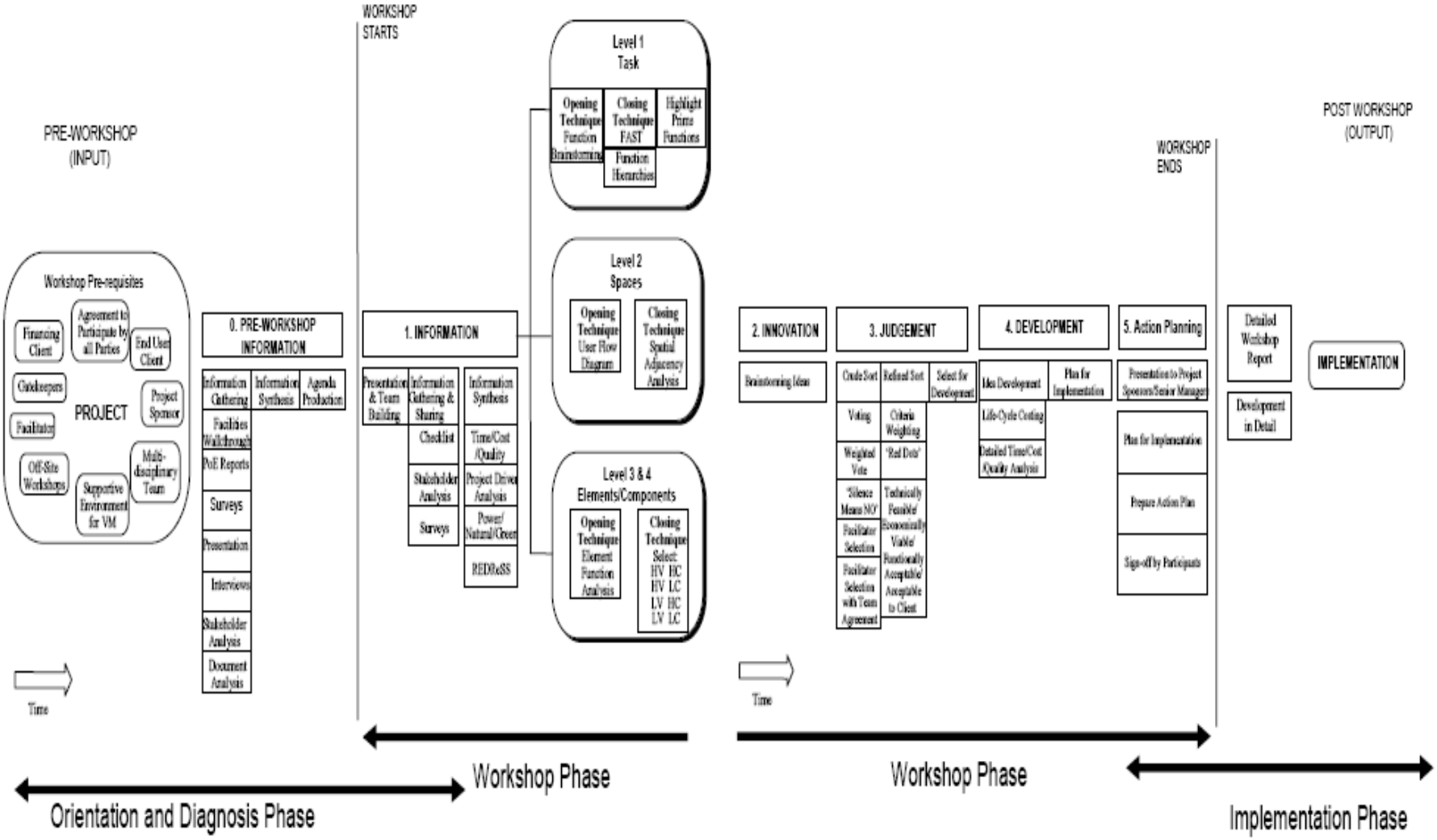

Figure 3.6: An enhanced value management process {source: (Male et al., 2005 p12)}

3.13 Value Management Study Stages:

This section highlights the key VM stages and the key tasks and activities within each one. Some tools and techniques might be applied slightly differently for later phases of the PLC. However, because this research concerns the early phase, VM techniques of the pre-brief are highlighted.

3.13.1 The Pre-workshop /Orientation and Diagnostic Stage {O&D}:

One of the most important objectives of this stage is to ensure that all parties are well coordinated and there is sufficient information available and ready for use in the workshop phase (Norton and McElligott, 1995 p33). The value manager will meet with the key stakeholders, review documents and conduct interviews. The study style and the workshop participants will be selected. It is important to set and plan the implementation process of options and changes or at least consider them at this stage (Kelly et al., 2004 p103). Nevertheless, different value managers will have different attitudes to this stage of VM but generally it is preferred to have full preparation during this phase where possible because it is essential to know about the value problem which will be tackled (Kelly et al., 2004 p123).

This stage should be given the appropriate time because the VM study is based on the information that is gathered and analysed in this stage. The value manager needs sufficient time to schedule the study/workshop and make any travel arrangements for the participants. In addition, the time increases if an interview is necessary. Therefore, the duration is between 5 to 10 working days and it will vary depending on the project (OPFAM: Office of Project and Fixed Asset Management, 1997 p24).

Male et al. (1998b p40) summarised the pre-workshop activities as follows:

- Identify stakeholders: this is done to know who has an interest in the project and who should be interviewed or involved. According to BSI (2006 p27), Kelly et al. (2004 p108), and Male et al. (1998a p32), this can be done using techniques such as stakeholders mapping and analysis;
- Collect information: this is done in order to ensure the availability of the required data. According to Hammersley (2002 p4) and Kelly et al. (2004 pp281-289), this information can be collected using techniques like pre-workshop meetings, document analysis, interviews and questionnaires;
- Identify the project objectives and constraints: this can be done to set the project purpose and the time, cost and quality limitations. According to Hammersley (2002 p4) and Kelly et al. (2004 pp281-289), this can be done through pre-workshop meetings, document analysis, and interviews;
- Determine the workshop scope and agenda: this should be done in order to highlight the workshop duration and the techniques that will be used. According to Hammersley (2002 p4), this can be done through pre-workshop meetings;

- ❖ Pre-workshop meeting: this is done to identify objectives and directions of the project and the study. According to Hammersley (2002 p4), this is conducted with key stakeholders to discuss and agree the scheme's objectives and requirements; study objectives, scope and constraints; and the information, which is required for the study. Ellis et al. (2005 p489) argue that pre-meetings enable the workshop participants to come reassured and well prepared. However, the number of meetings depends on the preparation required as more preparation will need more meetings (Kelly et al., 2004 pp96-97).

Details of these techniques can be found in Appendix B.

3.13.2 The Workshop Stage:

During this stage the multi-disciplinary team is used and led by the value manager, who carries out the workshop following the workshop agenda (Norton and McElligott, 1995 p22). Kelly et al. (2004 p135) mentioned that the most important aim of the tools and techniques in the workshop is to elicit, structure, restructure and illustrate information to participants. Figure 3.7 shows that the workshop processes are divided into four main categories of activities in order to provide a process guide.

Presentations, Information sharing, Prioritise information, Commence team building	Evaluate solutions, Develop winning solutions
Back-to-basics, Identify value mismatches, Brainstorm solutions	Present and agree on winning solutions, Develop action plan

Figure 3.7: The major workshop elements {source: (Kelly et al., 2004 p126)}

VM workshops last normally from a half day to two days and this varies depending on the project' size, nature and complexity as well as type and purpose of the workshop and stakeholders' availability (Hayles and Simister, 2000b p4; Norton and McElligott, 1995 p42). Connaughton and Green (1996 p27) support that for the early stage of projects. Whereas, Male et al. (1998a p32) provided an indicative length of between half to one day for the early stage. However, Kelly et al. (2004 p131) prefer to start a one-day workshop on the previous evening to gain many benefits for team focus, and team building.

3.13.2.1 Information Phase:

This phase is used to bring all members of the team to the same degree of knowledge and to provide a comprehensive understanding of the most significant aspects of the project (De Leeuw, 2001 p3; Hammersley, 2002 p6). In addition, this phase aims to complete the VM data package started in the O&D phase (SAVE International, 1998 p5). Therefore, the important questions that should be answered in this phase are: What is it? What does it do? What must it do? What does it cost? What is the value of the performance of the primary function{s}? (Command, 2006 pp4-13; Stocks and Singh, 1999 p255).

The early indicative VM techniques that can be used at this phase are: presentation, issue analysis, stakeholder analysis, strategic time line, project driver analysis, client value system analysis, and function analysis (Male et al., 1998a p32). Details of these techniques can be found in Appendix B.

3.13.2.2 Creativity/Speculation Phase:

The ability to think creatively, to discover innovative alternative solutions, and to think outside the box is a major aspect of VM (Ellis et al., 2005 p487). This phase aims to generate ideas for achieving the function without evaluating any of them until the evaluation phase. Therefore, the questions which should be answered in this phase are: What else will the primary function{s} do? Where else can the function be performed? Can the items be combined? Can the item be modified or condensed? (Stocks and Singh, 1999 p255; Younker, 2003 p61).

There are several techniques that can be used here. The early indicative VM technique that can be used at this phase is brainstorming ideas (Hammersley, 2002 p6; Male et al., 1998a p32,58). Details of this technique can be found in Appendix B.

The best technique should be selected depending on the project and the mix of the team members. Whatever technique is used, there are guidelines to enhance the creative session outputs which are: provide the ideas without criticism; assume that all ideas will work; provide ideas without restriction; participate in a competitive soul; capitalise from cross-fertilisation of ideas (Zimmerman and Hart, 1982 p102).

In addition, Male et al. (1998a p58) argued that information and creativity phases should occur on two different days because usually people are exhausted after the FA activity. In a one-day workshop they can be separated by a break.

3.13.2.3 Evaluation/Analysis Phase:

The evaluation phase is used to filter the brainstormed ideas, rank the alternative solutions, and select the feasible ideas for further expansion in the next phase (OPFAM: Office of Project and Fixed Asset Management, 1997 p22; SAVE International, 1998 p6; WVDOH: The West Virginia Division of Highways, 2004 p5.1). Therefore, the key questions that should be answered are: Are the primary functions fulfilled? What does it cost? What does it save? (Stocks and Singh, 1999 p255). However, in order to encourage innovative thinking without fear of criticism, the evaluation phase should be separate from creativity (Hiley and Paliokostas, 2001 p3).

The early indicative VM techniques that can be used at this phase are: silence means ‘no’, coloured dots, championing, and big issue (Male et al., 1998a p32). Details of these techniques can be found in Appendix B.

3.13.2.4 Development/Evolution Phase:

In this phase, the best ideas that have passed the evaluation phase are developed by additional data being collected. They are then made workable and drawings and cost estimations are made for them (TAM: Total Asset Management, 2001 p16; WVDOH: The West Virginia Division of Highways,

2004 p6.1). Therefore, the major questions which should be answered are: Will it work? Will it meet the requirements? What should I do now? What is needed? What are the processes? What are the problems of implementation? (Stocks and Singh, 1999 p255).

However, Kelly and Male (2002 p81) argued that in the UK, named team members need to champion the development of the winning ideas and this phase is often conducted outside the workshop. This might be because ideas development techniques such as LCC can be a time consuming exercise (Male et al., 1998a p60). Ellis et al. (2005 p490) supported this when they found that this phase is often undertaken after the workshop stage due to time constraints.

The early indicative VM technique that can be used at this phase is: establishment of project mission and outline specification (Male et al., 1998a p32). Details of this technique and others can be found in Appendix B.

3.13.2.5 Action Planning Phase:

This phase includes three main activities as follows:

Presentation to the Project Sponsor:

The recommendations and the refined ideas that are supported by written documents should be presented by the team to the decision making body or to the body that commissioned the VM study. This is a good way to end the workshop and help the participants to concentrate on the main issues of the workshop (Male et al., 1998a p26; SAVE International, 1998 p7, 2006 pp16-17).

Action Plan:

This encapsulates the outputs and produces a approach for subsequent tasks/evaluation/decision-taking. Furthermore, it illustrates the participants' consensus on outcomes and highlights those options that provide greater value improvement (TAM: Total Asset Management, 2001 p16). The action plan acts as an audit for the progress of the proposal implementation and is based on the following checklist: define the team members' responsibilities; define the proposal's deliverables; establish priorities; make a timetable for implementation; establish a checking system to review the success of proposal implementation (Male et al., 1998a p26).

Sign-off:

Finally, the action plan document should be signed off by the participants and the senior manager to ensure: greater implementation; greater team concentration; no risk of altering the decision later; less disagreement further into the project's life cycle; accountability by all parties (Male et al., 1998a p27).

3.13.2.6 Reporting Phase:

At this stage, the value manager should provide a draft report for further discussion with the key stakeholders. Then, the final report is prepared to describe the main issues that needed to be improved and the action plan. Sometimes, the report includes a short brief about the major points

that have been covered during the phases. After the report is finished, it should be sent to all workshop members as soon as possible (Hammersley, 2002 p5; Male et al., 1998a p61).

3.13.3 The Post- workshop/Implementation Stage:

This stage includes review workshops or implementation meetings which will usually last half a day and one day and includes the same participants who took part in the workshop phase plus the senior management representative. This stage could be carried out after completion of all of the above phases and after any opportunity point to allow the participants to report on their element of the action plan. Furthermore, any mismatches in the reported outputs can be solved at this stage. Nevertheless, the main objective of this stage is to make sure that all recommendations in the workshop report are being implemented (Kelly and Male, 2002 p93; Kelly et al., 2004 p139; Male et al., 1998a p46). Normally, this stage takes between two to three weeks (Kelly et al., 2004 p139).

In this stage, usually any changes are completed and implemented and situations are monitored (SAVE International, 1998 p3, 2006 p18). In addition, OPFAM (1997 p19) mentioned another two tasks in this phase which are to obtain implementation commitment from responsible management and to develop suitable documentation regarding funding, planning and reporting.

Nevertheless, while these tasks are important and the workshops are desirable, experiences indicate a review meeting with the client for the final report and action plan as the most common way for this stage (Kelly et al., 2004 p140). The designers should take responsibility for the implementation under the supervision of the value manager (SAVE International, 1998 p8).

3.14 Value Management Outputs:

The results of VM studies vary between tangible and intangible improvements and many of the benefits of VM cannot be easily quantified (Bloore, downloaded 28/3/2007 p4; OPFAM: Office of Project and Fixed Asset Management, 1997 p13).

The general VM outcomes have been identified above as advantages and benefits from VM. However, each value opportunity point would deliver certain outputs as shown in Appendix B. Generally, VM outputs usually depend on the size, complexity and nature of the project.

Having identified when and how VM is conducted as well as its inputs and outputs, the next section discusses how it can be improved.

3.15 Value Management Improvement and Future:

Firstly, it is useful to think about how a VM study can be undertaken without using the workshop phase or at least trying to use only the essential tools, which are needed for team working in order to save participants' time and reduce the study cost. In other words, finding an alternative to the workshop, such as an autonomous VM and electronic VM {eVM} (IVM Seminar, 2007; Kelly et al., 2004 p130). This argument is supported by Kelly and Male (2002 p80) when they stated that sometimes VM is applied without a workshop and that the French tend to use a value analysis system that is not based on the workshop.

Secondly, it is very useful to give consideration to the implementation phase, by making sure it is well planned in the pre-workshop to be addressed as a part of the VM process and its responsibilities are defined at the end of the workshop as part of the action plan. This is mainly because implementation is seen as an area of VM weakness and it is critical to the VM success (Kelly et al., 2004 p105,139; Male et al., 1998b p39).

Thirdly, it is beneficial to find an isolated and inexpensive place for the workshop, e.g. the workplace, and ensure that no interruption will happen. This will reduce the cost of the VM study to increase its reputation among small clients and it might encourage them to use VM when required.

Finally, a convincing argument for construction projects and the construction industry should be provided in order to highlight how VM is significant, particularly for a large construction project. In addition, it is useful to integrate a VM department into companies and organisations where possible. This might increase the popularity of VM.

However, in the IVM Seminar (2007), the practitioners gave suggestions to improve VM in the future according to two main aspects. The first aspect covered improving VM itself by: reducing the workshop cost and time; producing more research on the non-workshop VM; integrating VM with risk management {the third theme of this research} and other techniques such as life cycle cost; putting more effort into and concentration on implementation; encouraging links between VM and incentive schemes {research areas}. The second main aspect that will lead to improving VM is the improvement of the job and position of IVM by: providing training on other VM approaches such as non-workshop based; internationalisation of standards and training; better promotion of students' membership; a VM study on IVM itself; support network for overseas practitioners.

3.16 Chapter Summary:

VM was founded to solve the problem of strategic material shortages and provide better alternatives. This chapter discussed the VM literature which led to many lessons being learned, as follows.

VM has several terminologies. In this research, the term VM is used because: it is the most common in the UK; it is considered the most suitable one to describe the process in construction; and this research focused on the appraisal/strategic stage which are the VM domains. The VM framework's definition of VM is adopted as it is based on an international benchmarking exercise and it addresses the concept of value and FA. VM is a structured methodology which can improve decision-making; value; and performance of the organisation when applied to different organisational levels. VM can be applied in all projects but it is especially needed for complex, big, costly projects and projects with poor value.

The right team at the right time should be selected by the value manager and client through criteria such as the ACID test. The size of the VM team and its membership differ according to the stage of the intervention. At early stages, it includes stakeholders and more managerial disciplines, while it

tends to include more technical disciplines at later stages. Big teams should be dealt with by splitting into manageable sub-teams and bringing in a second value manager or a recorder as appropriate. An internal team with external experts as necessary is the most common way which allows the study to be carried out by those who are familiar with the project and minimise interruption to the project process. Also, it benefits from external experience when needed.

VM studies have been applied successfully at different project stages and organisational levels for different purposes. For a successful VM study, key documents should be in place and the CSFs should be satisfied and checked to make sure that VM is working smoothly in order to guarantee a good working environment to deliver its outputs. As change costs and resistance increase with time, VM may fail if it is undertaken at too late stage. VM interventions can vary from one project to another as needed, but VM is of central significance, which needs to be undertaken as early as possible. Although, the general principles and the standard activities and techniques remain similar for all studies, VM aspects such as study objectives, participants, detailed tools and techniques, and workshop duration differ according to the intervention stage.

In construction, there is a lack of VM application at high levels like organisational strategy, portfolio and programme. VM interventions are usually applied at the project level. However, in this research, the five opportunities that were shown in Figure 3.4 will be considered as they are identified in the literature as the most common and beneficial interventions.

Further interventions should be developed to manage value at high levels which will be achieved through this research. This is because integrating VM with PM and high management levels would be a powerful tool in managing the value throughout the value chain of the organisation which ensures stakeholders' needs and wants are highlighted and achieved.

All job plans refer to Mile's job plan, which is the original one. In this research, the pre- workshop {O&D}, workshop {including information, creativity, evaluation, development, action planning and reporting} and post-workshop {implementation} stages were adopted as they relate the job plan phases with the three practical stages. There are some overlap activities between the three stages as indicated in Figure 3.6. Each stage and phase of VM has a wide range of techniques and the ones that are associated with early VM studies were highlighted to be adopted for this research. However, the ultimate choice depends on the most appropriate techniques for each value opportunity point and the project itself. Therefore, it is preferred to employ expert, knowledgeable and independent value managers {with several skills such as those mentioned above} to design an appropriate VM procedure for each project considering the key stakeholders' needs and wants.

VM has many advantages such as those mentioned above. On the other hand, it also has some weaknesses but fortunately, many studies have exposed its methodology and improved these weaknesses. Therefore, it will be more effective and efficient if these improvements are achieved

and if its weaknesses are overcome. Furthermore, VM will be improved if it is integrated with other methodologies such as those explained in the following chapters.

This chapter has highlighted the application of VM as a separate methodology. This was the first theme of the research. The next chapter addresses the second theme of the research.

4 CHAPTER FOUR: REQUIREMENTS MANAGEMENT:

4.1 Introduction:

The previous chapter reviewed VM literature as the first theme of the research. This chapter continues to review the second theme of the research, which is ReqM through a critical evaluation of it and its principles to be used in integrating it with other themes addressed by this research.

Yogi Berra cited by Jonasson (2008 p1) stated that "*if you do not know where you are going, chances are you will end up somewhere else*". From this statement, it is clear that knowing the requirements is important to end up with the right project. Furthermore, ReqM, with its origins and methodologies in IT, concentrates on eliciting, documenting, organising and tracking requirements, a 'capability' that is required by a user to resolve a problem or goal (OGC, access on 21/5/2008 p1; Smith and Male, 2007 p4).

Initially, this chapter starts with a critical review of ReqM terminologies, definition and features. After that, the importance and advantages of ReqM are discussed. In addition, there is a discussion of who should participate in the ReqM study as well as who should manage it. Moreover, ReqM timing and procedures are reviewed which highlight some of the common ReqM techniques. Additionally, ReqM tools and software are reviewed. Also, ReqM improvements and the future are highlighted. Finally, a discussion takes place about ReqM in construction industry.

4.2 Requirements Definition and Terminologies:

Several terms that are used in ReqM are explained below.

There is a fairly common agreement on the concept of requirements and therefore this concept is used for this research which is:

> The statement of users and other stakeholders' needs {must have to satisfy their basic intentions} and wants {nice to have but do not satisfy the need} which should be comprehensive, clear, well structured, traceable and testable that a project has to satisfy (Alexander and Stevens, 2002 p8; APM, 2006 p52; Halbleib, 2004 p8; Kelly et al., 2004 p15; Soderholm, 2004 p517).

It is concerned with everything which influences the quality of the product or service, involving performance and design, and sometimes functions, safety and aspects of legality should be addressed. Normally, it is shown as textual statements but sometimes can comprise tables and diagrams (Dick, 2004 p4). However, people always seek to have good requirements which are important to improve productivity (Hooks and Farry, 2001 pxxiii). Good requirements come from a repeatable set of processes that take the project from its inception phase through to the establishment of an agreed-upon scope of the project between the client and developer (Jonasson, 2008 p1).

Within ReqM literature terms like 'function, system function/requirement and functional requirement' have the same meaning which is something which is done by a project or sub-project because it is made necessary by a requirement (Alexander and Stevens, 2002 pp8-9). This concept also links to VM and are dealt with in its studies through function analysis. The term 'constraints' are the limitations and boundaries under which the project is operating and they limit solution options. They are normally concerned with budget, resources and schedule (Jonasson, 2008 p45). However, sometimes there are limits of expertise, technology, politics or ethics (Hooks and Farry, 2001 p50).

4.3 Requirements Management Definition and Features:

ReqM is "*the process of capturing, analysing, and testing the documented statement of stakeholder and user wants and needs*" (APM, 2006 p52). ReqM is the systematic process of eliciting, organising, documenting and managing both the initial and changing requirements of the project and communicating this information across the various stakeholders and the project team (OGC, access on 21/5/2008 p1; Soderholm, 2004 p517). This links ReqM to VM as VM is also concerned about identifying the stakeholders' needs and wants.

However, the most important features for ReqM are: concentrating on the outcomes (OGC, access on 21/5/2008 p1); and it is a process not an event and it is important to treat it like that, since requirements change and their situation should be monitored over the PLC (Baxter et al., 2008 p587; Halbleib, 2004 p10). These are similar to VM processes.

4.4 Need for Requirements Management:

In the USA alone, $3 trillion was spent on IT over the past ten years. One trillion of this amount was wasted due to the disconnection between what is needed and what is delivered. In other words, this is because of poor definition and tracking of requirements. Furthermore, other firms, such as Waste Management, Inc., and Allied Waste Industries, Inc., closed down after they spent over $100 million on new management regimes (Hooks and Farry, 2001 pxxviii). In addition, government entities have experienced similar problems because a solution has been chosen without understanding the requirements. Thus, understanding the requirements is considered an important factor of success (Hooks and Farry, 2001 pxxviii). This is supported by Jonasson (2008 p1) who stated that the main reason for project failure is unclear or changing requirements. Furthermore, Alexander and Stevens (2002 p1) mentioned that the excellence of the project requirements can lead a project to success or failure and without good requirements, projects fail, are late, exceed budgets, or provide services that are never used. In addition, APM (2006 p52) stated that it is fundamental for success to have an obvious and agreed requirements expression and their acceptance criteria because this coordinates the aspirations of the stakeholders and produces a measure to judge the project's success.

However, in many organisations, there is a need to create the project parameters and performance requirements (Smith and Love, 2004 p22). The outputs from a project should satisfy the customer requirements, as identified at the early stage of a project and keep changing throughout its implementation. Therefore, ReqM is considered an essential process in any project (Zwikael and Tilchin, 2007 p50). This can be supported by Turk (2005 p13) as he argues that ReqM is a critical part for all projects.

From the above argument, it can be seen that ReqM is very important in PM and it has many advantages. Hooks and Farry (2001 ppxxiv-xxvii) argue that with good ReqM people can build and acquire products better, faster and cheaper. Furthermore, they argued that we could achieve a 50% cost reduction by a proper definition of requirements and ReqM, providing the capability to eliminate rework. Halbleib (2004 p8) mentioned that effective ReqM aids quality control, cost, organisation and schedule and therefore improves the probability of the project's success.

Baxter et al. (2008 p585) state that ReqM can improve several factors such as development time, product quality and customer value. According to them, ReqM can improve value and need satisfaction by ensuring the right requirements are identified and met, as if the stakeholders' requirements are better understood and systematically addressed, the perceived value is likely to be higher. This is supported by OGC (2007j p8) when they state that a requirements definition will add demonstrable value in needs satisfaction. Furthermore, ReqM improve value by sets the project scope and informs the project team about the needs and wants of the users and other stakeholders and the way to manage them (Alexander and Stevens, 2002 p1; Soderholm, 2004 p512). Zwikael and Tilchin (2007 p52) argue that ReqM should improve decision-making through providing the required functions during the optimisation of the necessary resources which improve value.

A list of other benefits of effective ReqM can be found in Dick (2004 p5) and Zwikael and Tilchin (2007 p52).

4.5 Requirements Management Timing:

According to Halbleib (2004 p10) ReqM is a continuous process over the PLC. Dick (2004 p4) supports this when he stated that the ReqM process is similarly applied over the PLC from inception when requirement elicitation occurs, to the end of the project when final testing is applied with respect to the initial requirements.

In order to explain ReqM timing, ReqM starts during the inception phase of the project when the client has to introduce the needs and wants and the project manager has to create the technical limitations. In this stage, the initial list of requirements should be created. After that, ReqM is continuous within the planning and design phase, which includes the creation of WBS that highlights all project tasks, which have to be performed to achieve the specified requirements. Next, ReqM should be controlled to manage changes in the implementation phase of the project (Zwikael and Tilchin, 2007 p51).

However, according to Alexander and Stevens (2002 p1) requirement issues should be fixed early in the PLC prior to committing to a design because problems caused as a result of poor requirements tend to be deeply embedded in the design and are hard to treat after that. This view is supported by Hooks and Farry (2001 p7) when they argue that the cost of treating requirements errors increases sharply as you progress through design towards operations.

Nowadays, ReqM software is generally available, with origins however within the IT domain. These software products are used to elicit and capture requirements during the PLC and at the post-project review stage and they can be used to audit information and determine if the requirements and subsequent benefits have been delivered (Smith and Male, 2007 p6).

In summary, in the same way as VM, ReqM should be applied through the PLC and there is an emphasis on its early application.

4.6 Business Analysts {Requirement Manager} and other ReqM Participants:

As with the value manger in a VM study, ReqM needs a business analyst which is the person who performs a business analysis and who should have several skills such as the ones discussed by Jonasson (2008 pp20-29). However, these skills are similar to the value manager's ones and the main difference is the IT skills which are required for using ReqM software.

The OGC (access on 21/5/2008 p2) highlighted other key participants who should participate in the ReqM process. These are the project manager, other project team members, customers, users and other key stakeholders. However, these participants are also key ones in the VM study.

4.7 Requirement Management Procedures:

The OGC (2006d p19) stated that the approach to ReqM should ensure that: requirements are highlighted, prioritised and that the baseline follows a consensus among all key stakeholders; project outputs are modeled to gain clarity and are formally verified against the agreed requirements; there is an obvious process for baselining requirements and managing their changes. Hickey and Davis (2004 p66) argued that the ReqM process is usually described as a series of activities. Several authors provide different activities for managing requirements, as can be seen in Table 4.1below:

Table 4.1: Different activities for managing requirements by different authors {source: The Author}

Activities	Source
Capturing, analysis and testing.	(APM, 2006 p52)
Elicitation; organising; documenting; managing requirements change.	(Davis and Leffingwell, 1996) cited by (Soderholm, 2004 p517)
Elicitation; organising; documenting; tracking; communication.	(OGC, access on 21/5/2008 p1)
Elicitation; analysis; tracking; verification.	(Tseng and Jiao, 1997) cited by (Chen and Sackett, 2007 p1601)
Firstly, requirements definition which is further divided into nine steps which are scope the product; develop operation concepts; identify interfaces; write requirements; capture rationale; level requirements; assess verification; format requirements; and baseline requirements. Secondly, manage requirement change and improve the definition process by: prioritising requirements; automating requirement management; managing change; measuring requirement quality.	(Hooks and Farry, 2001 pp37-41)
Identify stakeholders; gather requirements; organise requirements; check requirements; review and ensure baseline requirements.	(Alexander and Stevens, 2002 p16)
Elicitation; analysis; triage; specification; and verification.	(Hickey and Davis, 2004 p67)
Capturing; categorisation; refinement; assessment; and follow-up.	(Salo and Kakola, 2005 p266)
Gathering, analysis, selecting, documenting, verifying and managing.	(Davis and Zowghi, 2006) cited by (Baxter et al., 2008 p587)
Capturing; analysis; specifying; verifying and validating; and managing.	INCOSE RWG {requirements working group} cited by (Chen and Sackett, 2007 p1601)

Most of the existing procedures for ReqM, like those presented in the above table, indicate an ordered sequence of activities. Nevertheless, the reality is that these activities are not undertaken sequentially but iteratively and in parallel (Hickey and Davis, 2004 p67).

However, according to Chen and Sackett (2007 p1601) and from the above table, the basic activities for ReqM are similar and therefore, the activities which have consensus are adopted and will be explained in some detail in the following section:

4.7.1 Requirements Elicitation, Gathering and Capturing:

In this phase, users and other key stakeholders should be identified, as they are the main source of requirements. Then, requirements {needs and wants} should be gathered from them through interviews and workshops (Alexander and Stevens, 2002 pp16-17; Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1). It is noted that requirements capturing is also done within the VM information phase before and during the VM workshop.

Documents and other sources can provide further requirements, which should be agreed and acknowledged by the stakeholders if they want them. Other sources of requirements can be found in Alexander and Stevens (2002 pp50-54).

4.7.2 Requirements Analysis:

This phase is used to check for consistency and completeness (Hickey and Davis, 2004 p67). In addition, analysis is used to clarify and uncover requirements as well as prove their feasibility. Based on the unknowns and complexity of the project, the type and amount of analysis are determined. There are several analysis techniques which range from paper prototypes to operating

prototypes and they involve diagramming, software modeling, simulations and mockups (Hooks and Farry, 2001 p39).

4.7.3 Requirements Organising, Categorising and Prioritising:

Requirements need to be organised and categorised in order to know when a suitable set of requirements has been gathered and to ensure having as many details as needed. There are several techniques to do so which are: requirements taxonomy; stakeholder-based classification; sequences-oriented classification; and purpose-based classification. However, the business analyst has to know the purpose of classification and should identify several possible classification techniques and choose the most appropriate one for the situation in hand. Sometimes more than one system can work but the selected one should reflect the customers' view of their business in an approach that is easy for them to apply (Jonasson, 2008 pp106-118).

After choosing the system of categorisation, requirements need to be allocated by flow down requirements from high-level requirements {parent elements} into low level ones {child elements} in the architecture. Furthermore, requirement linkages should be traced to their origins {a parent requirement at high level} (Grady, 2006 p60; Hooks and Farry, 2001 p141).

Requirements should be prioritised: to execute important areas first; to provide information for trade off between requirements; and could be used to assess change requests (Jonasson, 2008 p177). Hooks and Farry (2001 p207) suggest formal priorities approaches such as quality function development for large and complex projects and they argued that most projects' requirements can be prioritised to: define priority classes; classify the requirements; resolve the differences; create priority based development schedules; and maintain the priorities. Jonasson (2008 p173) provided four prioritisation techniques: the dollar approach; forced pair; density dotting; analytical hierarchy process.

4.7.4 Formatting and Documenting Requirements:

In order to communicate requirements with the project team and other stakeholders, documents should be presented in a standard format in an appropriate language (Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1). However, Alexander and Stevens (2002 pp1-2) argued that the best approach to ensure that users' needs are met is to record stakeholders/users requirements and specification/system or functional requirements {what the systems must do to meet the needs} in two separate documents. According to Fernie et al. (2003 p357), the first one is referred as a user requirements documents {URD} while the second is referred as system requirements documents {SRD} and both are key documents in ReqM.

4.7.5 Requirements Validation and Verification:

Validation and verification are different. Validation is used to ensure the requirements are correct (Hooks and Farry, 2001 p157). On the other hand, verification means ensuring that the system does what it should according to the requirements (Hooks and Farry, 2001 p157; Jonasson, 2008 p233).

4.7.6 Tracking and Managing Requirements Changes:

Generally, requirements change with time. Once identified and approved, they should fall under change control and configuration management (APM, 2006 pp52-53). A single change control process must be carried out for all changes. It should produce an obvious set of steps and clearly allocated responsibility. Furthermore, it should be flexible enough to deal with certain issues such as emergencies (OGC, 2005e p8). In addition, it creates responsibilities up front and follows a repeatable procedure such as: applying change request for change, including the reasons behind it; assessment impact of change on all requirements that might be affected; prioritisation and authorisation; applied change if approved (Hooks and Farry, 2001 p228; Jonasson, 2008 p78; OGC, 2005e p8; Soderholm, 2004 p518). Effective change control ensures that changes which are made are needed and avoids changes that are unwanted by the organisation even if they might be wanted by a stakeholder (Jonasson, 2008 p78).

4.8 Requirements Management Tools and Software:

Traditionally, requirements are written in natural language and documented in structured software requirements specification {SRS} which has some limitations as it is difficult to update; hard to communicate changes to the affected team members; difficult to store additional information for each requirement; hard to identify links among functional requirements and corresponding use cases, designs, code, tests, and project activities. Therefore, a more appropriate solution can be produced through ReqM tools which store requirements and its associated information in a multi-user database. Furthermore, they can provide functions to manipulate and view the database contents, import and export requirements, and identify relationships among requirements. However, these tools only support and enable established processes and because they are not processes in themselves, they do not collect the right requirements for the project or replace any process for managing the project's requirements (Wiegers, access on 29/4/2010 p1).

There are many types of ReqM software which can be used and a list can be found in Jiludwig (access 29/4/2010 pp1-2). However, while there are several tools with a common purpose, Dynamic Object Oriented Requirements System {DOORS} was the first in the current wave of interest in requirements as well as the first to achieve broad success in the marketplace (Alexander, 2004 p1; Volere, access on 3/2/2011). It is considered as the leading solution for ReqM (IBM, access on 29/4/2010 p1).

DOORS was established by Dr Richard Stevens in the early 1990s as a ReqM tool (Alexander, 2004 p1). It is a sophisticated tool which can manage requirements on projects. It deals with individual requirements as objects, but illustrates them visually which appear as a structured, hierarchical requirements document (Wiegers, access on 29/4/2010 p3).

DOORS has several advantages as: it has an integrated change proposal system that allows reviewing and commenting on a project or requirements module; it has a direct interface to MS

project to link requirements to project activities; and it supports several import and export file formats (Alexander, 2004 p1; Wiegers, access on 29/4/2010 pp2-3). However, as any tool, it also has some disadvantages as: it is less intuitive to use than other software; generally its user interface is inefficient; while it provides several link definition mechanisms, the defining requirement links through the link matrix is clumsy (Wiegers, access on 29/4/2010 p3).

4.9 Requirements Management Improvement and Future:

In the last ten years, few practitioners would have recognised ReqM as a discipline in its own right. Firms did not employ requirements managers, nor did the title appear on resumes or CVs. Nowadays, firms employ requirements managers to exercise a recognised discipline. There are annual international conferences devoted to the area. Several factors led to this development: project complexity; globalisation; competition; and compliance cultures (Dick, 2004 p3,11).

4.10 Requirements Management in Construction Industry:

It is found that formal ReqM comes from and is dominated by IT literature (Fernie et al., 2003 p355; OGC, access on 21/5/2008 p1; Smith and Male, 2007 p4). Although construction literature does not indicate the application of formal ReqM, it is used by some large organisations like the Ministry of Defence {MoD}. Furthermore, construction researchers have recently become interested in this concept and some practitioners in the industry know about it (Fernie et al., 2003 p354). Therefore, the formal ReqM reviewed in this chapter can be used by other organisations in construction industry which should be investigated more in the fieldwork.

Generally, the formal ReqM process has no straight equivalent practice in construction. Nevertheless, it is achieved by briefing, VM, and change control processes which are the most similar practices in construction (Fernie et al., 2003 p358). Briefing is the procedure by which stakeholders specify their needs, wants and aspirations, formally or informally, while a 'brief' is a detailed document that formally sets out stakeholders' requirements (Kelly et al., 2003 p328). The tendency within ReqM to differentiate among the user requirements documents {URD} and system requirements documents {SRD} is reflected with the propensity to split briefing into two main stages (Fernie et al., 2003 p358; Kelly and Male, 1995 p99). The closest equivalent to the URD in construction is the 'strategic brief' {which is about understanding the stakeholders' needs} while 'project brief' {which is mainly focused on functional requirements and performance specification} is the nearest equivalent to SRD (Fernie et al., 2003 pp358-359).

VM is important in handling the briefing process (Fernie et al., 2003 p360) as specified in Kelly and Male (1995 pp99-105) and Kelly et al. (2003 pp329-336). Generally, requirements change with time. Once identified and approved, they should fall under change control and configuration management (APM, 2006 pp52-53; Fernie et al., 2003 p360) as specified in Hooks and Farry (2001 p228), Jonasson (2008 p78), OGC (2005e p8), and Soderholm (2004 p518). Therefore, ReqM is

achieved through VM and change control in the construction industry and the approach for that will be argued in Chapter 6 as aspect of integration for handling ReqM within VM process.

4.11 Chapter Summary:

This chapter discussed the ReqM literature which is dominated by IT and addressed ReqM philosophy and methodology in detail which led to many lessons being learnt, as follows.

There are very limited sources for ReqM in the construction industry and therefore this should be overcome in the practical information. Also, the review of ReqM literature indicates a shortage in ReqM applications for high levels in IT and for all levels in construction and generally ReqM is achieved by briefing, VM, and change control processes in construction industry.

The common concept of requirement is the stakeholders' statement of needs {must have} and wants {nice to have} which is the definition adopted for this research. ReqM is the process of capturing, analysing, and testing the documented statement of stakeholders' needs and wants. This is also done within the VM process which links the two processes together. ReqM plays a significant role in increasing the chance of project success and decreasing the chance of its failure as well as improving decision-making and value for money. ReqM is characterised mainly by focusing on the outcomes and it should be treated as a process not an event as requirements change and their circumstance should be monitored over the PLC. ReqM is a useful ongoing process in balancing stakeholders' interests in the projects by identifying and managing their requirements over the PLC.

ReqM's activities and techniques are applied within different project stages for different purposes {e.g. brief and design requirements}. However, requirements should be initially identified at an early stage in the PLC and then their identification and changes management should continue till a late stage before the post-project review. Similar to VM, ReqM should be applied through the project stages while its early application is very important and more effective.

Several authors provided different processes {see Table 4.1} but generally, there is consensus on six steps in ReqM, which are elicitation, gathering and capturing; analysis; organising, categorising and prioritising; formatting and documenting; validation and verification; and tracking and managing requirements changes.

Key stakeholders are the main data source for requirements while project documents are the secondary sources and the requirements identified from them should also be agreed by the stakeholders. ReqM uses workshops and brainstorming sessions as well as data gathering techniques {e.g. interviews} to identify requirements. Also, it uses prioritising techniques to structure and organise them.

ReqM are undertaken by a requirements manager or business analyst who should have several skills and features similar to those needed for the value manager. Within its process ReqM involves a range of internal and external stakeholders who are usually involved in the VM study as well.

DOORS is considered as the leading software which can help in capturing and tracking requirements and can be used after considering its advantages and disadvantages in relation to the project under review. It illustrates requirements as a structured, hierarchical document. This can ease the linkage with the FAST diagram of VM.

It is clear that ReqM has been improved particularly within the IT industry while its integration with VM and other methodologies addressed in this research can enhance its development within the construction industry.

Having reviewed VM and ReqM, the next stage is to review the literature on the third theme of the research, which will be done in the next chapter.

5 CHAPTER FIVE: RISK MANAGEMENT:

5.1 Introduction:

The previous two chapters reviewed the first and the second themes of the research, VM and ReqM respectively. They concluded that VM and ReqM can be enhanced by integrating with other methodologies such as RM. Therefore, this chapter is about the third theme which is RM.

As indicated earlier in the introduction chapter, both risk and uncertainty are inherent in the construction industry. Furthermore, Turner (1993 p235) argued that in order to develop the model of the project, the future performance should be assumed, and this will produce uncertainty. In addition, he mentioned that there is a risk, which may be that the identified project will not go as expected, and this risk comes from the uniqueness of the project. Therefore, he recommended that this risk should be managed in order to complete the project successfully. Nevertheless, risks of construction projects are often not dealt with properly (Thompson and Perry, 1992) cited by (Tah and Carr, 2000 p107). Moreover, the construction industry has been slow to realise the benefits from RM (Flanagan and Norman, 1993; Raftery, 1994; Simister, 1994; Ward et al., 1991) cited by (Uher and Toakley, 1999 p161).

This chapter produces a critical evaluation of RM. Initially, RM historical development is established and then the chapter is divided into two further main parts: firstly, the risk section which includes a critical review of risk definitions and terminologies as well as its relation with project objectives. Secondly, the RM section which includes a critical review of RM definitions and features. After that, projects that need RM are discussed. Then, the strengths and weaknesses of applying RM are reviewed. In addition, there is a discussion of who should participate in the RM study as well as who should manage it. Furthermore, there are some inputs and CSFs, which should be considered in a RM study. In addition, RM approaches are reviewed which highlight some of the common RM tools and techniques. Additionally, RM and timing within an organisation and its levels is reviewed. Moreover, the outputs of the RM study are highlighted. Also, the reasons for avoiding RM are discussed. Finally, a discussion takes place about RM improvements and its future.

5.2 Risk Management Background:

The subject of RM has been around for hundreds, if not thousands, of years (Dallas, 2006 p35). The first emergence of RM goes back as far as 3200 BC in the Tigris-Euphrates valley with the Asipu, who acted as risk consultants (Covello and Mumpower, 1985; Grier, 1981) cited by (Baker et al., 1999a p94). Nevertheless, Dallas (2006 p35) stated that all RM concepts started with gambling. Furthermore, there is also evidence from archaeologists that gambling occurred many years ago (Covello and Mumpower, 1985) cited by (Baker et al., 1999a p94).

However, the basic principles of probability theory were put forward by Pascal and Fermat in the 1650s (Smith, 2003e p40). Moreover, one of the earliest attempts to carry out probability analysis with a problem of risk was by Von Bortkiewicz in the 19th century (Campbell, 1980) cited by (Baker et al., 1999a p94). In addition, the real concept of risk analysis was devised by Hertz (1964) in his article "Risk Analysis in Capital Investments" (Baker et al., 1999a p94). However, RM was used within the construction industry many years ago (Weatherhead et al., 2005 p11) and it emerged as an independent new field in the construction industry in the 1980s (Thevendran and Mawdesley, 2004 p131).

5.3 Risk:

5.3.1 Risk Definition:

Loosemore (2006 p1) stated that risk is a complex concept which has physical, monetary, cultural and social dimensions. Moreover, Jergeas and Revay (1999 p3) mentioned that there are various definitions of risk. Furthermore, Smith (2003a p1) argued that it is hard to agree on a precise definition of risk. However, risk definitions can be categorised into three general ways.

Firstly, general expressions which define risk in the broader societal context {not in project or PM context} such as in Ansell and Wharton (1992), Douglas and Wildavsky (1981) and Franklin (1998) which are cited by Smith (2003a p1).

Secondly, downside definitions, which define risk as the uncertain or possible outcomes with a negative effect on a project such as in Barber (2005 p584), Chicken and Posner (1998), Concise English Dictionary (1976), Edwards and Bowen (1998a p339), Godfrey (1996 p9), Jergeas and Revay (1999 p3), Lowrance (1976), Rowe (1977), Royal Society (1991), Smith and Merritt (2002 p5) and Wideman (1992 p1.3). The downside definitions are usually used in Health and Safety (IRM, 2002 p2; Power, 2004 p14). However, the most common usage of the word 'risk' is for a negative definition or downside, as it basically has a negative meaning for people (Hillson, 2002 p235; Kähkönen, 2001 p2).

Thirdly, there are combined upside and downside definitions which define risk as having uncertain or possible outcomes with a positive or {normally} negative effect on the project such as in APM (2006 p26), BSI (1996), Chin (2004 p133), Flanagan and Norman (1993), H M Treasury (2004 p9), IRM (2002 p2), Jorion (2001 p3), Loosemore et al. (2006 p8), OGC (2002d p2, 2003h p3, 2007j p5, 2007x p1), Perminova et al. (2008 p74), PMI (2000 p127, 2004 p238, 2008 p275), Power (2004 p14), Simon et al. (1997 p16), Standards Australia (1999 p3, 2004), Turner (1993 p235), Ward and Chapman (2003 p98) and Zou et al. (2007 p602).

The last approach is the most recent one to define risk and leaders in the field of RM adopt it within their definitions. However, in this research, Smith's (2003a p2) definition of risk will be used because he summarised and combined their definitions of risk when he stated that "*It is clear that there are sources of risk which can be assessed by considering their probability of occurrence and*

their adverse impact on the project objectives, and there are genuine unknowns whose outcome could be beneficial or detrimental to the project objectives".

5.3.2 Risk Terminologies:

There are some terminologies, which should be clear in order to increase the understanding of risk. These are clarified as follows:

5.3.2.1 Risk, Threats and Opportunities:

As indicated earlier, risk has two sides which are positive and negative, the positive side is opportunity while the negative is threat (Hillson, 2002 p235). Both threats and opportunities should be considered and managed in any decision. They can sometimes be managed separately, but they are not independent (Ward and Chapman, 2003 p98). In addition, threats and opportunities are intuitively balanced by expert project managers, directors and organisation executives (Kähkönen, 2001 p1). However, both have the same significant effect on the project's success, and they need to be managed proactively. In addition, they are not qualitatively different in nature, since both have an uncertain effect on the project objectives. From this argument, both can be handled in the same process with some improvements (Hillson, 2002 p236).

5.3.2.2 Probability {Likelihood}, Consequences {Impact} and Imminence {Proximity}:

It is important to know what exactly is being measured in order to understand the concept of risk. Risk is usually measured in terms of probability and consequences (Loosemore et al., 2006 p10).

Probability is used to understand how likely it is that risk will occur and it can be expressed qualitatively as 'likelihood' or quantitatively as 'probability' (Dallas, 2006 p39). Probability can be defined as "*the degree of uncertainty of an event happening*" (Haynes, 1996 p3). Probability is a number bigger than zero and smaller than one that shows a judgment about the perceived relative likelihood of an event (Loosemore et al., 2006 p10).

Consequences are the results that could cause impact if the risks occur and they will affect the project objectives (Dallas, 2006 p39; Loosemore et al., 2006 p10; Walker and Greenwood, 2002 p79.6).

It is also essential to distinguish between probability and imminence as the former shows the likelihood of an event occurring depending on past experience or data while the latter illustrates the likely timing of that event (Loosemore et al., 2006 pp11-12; OGC, 2007x p31).

5.3.2.3 Cause, Effect and Event:

It is important to provide an obvious and unambiguous expression of each risk. Therefore, it is useful that risk is expressed in terms of cause, effect and event. Firstly, the risk cause identifies the risk source which is the thing that gives rise to the risk. Secondly, the risk effect identifies the impact which the risk would have on the organisation's activity should it occur. Finally, the risk event identifies the area of uncertainty in terms of the threat or the opportunity (OGC, 2007x p31).

5.3.2.4 Risk vs. Hazard:

Walker and Greenwood (2002 p78.6) distinguish hazard from risk, believing that the former is a pre-existing condition which has the ability to cause a negative effect, while the latter takes account of other circumstances to assess this ability. Godfrey (1996 p10) supports this by giving an example of petrol, which is a hazardous liquid with the risk being based on its nature; the way it is used; the way it is controlled; who is exposed to it; and what is being done. So, risk and hazard are different.

5.3.2.5 Risk vs. Issues:

Risk is an uncertain {but with a probability attached} event, which, if it occurs, can affect the project. Whereas in the risk literature, an issue is an unplanned event that has already occurred and can also affect the project. The project team needs to address issues in a similar manner to risk and they can be captured when they arise in risk identification. However, once they have been identified, they are managed in quite different ways (Dallas, 2006 p39; Kaliprasad, 2006 p28; OGC, 2007x p155; Smith and Merritt, 2002 p6). Problem, query, concern, change request or risk occurred are possible examples of an issue (OGC, 2007x p155). So, risk and issues are different and are managed separately.

5.3.2.6 Types of Risk: Fixed vs. Variable:

Variable and fixed risks are differences as variable risk is where the risk can: change, affect other risks or cause new risks while fixed risk cannot (Kraemer et al., 1997 p340). For example, inflation can: change, increase the risk of cost overrun in a project, or cause bankruptcy for a company and thus inflation is a variable risk. Therefore, variable risk is more important.

5.3.2.7 Risk vs. Uncertainty:

Different authors have different views of risk and uncertainty. Stoughton (access on 20/4/2010a p1) stated that several practitioners see uncertainty as another way of describing risk. Loosemore et al. (2006 p9) have argued that the differences between risk and uncertainty are specifically relevant to Health and Safety management. Kaliprasad (2006 p27) stated that while risk and uncertainty are not the same, their terms are used interchangeably. Smith (2002a p100) mentioned that risk and uncertainty have different meanings and the two terms should not be used interchangeably. In addition, Smith et al. (2006 p3) stated that these two terms could be used in different ways and because these two terms are distinctly different, several authors state that risk should be considered as separate from uncertainty.

However, the difference between the two can be traced back to the 1920s when Knight (1921 cited in Smith 2003a p2) stated that "*the practical difference between the two categories, risk and uncertainty, is that in the former the distribution of the outcomes in a group of instances is known ... while in the case of uncertainty this is not true, the reason being in general that it is impossible to form a group of instances, because the situation dealt with is in a high degree unique*".

Regarding this, Pender (2001 p81) argued that Knight (1921) sees risk as the incomplete knowledge from where the future can be forecasted by the laws of chance. Shackle (1952 cited in Pender 2001 p81) argued that this is where a probability distribution of future occurrence can be made. On the other hand, Miller (1956 cited in Pender 2001 p81) defined uncertainty as the variability of future outputs where a probability distribution of future occurrence cannot be made. From these definitions, Pender (2001 p81) concluded that risk applies when there is prior knowledge, while uncertainty applies when there is not.

Regarding this and according to other authors such as Hiley and Paliokostas (2001 p4), Kaliprasad (2006 p27), Smith (2002a p100), Smith et al (2006 p4) and Perminova et al. (2008 p77), risk exists when a decision is expressed in terms of probable outputs with known probabilities, whereas uncertainty exists when there are two or more probable outputs of a course of action but the probability of each one is unknown. In a linkage statement, risk is a measureable uncertainty but uncertainty is an immeasurable risk (Olsson, 2007 p747; Walker and Greenwood, 2002 p78.6). Nevertheless, uncertainty is a more comprehensive term which includes risks, opportunities, threats, as well as other aspects such as variability, ambiguity and complexity (Ward and Chapman, 2003 p99).

Having identified risk and its terminologies, the next section discusses how risk relates to project objectives.

5.3.3 Risk and Project Objectives:

Loosemore et al. (2006 p14) stated that risk is used to represent the influence of an uncertain event in the future on certain individuals, groups or a firm's goals. For example, if one goal is to finish the project on budget, then a firm's risk profile should involve the entire set of uncertain events that can affect that objective. If that objective changes, then other uncertain events in the future become risks and need to be managed. Furthermore, Zou et al. (2007 p602) supported this when they argued that there is a direct link between effective RM and project success, since risks are evaluated by their potential effect on the project goals. They also concluded that past research has significantly concentrated on examining the effect of risk on at least one aspect of project strategies with respect to: cost, time, quality, safety and environment sustainability. Examples of these studies have been reported on by a number of authors like (Abdelhamid and Everett, 2000; Chen et al., 2004; Chen et al., 2000; Dione et al., 2005; Haslam et al., 2005; Kaming et al., 1997; Kartam et al., 2000; Lee et al., 2005; Mulholland and Christian., 1999; Shen, 1997; Tam et al., 2004; Tilly et al., 2000). However, when considering many stakeholders and their requirements, the concept of risk becomes complicated (Loosemore et al., 2006 p14).

From the above discussion, it is clear that RM needs to have a clear set of project objectives and stakeholders' requirements in order to manage risks that are associated with them successfully.

Having identified and clarified risk and its relation to project objectives and requirements, the next section discusses the management of this concept.

5.4 Risk Management:

5.4.1 Risk Management Definition and Features:

PMI (2004 p237, 2008 p273) defines RM as "*the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project … in order to increase the probability and impact of positive events and decrease the probability and impact of negative events in the project*".

This definition is adopted for this research because it is common in RM literature; it considers both positive and negative aspects of risk; and it highlights the five core steps to manage risk formally which will be discussed later. From this definition and according to IRM (2002 p2), it is clear that RM should be concerned with managing both threats and opportunities. Kähkönen (2001 p1) supports this viewpoint by arguing that managing threats and opportunities should be integrated and the methods and models available have to be according to this principle. Furthermore, Godfrey (1996 p12) and Hillson (2002 p236) mentioned some benefits from this as: it provides a more complete picture of likely outcomes to help in decision making; ensures opportunities are highlighted and managed; reduces the additional overheads that result from managing opportunities as a separate technique; and increases efficiency, as a single technique dealing with two types of issues will be more efficient than two separate techniques.

However, Olsson (2007 p752) concludes that RM cannot fully manage opportunities. He also stated that it is not easy to design a step approach to identify and realise opportunities unless a holistic view within the project is developed. From this, it can be seen that RM needs some improvements to become more efficient in managing opportunities. One of these improvements is the modification to the process, as suggested by Hillson (2002 p236) while the other improvement is to integrate it with VM and ReqM as will be argued in the next chapter.

RM has features that distinguish it from other processes as follows. Wideman (1992 pI.2) stated that RM is a very constructive and creative process. HM Treasury (1997 p16) added that it is planned and systematic. Hiley and Paliokostas (2001 p4) supported this by stating that it is a systematic and contemporary process. Furthermore, it is not about future forecasting, nor is it a single, one-off determination fixed for the project period. In addition, the risk analysis implementation does not change anything in the real project. Rather RM is about communication and providing better decisions on a real project under uncertain conditions. It is a continuous and dynamic technique that is needed during the PLC (Smith, 2003a p4). Moreover, RM is not only about eliminating risk but rather it is used to mitigate it (Merna, 2003 p89; Smith et al., 2006 p187). RM is more than a technical practice; it involves important ideals and values, not least of which are responsibility and accountability (Power, 2004 p11). In addition, it provides a structured response to risk in terms of

alternative options about plans, solutions and contingencies; is a thinking technique needing imagination and ingenuity; and it provides a realistic {and sometimes different} behaviour in project workers by preparing them for risk rather than making them surprised when it arises (Smith, 2002b p42, 2008a p43).

5.4.2 Projects that Need Risk Management:

RM can be used for all projects depending on the size, nature, and complexity of the project (The Highways Agency, 1999 p6; Wood and Ellis, 2003b p255). In small projects, it might involve team reviews and a simple risk register only, while for more complex ones, there is a need for a full workshop and risk modeling (The Highways Agency, 1999 p6). Furthermore, Godfrey (1996 p20) and Smith et al. (2006 p183) mentioned some situations and problems that need the systematic use of RM. However, the main thing that is mentioned in relation to this research is to use RM at points of main decisions or changes like investment decisions and changes as a result of applying VM interventions.

5.4.3 Advantages of Risk Management:

Reichmann (1999 p6) states "*one of the most important lessons I have ever learnt, and I did not learn it early enough, is that risk management is probably the most important part of business leadership*".

There is a consensus on the idea that RM is a significant and integral part of PM and not just a set of tools and techniques (Haynes, 1996 p68; Kaliprasad, 2006 p26; Olsson, 2007 p745; Raz and Michael, 2001 p9; Smith, 2002b p42, 2008a p43; Smith and Merritt, 2002 p3). Furthermore, this view is currently widely recognised by the leading PM institutes (Asociacio´n Espanola de Ingenieria de Proyectos, 2001; IPMA: International Project Management Association, 1998; PMI, 2000; Simon et al., 1997) cited by (del Cano and de la Cruz, 2002 p473). In addition, IRM (2002 p2) considers RM as a central part of any organisation's strategic management. Moreover, Thevendran and Mawdesley (2004 p131) and Zou et al. (2007 p602) argued that RM has been considered a necessity in the current construction industry. Furthermore, most successful projects have effective RM while poor RM is considered the major cause of project failure (OGC, 2003h pp2-3, 2007j pp4-5). From this argument, it can be seen that RM is very important in PM generally, especially in construction projects, and it has many advantages as follows.

There are several reasons for applying RM but the major one is that it can produce significant advantages far in excess of the cost of doing it (Merna, 2003 p109). In addition, the benefits from using RM serve not just the project or investment but also other parties such as the whole organisation and its customers (Turner and Simister, 2000).

According to the above definition of RM and according to Godfrey (1996 pp16-18); Hillson (2002 p235); HM Treasury (2004 p7); Isaac (1995 p225); IRM (2002 p2); Loosemore et al. (2006 p5); Poynter-Brown (1995 p30); Smith et al. (2006 p7); and Ward and Chapman (1991 p117), RM is

used to maximise opportunities and minimise risks and uncertainties by identifying and managing them within different levels of the organisation in order to improve decision-making and alternative selection. Furthermore, it is used to provide a real and better estimation of cost and time earlier than other deterministic techniques to avoid excessive overruns that can invalidate the economic situation for the project (Huseby and Skogen, 1992 p160; Pugh and Soden, 1986 p160; Smith, 2003e p42). Furthermore, RM provides better customer concentration and smoother earnings profiles (Cadbury, 1992; Cary, 2000; Turnbull, 1999) cited by (Holt, 2004 p253). Also, RM enables stakeholders to decide if the possible advantages associated with a certain work are enough to guarantee accepting associated risks (Chapman, 1995 cited by Othman, 2005 p24).

RM plays a significant role in improving value for money (IRM, 2002 p4; Mootanah, 1998 cited by Othman, 2005 p25). RM improves value by managing risks and uncertainties associated with the solution that offers the best value to the business. Othman (2005 p25) supports that when he states that cost savings can be achieved and value can be enhanced through RM by identifying, assessing and responding to the risks associated with options that offer better value to the business.

Moreover, RM improves value by ensuring that only projects that add value to the organisation are approved (Smith, 2003e p42). However, project value is unlikely to be achieved if either all risks are avoided or many unmanageable risks occur that impair its delivery, thus destroying value. Therefore, risk should be taken and managed effectively to increase value (Dallas, 2006 p53). This is supported by Godfrey (1996 p12), Hiley and Paliokostas (2001 p5) and Othman (2005 p24) when they agree that by efficiently preventing, reducing or managing risk, RM can add more value to the project. For example, if a set of ladders on site is replaced by a hoist to minimise the risk of a worker falling and injuring themselves, the added value might be the increase in the worker's mobility and consequently their productivity (Godfrey, 1996 p12).

Other benefits of RM can be found in Edwards (1995) cited by Hiley and Paliokostas (2001 p5) and Turner and Simister (2000). However, Simister (1994 p7) highlighted four reasons for using RM: client demand; for own personal use; company policy; and because it is required by other personnel within the client's own company.

In summary, the above advantages can be attained if the RM is applied properly and effectively while keeping in mind that RM is only applied if its costs fit with expected benefits (Miller and Lessard, 2001 p437; Wideman, 1992 pI.5).

5.4.4 Disadvantages of Risk Management:

As mentioned above, there are many advantages to be gained from using RM. However, there are also some disadvantages. Firstly, there is some confusion in RM because it is the term used by different industrial areas to identify discrete activities which not only take place at different stages of the PLC but are periodic or repetitive procedures including different levels of certitude and possibly different methodologies (Smith, 2002a p100). Secondly, it is considered to be too

expensive and time consuming and therefore on a small project, with a small management budget, risk analysis is usually avoided (Pugh and Soden, 1986 p160). Researches like this one would contribute in solving these problems and reduce RM disadvantages.

Having identified concepts, features, need and weaknesses of RM which indicated what RM is, the next five sections discuss how and when this methodology can be used.

5.4.5 Risk Management Team:

Loosemore et al. (2006 p201) stated that the establishment of an effective RM team is a significant resource decision that helps to communicate a firm's commitment to its RM policy. Wood and Ellis (2003b p257) argued that RM teams consist of all key stakeholders such as clients, project managers, designers, cost consultants, contractors {where appointed}, end users and sometimes external organisations {such as a local residents' association}. Furthermore, Loosemore et al. (2006 p201) argued that an effective RM team involves several people with the necessary features and expertise to champion, drive, develop, monitor and continually improve the RM process. In addition, Godfrey (1996 p27) indicated some pre-identified criteria to be used in choosing an ideal RM team and mentioned that the risk manager helps the client to do that properly. The RM team can be external or internal but IRM (2002 p5) stated that an internal team with well communicated, consistent and coordinated processes and tools can be more effective than an external one.

It is clear that any RM team should be led by at least one risk manager who might or might not be an existing member of the project team (Godfrey, 1996 p26). However, an external risk manager is better at providing more control of team members as well as prompting and guiding sessions in order to provide a better balanced assessment of project risk sources (Godfrey, 1996 p26; Smith et al., 2006 p232). The roles of the risk manager are to lead the team towards effective RM and to review the RM system to ensure it is responsive to the organisation’s priorities and changes in the business environment (Loosemore et al., 2006 p202).

5.4.6 Risk Management Inputs:

As with VM, RM needs some considerations to be more effective and applied smoothly. Dallas (2006 p35) argued that for effective RM, it is important to keep it as simple as possible so it remains manageable. He added that too much detail and complication could make the RM task unwieldy and therefore team members could lose interest in the process. Moreover, OGC (2003h p3, 2007j p5) stated that successful RM needs commitment of senior management, process ownership and understanding, and an active RM system reviewed periodically in a constructive 'no-blame' culture. In addition, Smith et al. (2006 pp24-25) mentioned four requirements for effective RM and they considered them as the main factors of success. Therefore, they will be considered for this research. These are: management attention; motivation; the qualifications and knowledge within the project; and the experience and personality of the risk manager. They argued that these factors are related to both people and work within projects and they highlighted that understanding people and their

attitudes in different roles is one of the keys to success in RM. Other factors can be found in Smith et al. (2006 p94) and Ward et al. (1991 p140). Considering all these factors can lead to successful implementation of RM.

5.4.7 Risk Management Approaches:

It is very important for the project manager to keep risks and contingency in mind, especially when establishing the cost estimation and the project timetable {schedule}. In addition, the manager should know how to manage this risk if it occurs and whom the best person or team to deal with this risk is. Risks that do not offer the potential for profit should be avoided. Risks associated with achieving challenging and worthwhile goals should be managed through RM approaches. Smith et al. (2006 p37) stated that basically, there are two approaches of RM; formal and informal approaches. This view is supported by Loosemore et al. (2006 p198) and Ward and Chapman (1991 p120). The selection of one approach is based on the size, nature and complexity of an organisation and its projects (Loosemore et al., 2006 p198). The choice of approach influences the process and procedures which will be used in RM in typical engineering projects (Smith et al., 2006 p37). However, these two approaches are explained as follows:

5.4.7.1 Informal RM:

This is characterised by a relative absence of documented RM policies and processes as well as being suited to small companies, which undertake relatively low risk, and simple, repetitive projects in stable environments. Normally, processes are unstructured and subjective, the outcomes are a limited set of contingency allowances which are added to the cost and schedule of the project (Loosemore et al., 2006 p198). Regarding its nature, many firms apply this approach, even big ones, but they do not realise that they are implementing any type of RM process (Smith et al., 2006 pp37-38). The main problem with this one is that it is considered enough, but evidence and experience shows that it is not, especially in complex projects (Loosemore et al., 2006 p198; Smith et al., 2006 p38). However, the most widely used technique in this approach is the provision of contingency funds and the second one includes discussions with experts on similar projects and evaluation of their views as to the probable risks in a project, after reviewing the project in the light of these risks (Smith et al., 2006 p38). Therefore, the formal RM will be considered for this research which is discussed in the next section.

5.4.7.2 Formal RM and its Procedures:

This approach consists of a set of clear procedures for organising the RM process. These are designed to become a routine and habitual part of PM, producing integrated guidelines for all levels in the organisation, enabling uniformity of approach and more objectivity in decision-making (Loosemore et al., 2006 p198; Smith et al., 2006 p38). Normally, the outcome is a flexible system that leads people through the RM stages by motivating and promoting them to think about risks and by producing techniques for identifying, assessing and responding to them (Loosemore et al., 2006

p198). However, the establishment of a formal system consists of three major steps. These are: creating and communicating an RM policy; creating and executing an RM system; and building a RM ethic into corporate culture. Details on these steps can be found in Loosemore et al. (2006 pp199-207).

There are several models or methodologies for RM in projects. Different authors have produced their own procedures that are best suited to the kind of projects which they are involved in (Smith et al., 2006 p40). Examples of these procedures can be found in Chapman (2001 pp147-148); HM Treasury (2004 pp13-36); Merna and Lamb (2004); OGC (2007x pp35-54); Simon et al. (1997); Smith (2003e pp41-48); and Turner (1993 pp235-260, 2009 pp209-231). Raz and Michael (2001 p10) found that there is a general agreement about the content of the process, with differences based on variations in the detailed levels of the assignment of tasks to steps and phases. Thevendran and Mawdesley (2004 p131) supported this view when they argued that there is a consensus in the literature of RM on the four core steps of the RM process. These are: risk identification; assessment; response; and monitoring and control. Therefore, this research adopted the APM (2006 p27) and PMI (2004 p237, 2008 p273) procedures because they are: provided by two of the main PM bodies; considered as a comprehensive process; and accommodate the four core steps. Regarding this, the RM procedures are RM initiate/planning; RM identification; RM assessment {qualitative and quantitative assessment}; plan risk responses; risk monitoring and controlling {monitoring, reporting, reassessment, and learning}. Figure 5.1 shows these steps which include inputs, outputs, tools and techniques of each one. However, these steps are reviewed as follows to show the needed improvements to manage opportunities; and to be considered in the integrated approach of this research:

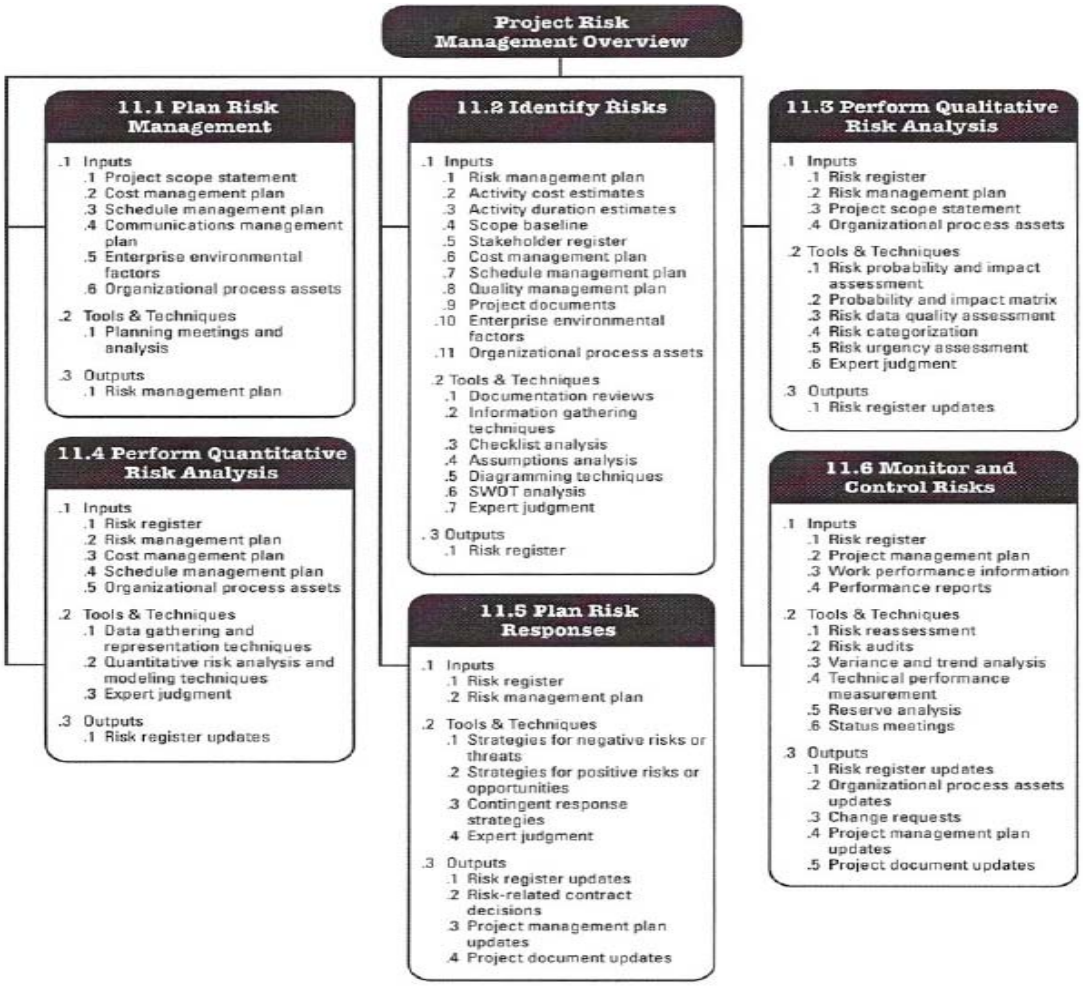

Figure 5.1: Project risk management overview {source: (PMI, 2008 p274)}

5.4.7.2.1 RM planning:

This phase ensures that project goals are clearly highlighted and understood, and concentrates on the risk process around the specific requirements of the particular project, recording the outcomes in the risk management plan (Hillson, 2002 p236). It aims to produce a clear unambiguous shared understanding of the RM process (Chapman, 2001 p149). The objectives of RM should be agreed before embarking on risk identification. Furthermore, it is important to highlight roles and responsibilities, methodology and manner, reviews and reporting frequency, budgeting, timing and risk categories, which are recorded in the RM plan. The RM plan is a subset of the PM plan, defining how RM will be carried out for this project (Hillson, 2002 p237; PMI, 2004 p243, 2008 p276).

5.4.7.2.2 RM identification:

Successful RM is based on the comprehension of risk identification (H M Treasury, 1997 p16; OGC, 2007j p12). Risk identification is beneficial even if no subsequent phases are carried out (Perry, 1986 p213). It is the most important phase of the RM process. It provides significant advantages in terms of project understanding and produces an early indication of the need for RM

strategies (Smith, 2003e p42). This phase is used to identify risks and create and update a risk register or risk log in order to record the identified risk (OGC, 2005f p4). Furthermore, it sets out to identify an organisation's exposure to uncertainty (IRM, 2002 p5).

5.4.7.2.2.1 Risk identification techniques:

There are several techniques for risk identification, most of them relying on experience of similar projects as there are no universal rules that could be applied (Bajai et al., 1997 cited by Hiley and Paliokostas, 2001 p4). Hillson (2002 p237) supported this view when he stated that there is no single best technique for risk identification, and a suitable combination of tools should be applied. However, risk identification is usually achieved by interviewing key project participants, risk workshop, reviewing past corporate experiences and/or reliance on the experience of the risk manager (Haynes, 1996 p74; Kwakye, 1997 p43). According to Haynes (1996 p74), risk workshop is generally the preferred and the most effective way to identify risks proactively.

Normally, all risks should be proactively identified when the decision is being taken so that they can be dealt with before they take place. Additional to the above, proactive risk identification techniques include imagining potential future events, which can influence negatively or positively on the achievement of identified goals. Nevertheless, it is impossible to identify all risks in advance and this indicates that risk identification should have a reactive and a proactive focus in order to be effective.

In contrast with proactive risk identification, the reactive one aims to detect unforeseeable risks that arise after a decision has been taken. These might be missed because of insufficient proactive measures or arisen suddenly as a result of unpredictable events in workplace activities and processes or in the business environment. Reactive risk identification techniques can be done by simply motivating workers to inform their supervisors of risks when they know them. However, there are also formal techniques that can help in this process. Examples are risk inspections; bug listing; risk review meeting; industry information; automatic sensors; incident investigations; performance appraisals (Loosemore et al., 2006 pp43-65).

However, Hillson (2002 p237) argued that SWOT analysis, constraints and assumption analysis and force field analysis can be added to help in identifying opportunities {these techniques are also used in VM}.

5.4.7.2.3 RM assessment:

Risk assessment is used to measure the magnitude of the identified risks (Loosemore et al., 2006 p16). Its purpose is to understand and quantify both likelihood and the impact of risk (H M Treasury, 1997 p16). Other advantages include: improvement of the project understanding in general and highlighting the options available in delivery and methods (Wideman, 1992 pIV.1). However, most risk assessments are applied in two stages which are: firstly, qualitative assessment to describe and understand each risk and to provide early indication of the key risks by using a

qualitative/descriptive scale such as high, medium and low. Secondly, quantitative assessment to quantify the probability and the impact of each risk in terms of cost, time and performance by using numerical estimates (H M Treasury, 1997 p16; Huseby and Skogen, 1992 p160; Loosemore et al., 2006 p85). Dallas (2006 p44) clarified the use of each one when he stated that the use of qualitative or quantitative assessment is based on the use of their results. If the data is to be used just to establish the RM system, qualitative assessment is normally enough. On the other hand, if the results are to inform a risk allowance the analysis has to be quantitative. Nevertheless, Loosemore et al. (2006 p119) stated that quantitative assessment can only be applied: after qualitative assessment; on risks that appear as specifically significant from qualitative assessment; when appropriate data for analysis is available; when there is enough time; when the expertise is available; and when it makes sense to attribute numbers to the consequences of a risk. Key points of the two stages are explained as follows:

Firstly, qualitative assessment results are the basis for most decisions (Restrepo, 1995) cited by (Patterson and Neailey, 2002 p368). This is mainly because they are easier, quicker and less costly than quantitative ones. However, as a result of this, more uncertainties and less accurate information than quantitative ones are involved and these are considered weaknesses of qualitative assessment (Patterson and Neailey, 2002 p368). Baker et al. (1999a p94) found the most successful techniques in this stage are personal and corporate experience and engineering judgment. Hillson (2002 p237) stated that the probability-impact matrix is the primary technique and it should be modified to accommodate opportunities more effectively, as shown in Figure 5.2. The arrow of attention has the wrong direction. It should be bottom-up ↑ to focus on risks with very high impacts and probabilities.

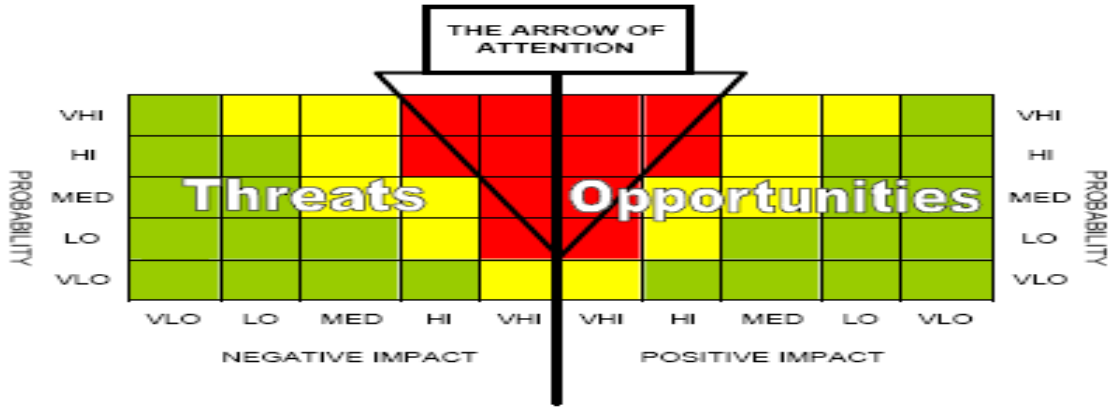

Figure 5.2: Double probability-impact matrix {source: (Hillson, 2002 p238)}

In order to overcome some of the weaknesses of qualitative assessment, it is possible to use semi-quantitative assessment, which takes qualitative assessment a step further by attributing pre-defined values to the probability and consequence labels which could result in better estimates of risk and can be applied to adjust schedule {time}, estimates or bids (Loosemore et al., 2006 p124).

Secondly, if quantitative assessment is needed, statistical methods should be applied (Dallas, 2006 p46). Perry (1986 p213) argued that there are several techniques in these stages and the choice of one depends on factors such as: the available experience; expertise; and computer software. Smith et al. (2006 p46) added other factors such as: the project type and size; time and information availability; and the purpose of the analysis. Baker et al. (1999a p94) found that: expected monetary value; expected net present value; sensitivity analysis; and decision analysis are common quantitative techniques. Hillson (2002 p238) stated that these techniques involve creating a model of the complete project or main components, reflecting defined uncertainty into the model, and assessing the negative and positive influence on the project goals through statistical simulations. In addition, arguing that the aim is to determine all levels of risk exposure associated with a project, highlighting areas of particular risk, and helping to choose a suitable response.

5.4.7.2.4 Plan risk response:

By carrying out a risk analysis, the possible effects of risk occurring can be seen in terms of the project outcome. This will then lead to the formulation of management responses to the risks. According to Isaac (1995 p227) response is any action or task which is applied to deal with a particular risk or group of risks. He argued that choosing the response{s} requires an evaluation of the influence, which the response will have on the original risk and the most effective way of choosing the response is through a cost/benefit analysis of the response and then selecting the best one. He identified the steps as: establishing a base line; considering each possible response by estimating its cost and benefits {effect on risk}; reappraising the risk impact, assuming it occurs, given that the response has been applied. Furthermore, he argued that the most important thing is to consider the response timing rather than be too concerned about its type. Hiley and Paliokostas (2001 p4) argued that risk response is based on risk attitude that has an important role within the client's organisational strategy. However, Hillson (2002 pp238-239), supported by OGC (2007x p51, 2007y p119) and PMI (2004 pp261-263, 2008 pp303-305), distinguishes between the response strategies for opportunities and threats and they are reviewed as follows:

5.4.7.2.4.1 Threats response:

This includes avoidance, reduction and transfer. Firstly, risk avoidance is for situations in which the level of risk is deemed too uneconomical to accept. Therefore it is eliminated by abandonment of a project or by removing the activity with which the risk is associated (Ashworth and Hogg, 2000 p123). Secondly, under risk reduction, the project manager takes on the risk but measures are put in place to reduce the effect should the risk occur, and normally a percentage allowance is added to the project estimate. Also, risk can be reduced by uncovering more information about its situation (Ashworth and Hogg, 2000 p122). Finally, transfer of risk requires that another organisation takes responsibility for part or all of the consequences of the identified risk when it occurs. Such an action requires that the risk is accurately and comprehensively identified and the parties which consume

the risk have the necessary ability to control and deal with the consequences and that the transfer is in the best interest of the client, who will usually pay a premium for the transfer (OGC, 2003h p12). However, Baker et al. (1999a p94) found that risk reduction through staff training and education, as well as improving working environments, is the most common approach for responding to threat.

5.4.7.2.4.2 Opportunities response:

This includes exploitation, sharing and enhancement. Firstly, exploitation strategy seeks to remove the uncertainty associated with a particular opportunity to ensure it definitely occurs. Secondly, shared strategy seeks to find another party who is best to manage the opportunities. This can be done by forming risk-sharing partnerships, teams, special purpose companies, or joint ventures that could be created with the aim of managing opportunities. Finally, enhancement strategy seeks to modify the opportunity size by increasing their probability and/or impacts, as well as by highlighting and optimising the main drivers of these opportunities (Hillson, 2002 p239; PMI, 2004 p262, 2008 pp304-305).

5.4.7.2.4.3 Threats and opportunities responses:

The residual risks of both threats and opportunities retained by a party to the contract may be controllable or uncontrollable by that party. Where control is possible, it is normal practice to include a contingency allowance in the estimate as a provision to cover risks in the event that they occur. This usually happens because there are no alternative strategies (Ashworth and Hogg, 2000 p123; Perry, 1986 p215; PMI, 2004 p263, 2008 pp304-305).

5.4.7.2.5 Risk monitoring and controlling:

The last phase in RM procedures aims to: ensure the RM responses are properly implemented and review their effectiveness; monitor the identified risk situations on a regular basis; highlight and assess new risks {reactively}; and monitoring changes in all risk exposure as the project progresses (APM, 2006 p26; Chapman, downloaded on 24/2/2008 p217; Hillson, 2002 p239; PMI, 2004 p237, 2008 p273). Furthermore, it is necessary to communicate and report the information from the RM process within the organisational levels as well as outside it , e.g. by informing external stakeholders (IRM, 2002 p9). Moreover, lessons should be learned for further decisions in future projects (Loosemore et al., 2006 p30).

5.4.7.3 Formal RM Study:

In a RM study, the above formal steps are undertaken through three stages similar to VM ones as: pre-workshop {planning and information}, workshop {introduction, identification, qualitative assessment, and quantitative assessment}, and post-workshop {most of risk assessments, risk response, risk report, risk monitor and control} (Haynes, 1996 p85; Wood and Ellis, 2003a pp25-27, 2003b pp257-258). These stages are explained as follows:

5.4.7.3.1 Pre-workshop stage:

There are usually some important tasks to be undertaken prior to the workshop, which include: firstly, an interview with stakeholders, if the time and the project scale allows. This is done to get a general feeling for the principal concerns of those who are involved in the project. Because of the quality of the information obtained, some practitioners consider it an important part of the process. Others consider it as the actual chance for an honest exchange (Wood and Ellis, 2003a p26, 2003b p257). Furthermore, this tool allows stakeholders to talk about risks which they can see and gives them a feeling of involvement in the process and ownership of the identified risk, and this might lead to more acceptance of any measures executed to decrease risk (Smith et al., 2006 p44). If the interviews are impossible, the risk manager {two days prior to the workshop} sends some information to the participants, which includes project scope, a drawing of the whole project, a detailed estimate and the workshop agenda. Moreover, some risk managers send questionnaires to gain an indication of the stakeholders' opinions before the workshop. They are referred to as risk identification forms and provide the basis for an initial risk listing that could be tabled at the workshop (Haynes, 1996 p74; Wood and Ellis, 2003a p26, 2003b p257).

Secondly, checklists from past projects help to identify risk for similar projects and normally consultants create their own database of risk. However, most of the information comes from participants during the workshop (Wood and Ellis, 2003a p27).

5.4.7.3.2 Workshop stage:

Using a workshop is common (Wood and Ellis, 2003b p254). Its duration ranges from half to two days but half to one day is the most common (Wood and Ellis, 2003a p26, 2003b p258). Typical workshop procedures are: information {sent prior to the workshop}; introduction; risk identification; qualitative assessment; quantitative assessment {usually after the workshop} (Haynes, 1996 p85). However, part of the analytical task is carried out in the workshop in order to create a risk register and define the risk owners who are responsible for mitigating risks (Wood and Ellis, 2003a p25).

5.4.7.3.3 Post-workshop stage:

Most analysis occurs after the workshop before issuing a report draft. Furthermore, some practitioners conduct a review meeting with key stakeholders in order to close out the issues. Usually, the risk manager monitors the execution of the response plan as part of ongoing involvement (Wood and Ellis, 2003a p25).

It can be seen that the above stages are similar to those in VM studies and this provides a good chance for integration of the two processes.

5.4.8 Risk Management Timing:

RM should become part of the organisational culture in order to work properly (Kaliprasad, 2006 p26). It is not easy to introduce RM to an organisation and therefore the Turnbull Report identified

some activities, which are needed to embed RM into an organisation's culture which can be found in Merna (2003 p91) and Smith et al. (2006 p189).

As an essential prerequisite of efficient management and effective decision-making, the RM studies should be applied thoroughly and proactively where key decisions are being taken (Dallas, 2006 p65; OGC, 2007x p5; Smith et al., 2006 pp15-18). At organisational levels when making a new corporate planning or investment decision for a new programme or project, a RM study should be undertaken to proactively identify, assess, and plan responses for key risks. This should produce a strategy for undertaking subsequent interventions during the remain lifetime of such corporate planning, programme or project (OGC, 2007x pp70-77). At the end of each project phase {phase or gateway review}, a RM study should be undertaken within the decision to proceed to the next one (Dallas, 2006 p65; OGC, 2007x p77; PMI, 2004 p237, 2008 p275; Smith et al., 2006 pp15-17). According to the above and Smith et al. (2006 p18), RM is a continuous process which should span all organisational levels and project phases.

The RM at strategic, programme and project levels within organisations should be integrated so that the levels of activity support each other. In such an approach, the RM organisational strategy will be led from the top and embedded in the organisation's normal working routines and tasks. The flow of information between levels is not necessary on a top-down or bottom-up basis (H M Treasury, 2004 p10; Merna, 2003 p90). The identified risks at each level are based on the information that is available at the time of investment and each risk can be highlighted in detail when extra information becomes available (Merna, 2003 p90; Smith et al., 2006 p188). All staff must know the relevance of risk to the accomplishment of their goals and RM training should be available to support them (H M Treasury, 2004 p10). In an organisation, stakeholders and their requirements should be identified at each level and they should contribute to the RM process (Merna, 2003 p114; Smith et al., 2006 pp194-195). Merna (2003 p115) proposes a generic model which aims to identify, analyse and respond to particular risks at each level. These procedures should be a dynamic process applied within the whole PLC in a continuous loop. Figure 5.3 illustrates this model.

From the above and according to OGC (2007x pp65-82), RM and its procedures {including tools and techniques} can fit at all organisational levels but a different focus and RM strategy for each level should be established to identify the specific RM activities for that level. Further information about what to be done at each level can be found in OGC (2005f pp16-23, 2007x pp65-82).

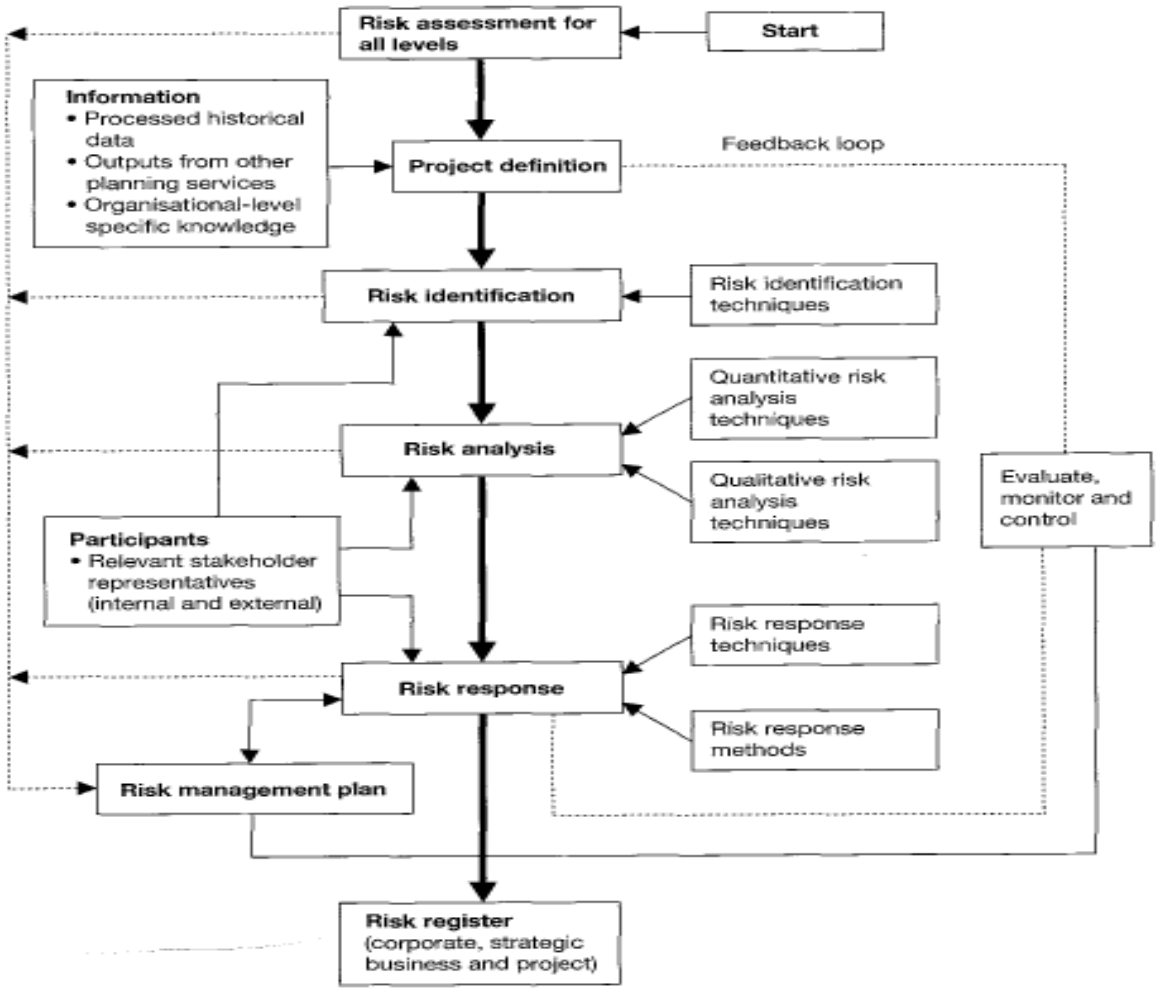

Figure 5.3: RM for all organisation levels {source: (Merna, 2003 p116)}

Turner (1993 p240) argued that just as with quality, risk impact varies over the PLC. The later it occurs, the more costly the consequences are, but in contrast, the less likely they are to happen. He stated that risk can be minimised during the design by selecting a proven design rather than an untested one, or during execution, by selecting a proven methodology. He argued that whenever novelty is introduced, risk of failure increases over the PLC. Therefore, Merna (2003 p110) argued that RM should be a continuous process from early in the PLC until the cost of doing it exceeds the benefits to be gained from it. OGC (2007j p6) added that a RM plan should be ready in order to deal quickly and effectively with risks if they arise and it is important to collaborate as an integrated project team from the earliest possible phase on an open book account to highlight risk throughout the team's supply chains. Nevertheless, Wood and Ellis (2003b p254) found that ongoing RM studies over the PLC are limited largely to the public sector and utilities. However, RM should be used in all stages and this can be explained as follows:

Firstly, all consultants should be involved as early as possible, and most RM studies should be applied during the conceptual phase to appraise and compare alternatives (Wood and Ellis, 2003a p24, 2003b p257). This is mainly because most of the uncertainties and cost implications of

decisions which are taken at the early stages of PLC would have a sharp influence on the overall viability of the project (Perry and Hayes, 1985 cited by Wood and Ellis, 2003b p257). Nevertheless, Uher and Toakley (1999 p161) found that, whereas most practitioners were familiar with RM, its implementation in the conceptual stage was relatively low. However, RM should be carried out by the client's staff at this stage (Smith, 2002a p107).

Secondly, RM should be applied by the contractors during the implementation stage in order to be used in tendering and to maximise competitiveness and profitability (Smith, 2002a pp107-108).

Thirdly, RM is usually undertaken by the party who is responsible for operations and maintenance in order to manage the operational risk (Smith, 2002a p108).

Finally, if there is a decommissioning stage in the project, RM should be applied by the party who is responsible for decommissioning work in order to manage the risk that is associated with decommissioning at the end of the PLC (Merna, 2003 p112).

In summary, RM is a continuous process but it is not applied effectively throughout the PLC, and research such as this will contribute to the increase of its application from earlier stages to the end of the project.

5.4.9 Risk Management Outputs:

According to Wood and Ellis (2003b p256) the outcomes from RM are risk profile, contingency and a risk register, which are explained as follows:

5.4.9.1 Risk Profile:

The summary risk profile is a simple way to maximise visibility of risk. It is a graphic illustration of information, which should be updated in line with the risk register on a regular basis. It illustrates risks as a probability and severity of impact with the effects of response action taken into consideration. However, it is usually referred to as a probability-impact matrix (OGC, access on 31/3/2008x p1).

5.4.9.2 Contingency:

Contingency allowance is the common form of risk premium strategy in construction projects (Akintoye and MacLeod, 1997 p33). Contingencies are needed to produce additional resources to respond to uncertainties or unforeseen events (Godfrey, 1996 p34). The setting and management of contingencies is an important part of project management (Smith et al., 2006 p88). Turner (1993 p254, 2009 p227) stated that contingency allowance can be added to any one of the PM objectives but the major approaches are to increase time and/or budget as well as plan to change the scope. Yeo (1990 p460) argued that one of the most common approaches for contingency allocation is the 'classes of estimate'. He also cited Blok (1982) who highlighted five classes of estimate as order of magnitude; factor estimate; budget estimate; definitive estimate; and final estimate. Yeo highlighted the main purpose of contingency allocation, which is to ensure that the budget of a project is realistic, and enough to accommodate the risk of cost increasing. Furthermore, Dallas (2006 p49)

added another benefit from contingency which provides a source of additional funding if the project forms a part of a large programme.

However, both risk profile and contingency should be included in the risk register which is reviewed in the next section (OGC, access on 31/3/2008x p1; PMI, 2004 p263).

5.4.9.3 Risk Register:

Patterson and Neailey (2002 p365) defined a risk register as "*a tool which has enabled the risks within a project to be documented and maintained irrespective of geographical location, and has provided the platform for the reduction and mitigation plans to be developed for the high level risks within the project*".

The risk register produces a formal tool to record the identified risks and their impact and likelihood as well as their ranking in the project (Patterson, 2001) cited by (Patterson and Neailey, 2002 p366). It should be updated as an ongoing and dynamic process, in which the monitoring and application of information that it includes have to be continual. This is mainly because RM is a cyclic methodology (OGC, 2007j p12; Patterson and Neailey, 2002 p366).

The risk register has several roles. Williams (1994 p18) mentioned two major roles: the storage of knowledge and to initiate the assessment and plans which flow from it. Chapman and Ward (1997) cited by Patterson and Neailey (2002 p366) stated that the risk register identification stage includes compiling a list, log or register in order to enable the recording of risk sources, categorisation and response. Ward (1999a p331) takes this further by stating that a risk register summary helps the project team in reviewing risks on a regular basis over the PLC. In contrast, Barry (1995) cited by Patterson and Neailey (2002 p367) used it as a comprehensive risk assessment system which is considered a formal method of identifying, quantifying, and classifying the risk as well as producing the means of developing a cost-effective way of controlling them. However, a risk register contains many elements about the risks such as those highlighted in Carter et al. (1995) cited by Patterson and Neailey (2002 p367) and OGC (2007x p30, access on 31/3/2008v p1).

5.4.10 Reasons for not Performing Risk Management:

Sometimes RM cannot be used for several reasons. Ward and Chapman (1991 p120) supported this view by providing some of these reasons and they relate the failure to use RM to one or more of them. Furthermore, Akintoye and MacLeod (1997 p36) conclude that formal RM procedures seem to be used to a limited extent by project managers and contractors. They argued that contractors do not apply formal RM because of a lack of familiarity with its tools and techniques as well as the difficulty seeing its advantages, especially for small projects. Moreover, they argued that some contractors considered the majority of risks to be contractual and solved through experience. Project managers also argue that RM is rarely requested by clients as it is not always commercially viable. In addition, some project managers add that RM is about people and not science and models.

In summary, the important thing is not to use RM if it is unnecessary for the project under review.

Having identified when and how RM is undertaken as well as its inputs and outputs, the next section discusses its improvement.

5.4.11 Risk Management Improvement and Future:

In its early days, RM procedures were not commonly agreed on, the supporting software was limited in its capability to indicate real practice and few professionals had trained properly in RM. However, nowadays this has improved (Smith, 2002a p115). In addition, it is still developing and its demand is growing (Smith, 2003g p124). Moreover, enterprise software has been developed, of which Active Risk Manager {ARM} is a common one, which enables the identification, capture and analysis {both qualitative and quantitative} of risks at all levels of the organisation (STG: Strategic Thought Group, 2010 pp3-4).

Regarding its future, Smith (2003g pp124-125) argues that it is difficult to know if perfect RM is possible but for the foreseeable future the need to deliver projects on time, within budget, and according to specifications will support the improvement of RM.

5.5 Chapter Summary:

The RM concept was founded with gambling many years ago. It is not a new subject but recently it has been used in the construction industry and its projects as an independent field. This chapter discussed the RM literature and addressed RM philosophy and methodology in detail which led to many lessons to be learned as follows.

There are different perspectives on risk but the most common one can be concluded as: risk is an uncertain event with known probability and impact, which has a negative or positive effect on the project and its objectives. Threats and opportunities are the main components of risk, in which threats are the negative face, while opportunity is the positive one. Nevertheless, most of the RM techniques apply to threats while there is a few for opportunities.

Risk should be distinguished from confusing terms such hazard, issue and uncertainty. Probability, consequences and imminence should be known to properly understand risk and its management. Other terms such as cause, effect and event should be used for expressing each risk clearly.

RM requires a clear set of project objectives and requirements to manage their associated risks properly. RM is the process of risk planning, identification, analysis, responses, and monitoring and controlling to decrease and increase the probability and the impact of threat and opportunities respectively. To manage both threats and opportunities, two improvements should be made. One is the modification to the RM process as indicated in this chapter while the other one is by integrating RM with other methodologies which will be discussed in the next chapter.

Similar to VM: the right team at the right time should be selected by the risk manager and the client through some pre-identified criteria; the internal RM team is considered more effective than an external one but should involve external experts as necessary; and it is preferred to employ expert independent risk managers. Moreover, for a successful RM, key data should be in place and CSF

should be satisfied and checked for RM to work smoothly, in delivering its benefits. Nevertheless, RM may fail if is undertaken at a late stage particularly when its costs exceed the expected benefits.

The formal RM approach is adopted for this research, as practice indicates that the informal one is not enough, especially for complex projects. The formal RM is carried out through systematic procedures of planning, identification, assessments {qualitative and quantitative}, response, and monitoring and controlling. Each step has some inputs, outputs and tools and techniques as indicated briefly in Figure 5.1. In a RM study, these steps are undertaken within three stages similar to VM ones as: pre-workshop {planning and information}, workshop {introduction, identification, qualitative assessment, and quantitative assessment}, and post-workshop {most of risk assessments, risk response, risk report, risk monitor and control}. The workshop duration ranges from half to two days. The main output from a RM study is a risk register which includes risk profile and contingency.

Formal RM studies should be applied at different organisational levels as well as in different project phases as a continuous process. Nevertheless, their applications are limited in the early phases and at high levels. Stakeholders and their requirements should be identified at each level and phase and contribute to the RM process. RM and its procedures {including tools and techniques} can fit all organisational levels and project phases but for different focuses through different RM strategies. Similar to VM and ReqM, RM studies can be applied at any stage of the PLC while its early application is more important.

Similar to VM and ReqM, RM improves decision-making and value to the organisation. It plays a significant role in project success and failure. However, RM is still improving and powerful tools like ARM are developed to help in managing risk at all levels and phases. Also, researches like these one can help to improve it and overcome some of its weaknesses.

Having reviewed the literature on PM, VM, ReqM and RM, the next chapter attempts to pull them together to conceptualise an integration approach.

6 CHAPTER SIX: SYNTHESIS AND APPROACH CONCEPTUALISATION:

6.1 Introduction:

This chapter draws together, critically reviews and integrates earlier chapters. The chapter conceptualises an approach to solve the research problem stated in Chapter 1 through helping to make informed decisions, particularly investment decisions undertaken at the appraisal stage under great uncertainty, to improve the value and performance of an organisation. To do so, the relationship between different organisational levels will be clarified and their links to investment decisions and the value chain will be discussed. Then, the need and possibilities of integrating ReqM, VM and RM will be discussed through theoretical underpinnings, processes, tools and techniques and intervention points. So as to manage the value chain and aid its investment decision-making in delivering the organisational value, a series of integrated studies will be identified at several interventions. These integrated studies will be clarified through a process diagram which shows the management flow of these integrated studies through the organisational levels. Moreover, the detailed approach of how an integrated study is undertaken will be argued, drawing together ReqM, VM and RM activities as one methodology.

6.2 Structure of Organisational Levels, Investment Decisions and Value Context:

This section deals with structuring value delivery within a large organisation through organisational levels. This is done by clarifying these levels relationships; relating them to the appraisal stage and its investment decisions as well as to the value chain.

6.2.1 Organisational Levels and their Relationships:

A review of the literature including several authors such as Aritua et al. (2009 p75); Haughey (2001 p6); Male (2008 p12); Morris and Jamieson (2004 p5, 2005 p7); Reiling (2008 p1); and Turner (2009 p326) as well as some key institutions such as APM (2006 p7); OGC (2004b p3, 2006d p5); and PMI (2008 p8) indicates four main management levels in the normal delivery of projects in an organisation. These levels are organisational strategy, portfolio, programme and project levels. Some authors such as Aritua et al. (2009 p75); Male (2008 p12); and Naaranoja et al. (2007 p659) note that vision and mission drive organisational strategies and objectives. Nevertheless, there is no clear indication that vision and mission should be treated as a separate level. Thus, the four levels indicated above are adopted in this research.

A project comes originally from the strategies of its organisation as the result of the strategic management process undertaken at its appraisal stage which include a series of investment decisions and strategic alignment processes undertaken through different organisational levels (Kelly et al., 2004 p159; Smith, 2002b p30, 2008a p35). Morris and Jamieson (2004 p5, p23, 2005 p7, p16) support this as they indicate that the strategic management is an ongoing process which starts by formulating strategy at organisational strategy level and then continues to translate this strategy into

implementation via portfolio, programme and project. They argue that strategies could be aligned top-down in a systematic and hierarchical way and corporate planning cascades similarly throughout portfolio management into programmes and projects. There is also a bottom-up flow from project to corporate strategy over resources and as implementation alerts the strategic landscape. Morris et al. (2006 p469) add that project and programme management should feed portfolio management with accurate, up-to-date information, especially on status, including risks as well as arguing about their project or programme needs throughout the portfolio resources allocation process. Reiling (2008 p1) provides an approach to the link between project, programme and portfolio by thinking in terms of a pyramid hierarchy with portfolio at the top, then programme and then project. This view is similar to Male's (2008 p12) pyramid diagram {Figure 2.2}.

The above discussion as well as the portfolio and programme definitions and activities indicated in Chapter 2 clearly indicate to: the portfolio as a link level between organisational strategy and programme levels which select and manage the right programmes and projects; and the programme as a link level between portfolio and project levels which select and manage the right projects. These two links are supported by Haughey (2001 p6); Male (2008 p12); Morris and Jamieson (2004 p15, 2005 p16); and OGC (2004b p3, 2006d p5). According to Ferns (1991 p150), large organisations with several business areas should have several programmes to deliver these business areas as supported by OGC (2006d p5) and illustrated in its diagram. Considering this and the above argument, this diagram is used to show the context of organisational levels as seen in Figure 6.1. It conceptualises the top-down alignment and implementation of strategies via portfolio, programmes and projects.

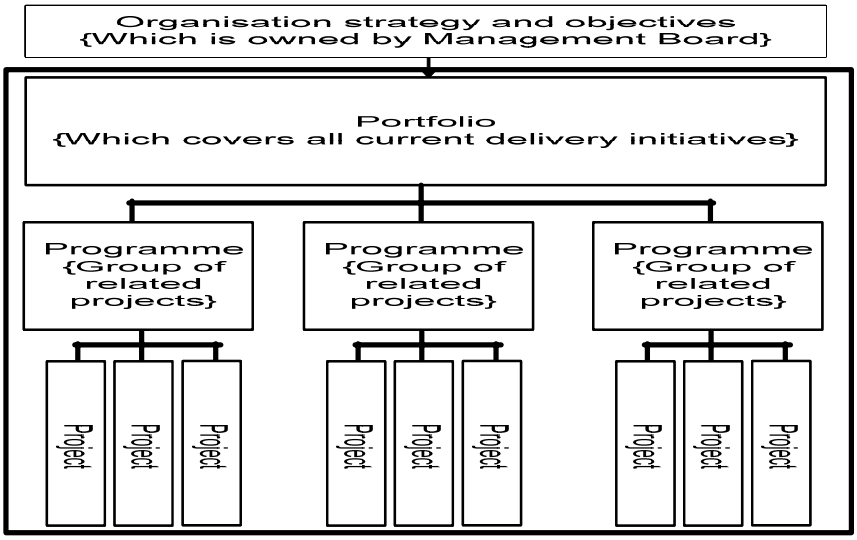

Figure 6.1: Context of organisational levels {adapted from OGC (2006d p5)}

Having clarified the links between organisational levels, the next section shows the value chain flow through these levels in delivering organisational value.

6.2.2 The Value Chain through Organisational Levels:

The PVC has been introduced in Chapter 2 {section 2.6} which forms a part of the organisational value chain {OVC} as the latter highlights the value flow in an organisation from its corporate value at corporate level to use value at project level (Kelly et al., 2004 pp175-177; Male, 2002b p275, 2008b p266).

Kelly et al. (2004 pp159-162) signify the alignment of projects with their higher levels to ensure achieving value for money. They cite Bell (1994) who argues that this can be done through transmission, transfer and maintenance value to achieve value for money through different organisational levels as an outcome of the strategic management process for an organisation. Therefore, the OVC should be kept unbroken to align the project with its higher levels and achieve value for the organisation as a whole (Gray, 1996 p47; Kelly et al., 2004 p159; Standing, 1999 p162).

The strategic phase {client value system} concerns corporate and business value and is used to align project with corporate strategy and thus, it is the main focus of this research. Kelly et al. (2004 p162, p175) argue that in large organisations, the value chain is a multi-layered system of strategically linked activities and it might contain portfolio and programme, where applicable. Therefore, they extend the corporate and business value to think in terms of programme value {∑projects value}. Logically this is because programme concerns delivering a business area (Ferns, 1991 p150) and thereby delivering business value for the organisation from projects realisation, achieving a part of corporate value. Whereas, portfolio concerns delivering the whole investment for the organisation, achieving corporate value from programmes and projects realisation as indicated by OGC (2004b pp2-3, 2011 p39). Therefore, corporate value can be extended to think in terms of portfolio value {∑programmes value}.

From the portfolio or programme perspective, the strategic stage will encompass all competing networked projects and single-project delivery is a tactical issue. Furthermore, a single-project, whether undertaken within a programme or alone, will have strategic and tactical stages. However, the concept of the value chain is useful for viewing a group of projects and their strategic links (Male, 2002a pp20-21). Figure 2.12 is modified and updated into Figure 6.2 to: clarify the above argument; show the concept of the OVC; and focus on the strategic phase.

Having dealt with organisational levels and their relation to the value chain, the next stage is to highlight responsibilities to manage all these.

6.2.3 Roles to Manage Organisation Levels:

According to OGC (2006d pp4-5) and Turner (2009 p367), organisational strategy level is managed by the Board and its members. Platje et al. (1994 p102) and PMI (2008 p25), refer to portfolio and programme managers being responsible for managing portfolios and programmes respectively. All

those people have certain roles in managing their levels as indicated in Chapter 2, while the same chapter highlighted some key skills for portfolio and programme managers.

According to Ceran and Dorman (1995 p67), the project manager is the person who should be responsible for project level work. This role and its required skills are acknowledged by several PM literatures which are highlighted in Chapter 2. Nevertheless, Graham (2000 p189) concludes that in reality, the early stage of a project is not managed by the project manger as this stage requires a unique style of management with high ability and authority, particularly for decision-making. Another reason might be that a project manager tends not to be appointed at this stage as indicated by Kelly and Male (1995 p100). Therefore, APM (2006 p82) and PMI (2008 p25) refer to the sponsor as the one who should manage the project at this stage. This responsibility can be extended to programme level as indicated by Male (2008 p13) and OGC (2006d p4, 2007y p36). Because of their important roles, sponsors should have 360º skills requirements as argued by Male (2008 p13) and highlighted in Chapter 2.

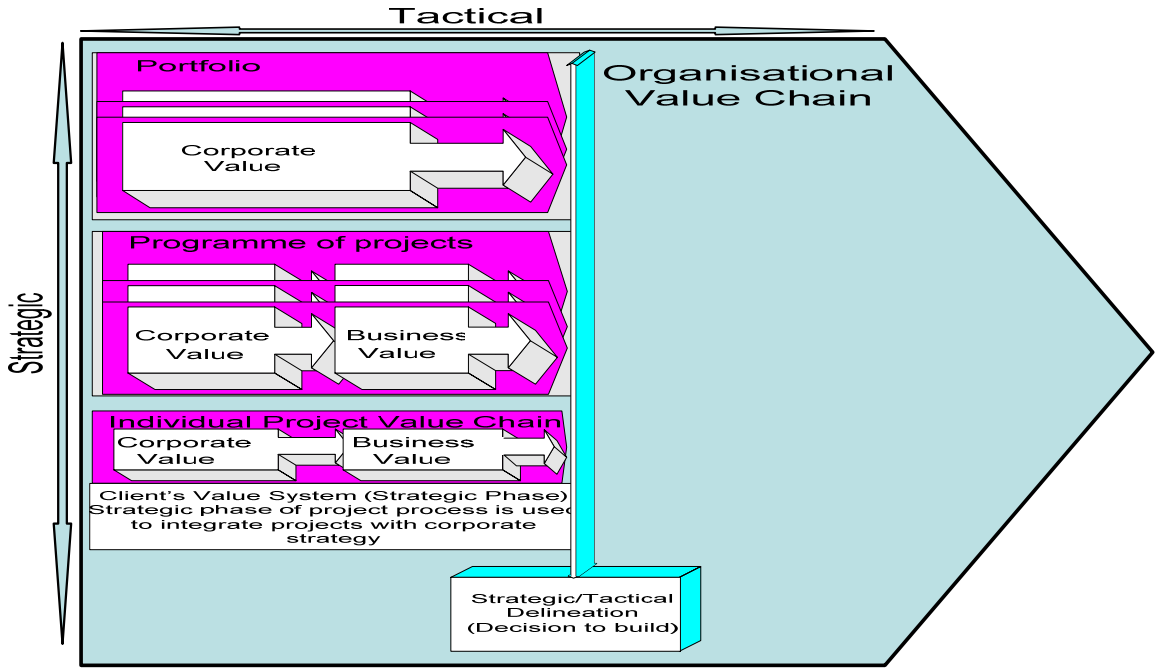

Figure 6.2: The OVC {adapted from Standing (1999 p161)}

As the value chain concept is strongly linked to organisational levels, the two diagrams in Figure 6.1 and Figure 6.2 are combined side by side in Figure 6.3 as an organisation structure considering these aspects and showing the relationships between the different organisational levels as well as OVC within them.

Having linked organisational levels, investment decisions and value chain, it has been identified that investment decisions and value chains go from organisational strategies through portfolio and programmes into projects to deliver organisational value as shown in Figure 6.3. The next stage is to argue the need and possibilities of integrating VM, ReqM and RM.

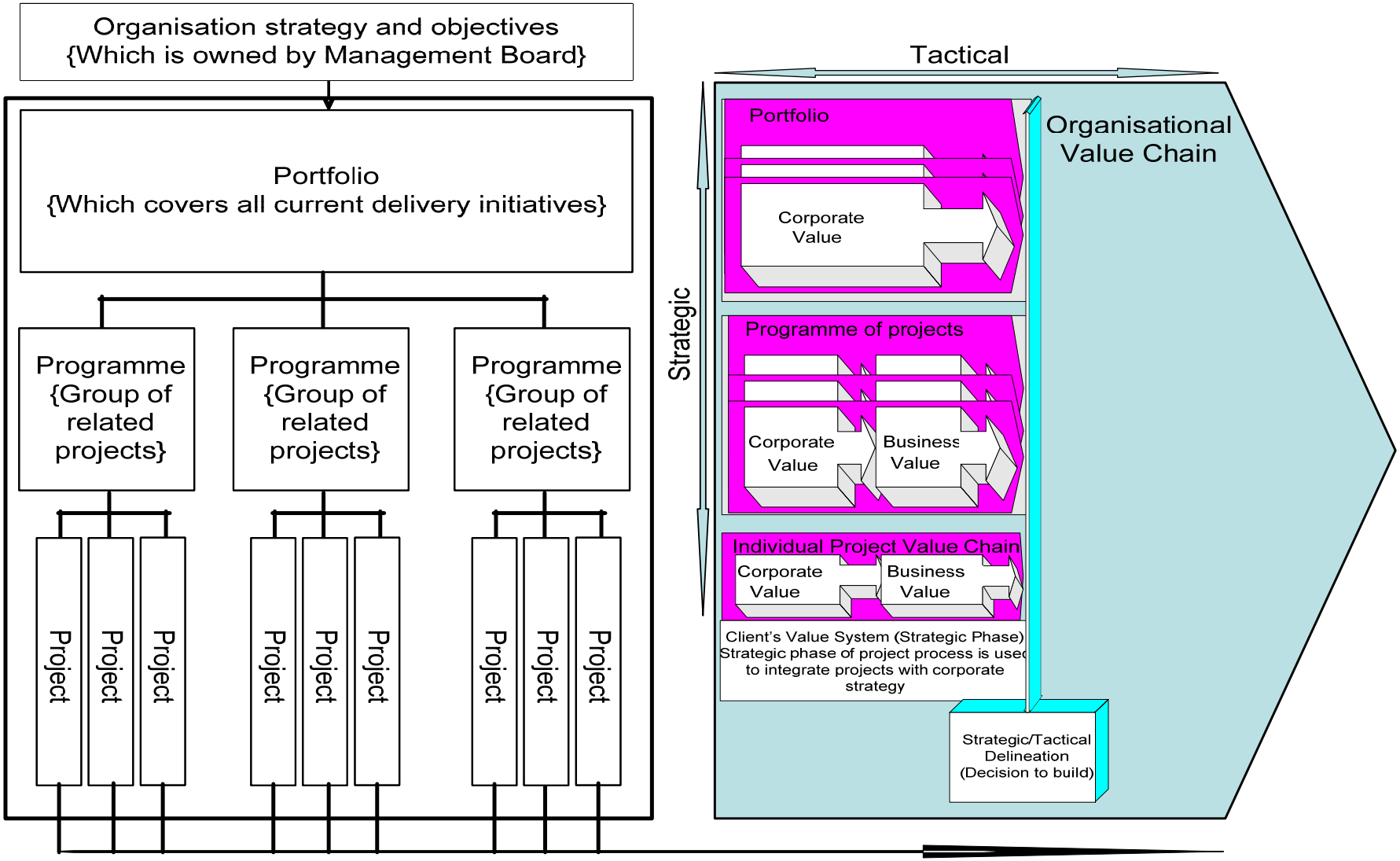

Figure 6.3: The conceptual organisation structure for the research {source: The Author adapted from OGC (2006d p5) and Standing (1999 p161)}

6.3 ReqM, VM and RM Integration Argument and its Possibilities:

Chapters 3 to 5 indicated that several benefits can be gained when each one of ReqM, VM and RM is used properly. Nevertheless, they are related methodologies (Smith and Male, 2007 p3). This section addresses that by highlighting general links between these concepts and then examining the integration possibilities from theoretical underpinnings, processes, tools and techniques and intervention viewpoints.

6.3.1 Overview about ReqM, VM and RM and their General Relations:

In the UK and several other countries, VM was applied as a value-for-money measure within the construction sector. Whereas, RM has developed in the last two decades and is usually associated with VM as a complementary service in the UK (Kelly et al., 2004 pp1-2). The analysis of risk and value has been joined by researchers, seeing them as two sides of one coin, with RM being on one side and value opportunities on the other (Kelly et al., 2004 p139; Major, 2003 p5). The use of this metaphor 'two sides of a coin' to offer an understanding of VM and RM as related concepts is interesting (Griffin, 2004 p32) as metaphors could play a significant role when appropriate clear language is unavailable (Griffin, 2004 p32; Srivastava and Barrett, 1988 p46).

Also, intimate relationships become visible between the conceptual approaches to VM and RM and the thoughts and concepts from within the emerging research area of ReqM (Smith and Male, 2007 p3). Stakeholders and their requirements should contribute to the RM at each organisational level and project phase (Merna, 2003 p114; Smith et al., 2006 pp194-195). Raz and Michael (2001 p11) indicate that ReqM is tightly related to RM especially in giving background information. Furthermore, OGC (2007j p8) state that the VM principles centre on requirements definition. Dallas (2006 p1) argues that VM produces effective procedures to optimise value in line with clients' and end users' requirements.

Having introduced some general relations between these concepts, the next section addresses the first integration possibility through theoretical underpinnings.

6.3.2 Theoretical Integration Argument through ReqM, VM and RM:

This section looks at the theoretical underpinnings and fundamental principles that underpin VM, ReqM and RM and then examine if these principles are common.

6.3.2.1 Problem-Solving as a Theoretical Link:

From the literature, it can be observed that the concepts of ReqM, VM and RM start with different problems to be solved which will be argued as follows. Fernie et al. (2003 p355) link the origins of ReqM to the longstanding problems of stakeholders' requirements in the IT industry. This is supported by OGC (access on 21/5/2008 p1) and Smith and Male (2007 p4) when they state that ReqM, with its origins in IT, concentrates on identifying and tracking requirements, a 'capability' which is required by a stakeholder to resolve a problem or goal. Therefore, Fernie et al. (2003 p355,

p360) argue that it can be feasible to capture things which look to resolve the longstanding problems of project delivery and describe them as constituent aspects of ReqM. Thus, they stated that stakeholders and their requirements should be identified and communicated to be satisfied as a core of ReqM. They see the logic of ReqM as it tries to achieve identified functions at the lowest cost which epitomised the original narrow construct of VM. Zwikael and Tilchin (2007 p52) support this by stating that during the optimising of needed resources, ReqM has the ability to produce the required function.

The origins of VM can be traced back to the problem of materials shortages when Miles began looking for alternative solutions to this problem which provide the same function for the same or less resources (Griffin, 2004 p8; Kelly et al., 2004 p12; Male et al., 1998b pp52-53). This is supported by Thiry (1997 p9) when he argued that there is no need to improve value when there is no goal or problem and VM can only exist to achieve a goal or solve a problem. Fong (1999b p211) also highlights that VM provides methods to think about the problems and their constraints, applying the value concept through function analysis.

The origins of RM can be traced back to the problem of risks associated with gambling and its decisions to provide a solution to this problem through probability theory and its mathematical consideration (Edwards, 1954 p411; Griffin, 2004 p17; Thiry, 1997 p78). So, the development of risk and uncertainty is rooted in gambling and situations of decision-making (Dallas, 2006 p35; Edwards, 1954 p392; Hetland, 2003 p66). Merna (2003 p109) states that in managing projects, a significant number of decisions are made under the problem of risk and uncertainty. Macmillan (2000 p11) found an agreement among several authors that risk and uncertainty are inherent in all decision-making and thereby gains significant consideration in the literature of investment decision-making. She also found an agreement that this importance is well deserved because in reality, risk and uncertainty forms a major barrier to efficient investment decision-making. Therefore Smith et al. (2006 p2) consider RM as a particular form of decision-making within projects and organisations.

Having traced back the methodologies to problem-solving and highlighted their contribution to solving problems, this fundamental principle can be considered as one theoretical link for these methodologies. Furthermore, it is clear that value concepts and decision-making could be considered as the fundamental principles behind VM and RM respectively. The value concept through achieving the identified functions at lowest cost can be linked to the ReqM origins as well. However, the principles of problem-solving, decision-making and value concept could be linked logically in solving the problem of this research as follows. The problem can be summarised as low performance and value within construction projects and their organisations. Informed decisions should be made to choose the best option{s} to maximise value. Therefore, the methodologies that

are based on those principles are adopted to solve the research problem. The next section links the three methodologies to decision-making.

6.3.2.2 Decision-Making as a Theoretical Link:

Decision-making is part of problem-solving, and it occurs at every step of the problem-solving process (FEMA, 2010 p2.1). This section examines the contribution of ReqM, VM and RM in decision-making as follows. ReqM helps decision-making by defining the investment scope and objectives; and identifying stakeholders and managing their requirements (Alexander and Stevens, 2002 p1; Soderholm, 2004 p512; Zwikael and Tilchin, 2007 p52). ReqM provides a better understanding of stakeholders' requirements (Baxter et al., 2008 p585) which should improve decisions (Major, 2003 p19).

Hiley and Paliokostas (2001 p5) state that both VM and RM improve decision-making. Ellis et al. (2005 p489) support that by illustrating that value and risk management can help in making the most appropriate decision at the right time. Afila and Smith (2007 p63) emphasise the significance of VM and RM in decision-making under uncertainty at the early stage to properly identify feasible investments. They argue that these two methodologies do that through producing the rationale for highlighting the kinds of ideas and concepts which could grow to become feasible investments as well as the kinds of investment alternatives which are likely to realise their goals. If VM is applied effectively, it should result in better business decisions by giving a sound basis for decision takers, depending on their choice (IVM, access on 5/2/2007 p3). Furthermore it helps in decision-making through managing stakeholders' needs and wants as well as producing recommendations and alternative options for decision takers (BSI, 2000b p6; De Leeuw, 2001 p11; OGC, 2007j pp7-8).

Whereas, RM helps in decision-making through managing risks and uncertainties in the investment and within different options as well as managing adverse effects of change (Godfrey, 1996 pp16-17; Hillson, 2002 p235; Smith et al., 2006 pp1-3). So, decisions can be made on a realistic, objective and detailed analysis of the case, considering the likely outcomes of alternative courses of action (Godfrey, 1996 p17). However, considering value and risk aspects together prevents decision-making mismatches caused by addressing them separately and creates a full picture of the investment which enables decision-takers to understand both opportunities and uncertainties (Weatherhead et al., 2005 p11, p15). Furthermore, this could increase knowledge which results in an improvement in decision-making (Hiley and Paliokostas, 2001 p5).

Having linked the methodologies to the decision-making and highlighted their contribution to improved decisions, this RM fundamental principle can be considered as a second theoretical link for these methodologies. The next section links the three methodologies to the value concept.

6.3.2.3 Value Concept as a Theoretical Link:

Chapter 3, section 3.2, defines value by linking the satisfaction of needs with the use of resources, expressing the latter in terms of whole-life cost. Othman (2005 p25) states that enhancing the requirements or reducing the cost of meeting them can improve value. This section examines the contribution of ReqM, VM and RM towards enhancing value as follows. ReqM can improve value and need satisfaction by ensuring the right requirements are identified and met, as if the stakeholders' requirements are better understood and systematically addressed, the perceived value is likely to be higher (Baxter et al., 2008 p585). This is supported by OGC (2007j p8) when they state that a requirements definition will add demonstrable value in needs satisfaction.

VM enhances value by clarifying objectives and requirements, establishing better communication and preventing conflicts between key stakeholders (Hiley and Paliokostas, 2001 p5). According to OGC (2007j p4), VM also seeks to improve value by identifying the most appropriate way for satisfying the stakeholders' needs and wants while RM is a methodology for managing risks and uncertainties associated with the solution that offers the best value to the business. Othman (2005 p25) supports that when he states that cost savings can be achieved and value can be enhanced through RM by identifying, assessing and responding to the risks associated with VM options. According to Day et al. (2003 p10) VM or RM can produce added value if used separately, and if they are used together the benefit can be multiplied.

Having linked the methodologies to the value concept and highlighted their contribution to value enhancement, this VM fundamental principle can be considered as a third theoretical link for these methodologies. Thus, the integration possibility of theoretical underpinnings is addressed. The next section addresses the second integration possibility of integrating ReqM, VM and RM processes.

6.3.3 Processes Integration Argument through ReqM, VM and RM:

Integrating the existing processes of VM and RM is the main focus of most integration literature written in these areas (Griffin, 2004 p38; Kelly et al., 2004 p299; Weatherhead et al., 2005 pp11-12). Several approaches for that have emerged as indicated in Table C.1 in Appendix C. This section examines the possibilities of integrating ReqM, VM and RM processes through discussing similarities and differences between them, their integration advantages and barriers and the ways to overcome these barriers if possible as follows:

ReqM, VM and RM similarities vs. differences:

VM and RM tend to be codified discretely in the guidance literature. In fact, this is the main cause for any anticipation that they should be treated individually (Green and Liu, 2007 p656). Although their processes {as outlined in Chapters 3 and 5} may vary in detail (Dallas, 2006 p53), in the UK their integration has grown to be common practice (Smith, 2002a p109). Generally, a VM study is similar to a RM study because it develops mutual understanding between stakeholders, develops

project learning earlier in the study, challenges assumptions, generates alternative options and promotes synergy between the whole team (Hammersley, 2002 p12). On the other hand project teams, stakeholders, customer voice, objectives, functions and constraints, as well as service specification, including related systems behaviour, are nomenclature in the area of ReqM and also emerge in the VM paradigm (Smith and Male, 2007 p4).

Table C.2 in Appendix C provides a detailed review of similarities and differences between ReqM, VM and RM, providing a comparison between their processes. This table indicates many similarities between ReqM, VM and RM processes which can be summarised as follows. ReqM, VM and RM: are considered significant parts of PM; need clear implementation plans; need to gather information from several sources, whether documents or stakeholders, as the first activities; start with understanding the investments; are group activities which depend on systematic procedures and utilise multidisciplinary teams in workshops; need stakeholder identification, analysis and the involvement of key ones; commonly use existing teams with external specialists when required, particularly in the UK; participants are selected by the clients with help from the study managers; should have preparation stages; need to report and communicate the outcomes; need monitoring and change controlling; and the outcomes from each process being intimately related and interdependent.

Furthermore, both VM and RM have pre-workshop, workshop and post-workshop stages. Although, nothing is mentioned about that particularly for ReqM, but as it uses workshops, logically there should be pre and post workshop stages. Additionally, the pre-workshop stage for VM and RM processes consists of similar activities. Although nothing is mentioned about that particularly for ReqM, there should be some similar activities like the appointment of the study manager, participant selection and preparation.

Table C.2 indicates also several differences between ReqM, VM and RM processes which can be summarised as follows. Firstly, the participants' selection is based on tests and pre-defined criteria in VM and RM respectively while in ReqM, key stakeholders are identified as they are the main requirements' source. Secondly, the use of workshops is mainly for gathering information in ReqM while in VM and RM they are also used to carry out different levels of analysis as well. Finally, it is also clear from the table that using independent study managers is preferable in VM and RM and both studies need creative thinking. RM needs creativity to identify appropriate responses to deal with potential risks while VM requires creativity when generating value alternatives that meet required functions.

Advantages of processes' integration:

Organisations are mostly unaware of VM and RM advantages and both are considered as an additional cost and time consuming. Their combination could overcome these issues through providing an integrated, efficient service which therefore aids these methodologies to gain the

recognition they merit in the industry (Hiley and Paliokostas, 2001 p5). This is because the combined approach can use a common workshop, team, structure and techniques which means less resources are utilised (Kelly et al., 2004 p299) through fewer interventions (Griffin, 2004 p33; Major, 2003 p18; Walker and Greenwood, 2002 p13.1; Weatherhead et al., 2005 p15). Weatherhead et al. (2005 p15) state that this will improve the quality and depth of discussion, leading to more gains in efficiency. Moreover, combining VM and RM is more effective as it will benefit from being systematic and consistent (Walker and Greenwood, 2002 p13.1).

Practically, VM and RM integration is used to support strategic goals accomplishment and optimise strategy (Morris and Jamieson, 2004 p13, p23, 2005 pp15-16; Naaranoja et al., 2007 p659). Phillips (2002 p67) adds that this integration is the natural companion to good project and programme management for complex or sensitive areas, and for continuous improvement. Moreover, he argues that by formal consideration of risk, VM has proved to be very powerful in helping project development. According to Kirk (1995 p62), this integration has proved successful in practice and has been a strong instrument for providing credibility to recommendations at senior policy level.

Weaknesses and Barriers to processes' integration:

Hiley and Paliokostas (2001 p9) found difficulty in identifying the disadvantages of combining VM with RM. This might be because of there being very little written on this area as indicated by Griffin (2004 p34). However, some weaknesses will be discussed as follows.

The main weakness that has been identified by some practitioners is the different mindset needed when evaluating value and risk. So, the introduction of RM might stifle VM (Hiley and Paliokostas, 2001 p9). Smith (2002a p109) supports this when he states that these two aspects need different mindsets from the team during the process. Moreover, Kelly et al. (2004 p139) support this by arguing that risk is threat focused and consequently viewed as a negative, while value improvements are naturally perceived as positive. Therefore, they see a difficulty in moving participants from being threat focused to value opportunity focused without a time period for mindsets to shift. Griffin's (2004 p80) empirical evidence supports this as people find it hard to consider issues of risk and value at the same time.

To overcome this weakness, Smith and Male (2007 p6) suggest splitting the team into smaller sub-teams, some of whom concentrate on value opportunities while others can address risks and response measures. Moreover, Hiley and Paliokostas (2001 p5) highlight a key point regarding the different mindsets as the RM's negative phase could be limited to threat identification activity while the risk response activity needs a positive mindset in order to highlight ideas which might improve the situation.

Mootanah et al. (1998b p272) list other weaknesses and the ways to be overcome. Griffin (2004 p80) identifies two barriers including change resistance and the need for expert study managers. Bloore (downloaded 28/3/2007 p2) lists other barriers to be understood and dealt with carefully.

Compared to VM and RM integration, the integration of VM, RM with ReqM is a relatively new concept raised by Smith and Male (2007) and there is nothing written on its advantages and weaknesses within the literature and thus these should be investigated in the fieldwork.

Having discussed the integration possibility from a processes viewpoint, this identifies the fact that while there are some differences between ReqM, VM and RM processes and barriers for the integrated process, they seem to be manageable. Therefore, combining the three processes within a single one is logical and practical. The next section addresses the third integration possibility of integrating their tools and techniques.

6.3.4 Tools and Techniques {T&T} Integration Argument through ReqM, VM and RM:

There is very little about the integration of the T&T of ReqM, VM and RM in the accessible literature. In fact, Smith and Male (2007 p8) are the only ones that try to provide an integrated technique for capturing risk and value requirements. Therefore, this section examines the possibilities of integrating T&T of those methodologies by discussing similarities and differences between them.

Godfrey (1996 p12) states that VM and RM have similar techniques. Table C.3 in Appendix C provides a review of similarities and differences of ReqM, VM and RM, providing a comparison between their T&T. This table indicates several similarities between VM, RM and ReqM techniques, while there are very few differences; both are summarised as follows. All of VM, RM and ReqM apply similar: information gathering techniques like interviews, questionnaires and documents; idea generation techniques like brainstorming; and prioritising techniques like colour dots. It is also clear that VM and RM similarly apply SWOT analysis while VM and ReqM similarly use function diagramming and matrices. On the other hand, there are some special techniques and software attached to each methodology.

Some techniques can be integrated and used at the same time for all VM, RM and ReqM, such as information gathering techniques. For example, value, risk and requirements issues can be asked in an interview. Others can be used for all of them but sequentially {at different times} or in parallel {two or more sub-teams}, like idea generation and prioritising techniques. For example, it is not possible to brainstorm risk, value and requirements issues at the same time by the same team. In contrast, the special techniques are particularly developed for each methodology and therefore cannot be integrated. Also, these special T&T are usually carried out by specialists who can be brought to the workshop for this purpose.

Having discussed the integration possibility from a T&T viewpoint, this identifies the fact that while there are some differences between VM, RM and ReqM techniques, some of them seem to be common. Therefore, combining these common ones is logical and practical to save money and time

while others can be used sequentially, in parallel or by bringing specialists to the workshop. The next section addresses the fourth integration possibility of integrating their interventions.

6.3.5 Intervention Points Integration Argument through ReqM, VM and RM:

OGC (2003h p3, 2007j p5) states that value and risk management are interrelated methodologies which should be carried out sequentially. Griffin (2004 p30) highlights that this level of integration is different from processes integration. However, reviewing the literature indicates several attempts to use VM and RM sequentially {intervention integration}. Examples of this can be found in Dallas (2006 pp73-75), HM Treasury (1997 p6), OGC (2003h p8, 2007j p10), Walker and Green (2002), and Weatherhead et al. (2005 pp17-23). Therefore, this section examines the possibilities of integrating the interventions of ReqM, VM and RM by discussing similarities and differences and integration advantages and barriers and the ways to overcome them if possible.

Table C.4 in Appendix C provides a review of similarities and differences between ReqM, VM and RM, providing a comparison between their interventions. This table highlights some evidence of using ReqM, VM and RM over the PLC while evidence to support their use at other organisational levels is limited to VM only. However, the table indicates that all of them should be applied over the PLC and at different organisational levels but for different focuses. Also, their early applications would provide better results and later ones will cost more. These indicate the importance of these methodologies and therefore, it can be assumed that ReqM, VM and RM are used at each number>26</rec-number><foreign-keysase {Assumption A.1}.

Regarding the advantages, section 6.3.3 indicates that ReqM, VM and RM outcomes are intimately related and interdependent. Thus, if their processes are not integrated, at least they should appreciate each other for more benefits. For example, having highlighted an opportunity in RM, it is sensible to communicate it to the VM process which should be undertaken sequentially to RM so the opportunity can be maximised (Dallas, 2006 p38). Also, logically having identified any threats associated with VM options, it is wise to communicate them to the RM process to be actively managed. Furthermore, the stakeholders and their requirements identified in ReqM should be communicated to the VM and RM processes as section 6.3.3 indicates that both VM and RM need them. On the other hand and as indicated above in section 6.3.2.2, ReqM, VM and RM contribute to decision-making and therefore, they should come together to inform key decision points at assurance gates (OGC, 2003h p8, 2007j p10).

Regarding the barriers, if these processes are already used in an organisation and their results can be communicated properly, there is nothing to prevent them from be used sequentially and complementing each other. However, the absence of one or more of these methodologies within the organisation can be considered the main barrier to their intervention's integration.

In summary, ReqM, VM and RM should be applied at similar timings and therefore, using them at least sequentially is logical and practical to gain more benefit. The next section discusses the logical sequence for using ReqM, VM and RM together.

6.3.5.1 The Logical Sequence for Using ReqM, VM and RM Together:

To assess the project viability in its appraisal stage, Afila and Smith (2007 p63) argue that some organisations and practitioners prefer to apply VM before RM to define the project goals and options and to decide what constitutes value to the organisation from the project delivery. Whereas, they argue that there are also others who give priority to RM over VM to evaluate the risks which are inherent in the project, then use VM to determine the value which would be achieved by the project. Weatherhead et al. (2005 p11) support the use of VM before RM. They argue that at the project's early stage, when comprehensive decisions {e.g. contractual arrangements} are being taken in relation to risks to the business, it is significant to apply the correct risk strategy. They see that as difficult to achieve before considering project goals together with VM issues. Moreover, OGC (2003h p3, 2007j p5) state that in practice, a VM exercise is usually employed first in order to identify the business objectives of the project. A preferred strategy is thus identified, together with the risks, which might occur if that strategy was implemented.

Loosemore et al. (2006 p14) and Zou et al. (2007 p602) indicate that risks affect objectives and RM is used to manage these risks properly but needs a clear set of objectives, considering stakeholders and their requirements. VM uses stakeholders and their requirements to clarify and balance objectives (Male et al., 1998b pp40-53; Smith et al., 2006 p20; Walker and Greenwood, 2002 p13; Ward and Chapman, 2003 p104). Furthermore, VM changes could bring new risks when they are implemented and these should be managed through RM as indicated by Hammersley (2002 p11). Therefore, VM should be applied before RM. Nevertheless, according to Dallas (2006 p1); Merna (2003 p114); OGC (2007j p8); Raz and Michael (2001 p11); and Smith et al. (2006 pp194-195), both VM and RM require clear and proper identification of stakeholders and their requirements in the first place. This is the main role of ReqM as agreed by APM (2006 p52); Baxter et al. (2008 p585); Fernie et al. (2003 p355); OGC (access on 21/5/2008 p1); and Soderholm (2004 p517). Therefore, it can be assumed that the logical sequence could be as follows. Stakeholders and their requirements should be identified clearly first through ReqM. Then, objectives should be clarified and balanced according to them and the best value alternatives to satisfy these objectives and requirements should be identified through VM. Next, risk associated with these options should be identified and managed through RM {Assumption A.2}.

Having discussed the integration, this identifies three theoretical links of problem-solving, decision-making and value concept between ReqM, VM and RM. It is found that their processes integration would deliver many benefits while there are few barriers in which most can be overcome.

Regarding T&T, they can be integrated but only to a certain extent as not all of them can be used for all ReqM, VM and RM at the same time and there are also special ones that can only be used for one of these methodologies. If an organisation does not conducted them as an integrated process with some integrated techniques, then at least using them sequentially, appreciating each other, would maximise their benefits. The next section conceptualises the possible interventions to integrate ReqM, VM and RM in managing the value chain and informing investment decisions.

6.4 Conceptual Integrated Studies Series within the Organisational Levels:

To manage the OVC and inform key decisions undertaken within it, ReqM, VM and RM activities should be applied together at each organisational level. This creates a series of integrated studies aimed to improve performance and value for the organisation.

To do that, four intervention points are targeted to locate four integrated studies {each integrated study include ReqM, VM and RM activities} within the appraisal stage {strategic phase in the value chain} at different organisational levels. These would manage organisational levels' values and provide the basis for investment decisions and strategic alignments undertaken within those levels. These are: S1 at organisational strategy, S2 at portfolio, S3 at programme and S4 at project {pre-brief}. The organisation structure produced in Figure 6.3 {page 101} is used to indicate the timing of these integrated studies as shown in Figure 6.4.

These integrated studies are important and the focus of this research. This is mainly because firstly, they would enhance the corporate and business values which are the establishment for other value transitions as indicated in Chapter 2 {section 2.6}. Secondly, the appraisal stage encompasses critical decisions (Smith et al., 2001 p122), many problems and difficulties (Latham, 1994 p13), and the greatest uncertainty (Wood and Ellis, 2003b p257) which emphasises its importance and the need for sufficient attention and resources (Smith et al., 2001 p122). Thirdly, VM and RM applications at the normal project phases {after pre-brief} are well known and have been used for years. Moreover, several models have been developed for their integration as seen in Table C.1 in Appendix C. Fourthly, the earlier applications of ReqM, VM and RM are acknowledged in the literature to be more effective {See Table C.4 in Appendix C}, and opportunities reduce with time as shown in Figure 3.3. Finally, Smith and Male (2007 p7) concluded that the integration of these concepts {ReqM, VM and RM} can only enhance the appraisal stage, arguably the most significant domain for influencing the remaining stages.

Having identified the integrated studies, the next section discusses them against several features.

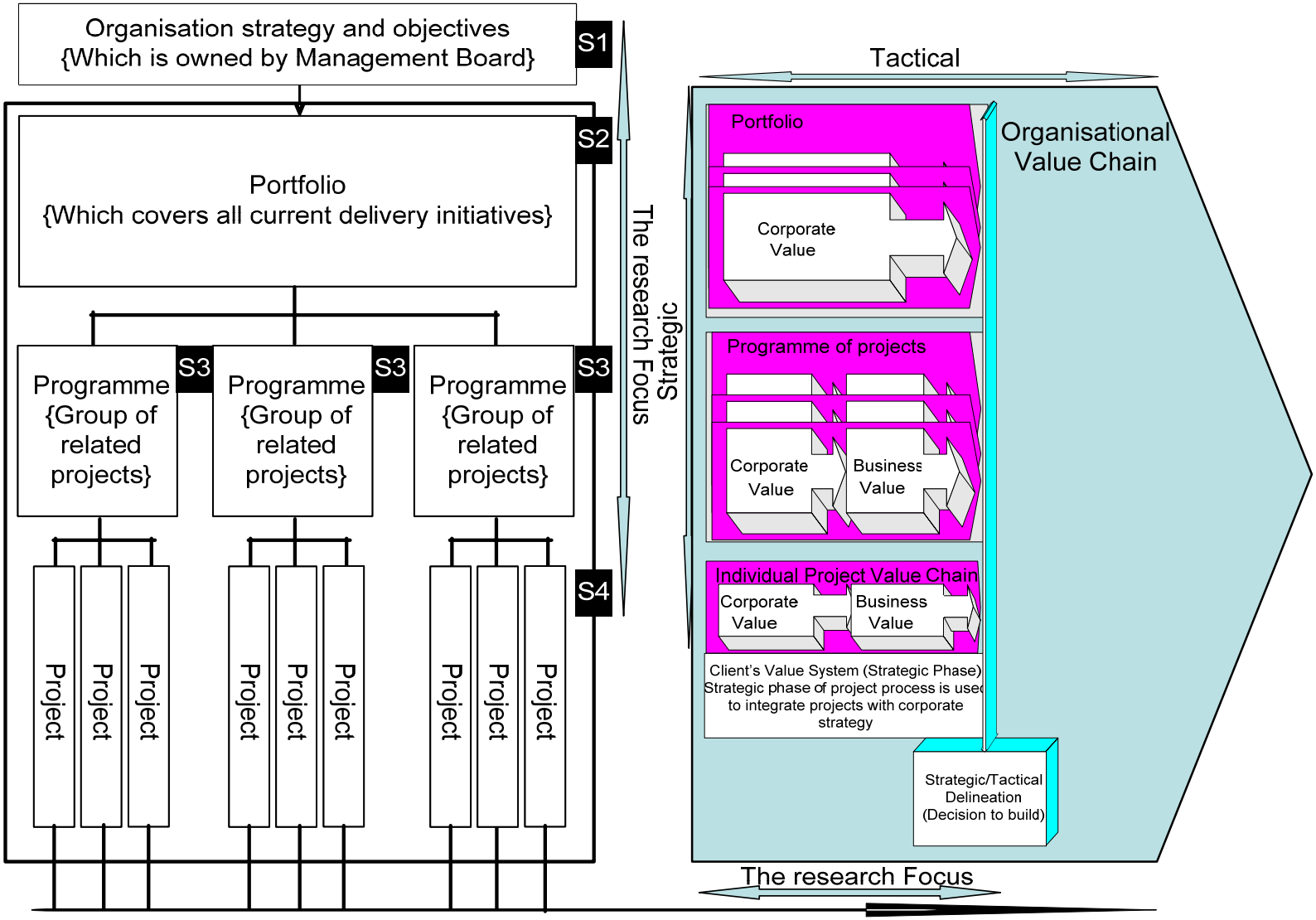

Figure 6.4: Conceptual organisational structure and studies timing {source: The Author adapted from the literature}

6.4.1 The Integrated Studies {S1, S2, S3 and S4} and their Features:

According to Chapters 3, 4 and 5, sections 3.11, 4.5 and 5.4.8, ReqM, VM and RM processes and standard techniques can fit different timings and stages for different purposes with some different stakeholders at each stage. Thus, the researcher can assume that ReqM, VM and RM processes and standard techniques are generally similar for organisational levels and project phases and thereby their integrated approach while the differences are mainly in the focus, key participants and some detailed techniques for each intervention point {Assumption A.3}.

According to the above assumptions and as the integrated studies should be applied at different interventions, they would have different purposes and focuses and consequently they would need different data as inputs to deliver different outputs for each intervention. Furthermore, they would involve different combination of participants and thereby slightly different team sizes. Although, the detailed techniques are also different for different interventions, they will not be considered as a key feature here because the literature indicates that their choices depend on the situation in hand and the studies managers. Also, the focuses of individual ReqM, VM, and RM are different for different interventions and thus they will be highlighted to indicate their roles and how they work together for each integrated study. Therefore, the integrated studies will be described here against their purposes {issues to be addressed}; inputs {data}; outputs; key participants; and ReqM, VM, and RM roles within them. At the strategic and portfolio levels, there is no mention in the literature of which criteria need to be considered when using ReqM, VM and RM at these levels. Nevertheless, good insights can be gained from looking at the literature concerning these levels to conceptualise their relevant integrated studies {S1 and S2}.

The integrated study {S1} at organisational strategy level:

The main issues to be addressed for S1 would be supporting the strategic management process in formulating or confirming the right strategies. This is because the organisational strategy level concerns mainly about these issues as indicated by Daft (1991 p152); Graham and Male (2003 p215); Johnson and Scholes (2002 p16); and Male (2008 pp32-33). Therefore, according to Daft (1991 p156), the inputs to this exercise are current objectives and strategies {if to be confirmed}; and missions. Moreover, as strategy identifies the way to reach the vision (Naaranoja et al., 2007 p659), thus vision should be another input as well. Male (2008 pp32-33) adds resources and strategic capability, culture and stakeholders' expectations and organisational environment.

According to Merna (2003 p114); Smith et al. (2006 pp194-195); and Assumption {A.2}, stakeholders' expectations and requirements at this level should be identified and managed which is the role of ReqM; VM can then consider these requirements in clarifying and balancing strategic objectives and identify and evaluate strategic options to satisfy these objectives and requirements;

and RM concerns identifying and assessing strategic risk including risks associated with strategic options which could influence the business, survival, continuity and growth in the long-term.

The outputs from S1 would logically be organisational strategies and objectives with a list of associated strategic risks and requirements that were considered. The key participants in this study would be the Board members as they are responsible for this level as indicated in section 6.2.3. The literature does not provide particular team sizes at this level and at portfolio and programme levels. The Highways Agency (1999 p14) suggest participation of 10 to 15 people as a maximum for a VM and RM combined study while Kelly et al. (2004 p84) indicate that VM teams tend to be 18 to 20 mostly. Thus, the number of participants of S1 to S4 would be 10 to 20 which is the minimum and the maximum normal size that is considered ideal by Dallas (2006 pp197-203).

The integrated study {S2} at portfolio level:

The main issues to be addressed for S2 would be linking programmes and projects within the portfolio with the organisational strategies through the portfolio organisation for strategy implementation. Also, to optimise the alignment of investment, organisational capability and capacity with programmes and projects. This is because the portfolio level mainly focuses on these issues at the strategic stage as indicated by Haughey (2001 p7); Morris and Jamieson (2004 p23, 2005 p16); and OGC (2004b p4). As this would be a series of linked integrated studies, the outputs from a study should be the inputs for the following one as supported by Dallas (2006 p76). Thus, the inputs for S2 would be the outputs from S1 and so on.

According to Merna (2003 p114); OGC (2004b p4, 2011 p87); Smith et al. (2006 pp194-195); and Assumption {A.2}, portfolio requirements should be identified and managed which is the role of ReqM, to be considered in VM and to assess whether it can be accommodated within the existing capability and capacity of the organisation; VM activities would include ensuring that programmes and projects within the portfolio conform to its overall objectives. This can be done by helping investment decision-making of selection and prioritising programmes and projects which lead to the definition of the whole portfolio (APM, 2006 p8); and RM focuses on identifying and managing portfolio risks including risks associated with investment options and help in assessing the correct implications of the cumulative level of programmes and projects risks.

The outputs from S2 would logically be the portfolio's brief including portfolio requirements; value[2] and risk profiles across programmes and projects; risk allocation and management plan. The key participants in this study would include the portfolio manager as responsible for this level as indicated in section 6.2.3. Furthermore, the programmes and projects sponsors are key stakeholders at this level (OGC, 2004b p4) and they should be involved because they make decisions and may manage their programmes and projects at the strategic stage as indicated in section 6.2.3.

[2] Value profile represents the client value priorities graphically which identifies areas with most potential for adding value and can be used as a basis for decision-making {Dallas, 2006 p355}.

The integrated study {S3} at programme level:

The issues to be addressed for S3 would be linking projects within the programme with the portfolio strategy through the programme organisation for strategy implementation. This is because the programme level mainly focuses on these issues at the strategic stage as indicated by Male (2008 p33, p41); and Morris and Jamieson (2004 p23, 2005 p16).

According to Merna (2003 p114); Smith et al. (2006 pp194-195); and Assumption {A.2}, programme requirements should be identified and managed which is the role of ReqM, to be considered in VM; VM activities would include ensuring that projects within the programme conform to its overall objectives. This can be done by helping investment decision-making of selection and prioritising projects which lead to the definition of the whole programme as indicated by Dallas (2006 p73) and supported by Graham and Male (2003 p223) and Male (2008a p139); and RM focuses on identifying and managing programme risks including risks associated with alternative projects and risks of transforming business strategy to new working approaches as indicated by Lycett et al. (2004 p293) and OGC (2007x p71).

The outputs from S3 would logically be the programme's brief including programme requirements; value and risk profiles across projects; risk allocation and management plan as indicated by Dallas (2006 p73). The key participants in this study would include the programme manager {if he is appointed} as responsible for this level in section 6.2.3. Furthermore, the programme and projects sponsors should be involved as key persons who make decisions and may manage the programme and projects at the strategic stage as indicated in section 6.2.3.

The integrated study {S4} at project level:

The issues to be addressed for S4 would be linking the project with the programme strategy through the project organisation for strategy implementation. This is because the project level mainly focuses on these issues at the strategic stage as indicated by Male (2008 p33, p41) and Morris and Jamieson (2004 p23, 2005 p16).

According to Merna (2003 p114); Smith et al. (2006 pp194-195); and Assumption {A.2}, project requirements should be identified and managed which is the role of ReqM, to be considered in VM; VM activities would include developing the project's strategic brief as indicated by Male et al. (1998a p29) and supported by Dallas (2006 p195); and RM focuses on identifying and managing project risks including risks associated with alternative options and risks of delivering the project's objectives as indicated by OGC (2007x p74).

The outputs from S4 would logically be the project's strategic brief including project requirements; value and risk profiles; risk allocation and management plan as indicated by Dallas (2006 p62) and Male et al. (1998a p29). The key participants in this study would include the project manager {if he is appointed} as responsible for this level as indicated in section 6.2.3. Furthermore, the project sponsor should be involved as a key person who makes decisions and may manage the project at the

strategic stage as indicated in section 6.2.3. Table 6.1 highlights these integrated studies {S1-S4} against their seven features.

Table 6.1: Conceptual studies, types and their information {source: The Author adapted from the literature}

Integrated Studies / Features	S1 {strategic level}	S2 {portfolio level}	S3 {programme level}	S4 {project level/pre-brief}
Purpose {issues addressed}	Strategy formulation / confirmation	Portfolio organisation. Linking portfolio to fit with organisation strategy.	Programme organisation. Linking programme to fit with portfolio strategy.	Project organisation. Linking project to fit with programme strategy.
Inputs {data}	Vision, mission, resources and strategic capability, stakeholders' requirements and organisation culture and environment.	Organisation strategy and objectives with a list of strategic risks and requirements.	Portfolio brief: portfolio requirements; value and risk profiles across programmes and projects; risk allocation and management plan.	Programme brief; programme requirements; value and risk profiles across projects; risk allocation and management plan.
Outputs	Organisation strategy and objectives with a list of strategic risk and requirements.	Portfolio brief: portfolio requirements; value and risk profiles across programmes and projects; risk allocation and management plan.	Programme brief: programme requirements; value and risk profiles across projects; risk allocation and management plan.	Project strategic brief; project requirements; value and risk profiles; risk allocation and management plan.
ReqM Focus and activities	Identifying and managing strategic requirements.	Identifying and managing portfolio requirements.	Identifying and managing programme requirements.	Identifying and managing project requirements.
VM Focus and activities	Identifying and evaluating strategic options.	Portfolio definition: Ensuring that programmes and projects within portfolio conform to its overall objectives.	Programme definition: Ensuring that projects within programme conform to its overall objectives.	Project definition: Develop the project's strategic brief.
RM Focus and activities	Assessing strategic risks which could influence the business survival, continuity and growth in the long-term.	Identifying and managing portfolio risks.	Identifying and managing programme risks.	Identifying and managing project risks.
Key Participants	10-20, Board, all at senior level in the client organisation.	10-20, portfolio manager, programmes and projects sponsors.	10-20, programme manager {if appointed} and programme and projects sponsors.	10-20, project manager {if appointed} and project sponsor.

Having conceptualised a series of integrated studies through several interventions, this identifies the fact that ReqM, VM and RM should be considered together at different organisational levels and through the value chain to help in delivering value and informing key decisions. The next section clarifies how these integrated studies flow throughout the organisational levels.

6.5 Conceptual Process Diagram of the Integrated Studies throughout Organisational Levels:

To provide more clarification on the conceptual studies series argued above, a process diagram will be conceptualised here, showing the management flow of these integrated studies as a systematic process. The idea for this diagram is adopted from other process diagrams like the one provided by Dallas (2006 pp54-55) in his integrated approach to clarifying the systematic flow of his VM and RM integrated studies.

As this diagram will be used to clarify the studies series, it is created based mainly on the information presented in Table 6.1. The ReqM, VM and RM activities are adopted from Table 6.1 which are the activities associated with each integrated study to deliver its required outputs. These outputs are also adopted from the same table. Whereas, the timing of the studies is based on the one which appeared in Figure 6.4.

The diagram starts with identifying the need for beneficial change to improve performance and value for an organisation, leading to the creation or update of its vision, mission and thereby strategies to achieve that. After that, the integrated studies activities are undertaken at S1 to aid the strategy formulation exercise through producing better strategic alternatives for the Board to make informed decisions about the most appropriate strategies to improve the situation. Then, the integrated studies activities continue to cascade to be undertaken at other organisational levels to provide robust bases for investment decisions undertaken at these levels, leading to the adoption of the right investment which is aligned with organisational strategies identified. Logically, proceeding from one study to another can only be done after gaining and agreeing its main deliverables like agreeing and aligning the portfolio investments at S2 before moving to S3 and so on. Otherwise, S2 activities should be revisited again. This process diagram is shown in Figure 6.5.

Having shown that the integrated studies flow in a systematic manner, the next section argues how VM, RM, ReqM processes and T&T come together as a conceptual integrated study approach which discusses how the individual integrated study should be generally undertaken.

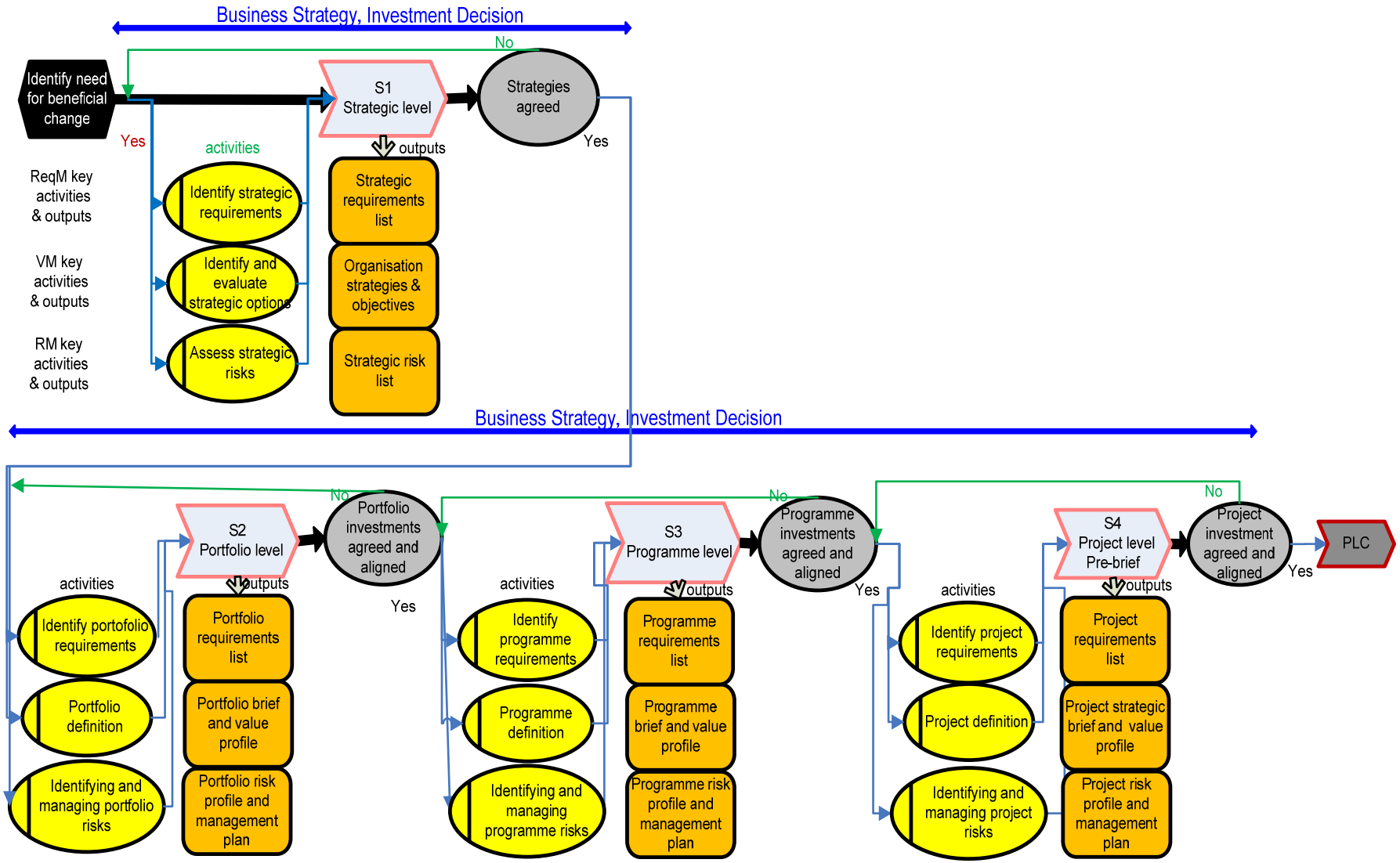

Figure 6.5: Conceptual process diagram of the integrated studies {source: The Author adapted from Figure 6.4 and Table 6.1}

6.6 The Conceptual General Integrated Study Approach:

This section reviews possible approaches for ReqM, VM and RM integration and then uses them to conceptualise the integrated study as well as identifying the key skills to manage it.

6.6.1 The Approaches for the Integration:

Sometimes, the best solutions in value improvement become the most risky, so it is important to consider risks within a VM study (Hammersley, 2002 p11). IVM (access on 16/4/2008 p2) supports this when they state that RM should be an integral part of the VM process. Furthermore, Thiry (1997 p81) lists several benefits of including RM in the VM process.

Connaughton and Green (1996 p20) argue that it is better to combine RM within VM in the same workshop as it is hard to separate them. This approach is adopted by Kirk (1995 pp62-63), Mootanah et al. (1998b p269) and Phillips (2002 p71) in their integrated processes. According to Chang and Liou (2005 p2), each one of these authors introduces a full scale RM process to be combined with the VM job plan.

Day et al. (2003 p10) argue that it is impractical to identify risk while generating value opportunities at the same time because the two require different thought processes. They preferred applying VM first to create options then included risk assessment with an evaluation of these options. Kelly et al. (2004 pp299-301) support this when arguing that in practice a VM workshop should be completed to the evaluation phase before addressing risks; then risk could be addressed by analysis of the value issues raised; and if needed, full risk analysis could be done after completing the value workshop. Hammersley (2002 p11) considered this issue when identifying three ways to integrate RM within the VM process as with evaluation ideas; as a separate phase of VM workshops; or as a full RM workshop after the VM workshop.

On the other hand, ReqM is achieved by VM and change control processes in construction as discussed in Chapter 4 {section 4.10}. Othman (2005 p24) indicates that stakeholder requirements can be highlighted by using VM. OGC (2003h pp5-6, 2007j pp7-8) support this as VM enables the stakeholders to discover and achieve their requirements through the workshop and create a balance between their priorities. BSI (2006 p27) states that stakeholder analysis should be applied within VM to highlight: all interested stakeholders; their concerns; their impact; and any requirements they might have. VM techniques such as stakeholder analysis, function priority matrix, and strategic FAST diagrams are linked to requirements capturing and prioritising, and are a series of related techniques which aid information and requirement structuring in a logical approach to competing value systems (Kelly et al., 2004 p137; Smith and Male, 2007 pp4-5). Smith and Male (2007 p5) present a case study about the Library Project, drawing together ReqM, VM and RM issues and activities within the VM process. These discussions lead to the assumption that the VM process can

partially accommodate requirements and risk issues and activities to deal with them {Assumption A.4}.

6.6.2 The Conceptual VM Extended Process:

From the above assumption {A.4}, the VM process could be improved to accommodate RM and ReqM issues to become an integrated study. The VM stages and job plan argued in Chapter 3 will remain the same for the integrated approach with some modifications to suit ReqM and RM issues. This will be conceptualised as: conceptual pre-study {preparation}, conceptual study {mainly workshop{s}} and conceptual post-study {implementation} stages which are shown in Figure 6.6, Boxes 1, 2 and 3 respectively. According to assumption {A.3}, ReqM, VM and RM process and standard techniques are similar for all organisational levels and thereby this integrated study can be generally applied at all interventions identified in section 6.4. However, tools and techniques will be briefly covered as Assumption {A.3} indicates that some of them might be different for each study, depending on the situation in hand and study leaders' {integrated study managers} choices.

6.6.2.1 The Conceptual Integrated Pre-study {preparation} Stage:

The VM literature indicates many activities to be done at VM pre-workshop stage. However, Male et al. (1998b p40) summarise them by highlighting five key activities as indicated in Chapter 3 section 3.13.1. According to Mootanah et al. (1998b p270) and Smith and Male (2007 p5) and because section 6.3.3 indicates similarities in the pre-workshop activities between VM, RM and ReqM, the VM pre-workshop activities should remain the same for the integrated approach with some additional issues regarding ReqM and RM as follows.

In the information gathering activity, information about key user requirements and major functional requirements should be collected (Smith and Male, 2007 p5). Mootanah et al. (1998b pp268-270) support that and add the gathering of risks preliminary information. Furthermore, information about uncertainty is likely to be collected as indicated by Stoughton (access on 20/4/2010b p1).

Moreover, Kelly et al. (2004 p103) signify the planning {or at least considering} of the implementation process of options and changes at the VM pre-workshop stage. In the integrated approach this should include the change procedures and control for RM as well as change requirements because this is needed for RM and ReqM planning as indicated by Dallas (2006 p57) and Jonasson (2008 p20) respectively.

According to OPFAM (1997 p24), VM pre-study could take 5 to 10 working days depending on the scheme[3], study preparation and arrangements required which are adopted here as this should be enough for the extended VM because most of the activities remain the same.

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[3] In this chapter and afterwards, the term 'scheme' refers to organisation strategy, portfolio, programme and project and is used when indicating a common thing among all organisation levels. For example, scheme plans refer to organisation strategy, portfolio, programme and project plans. Another example is scheme managers, who are Board, portfolio manager, programme manager and project manager.

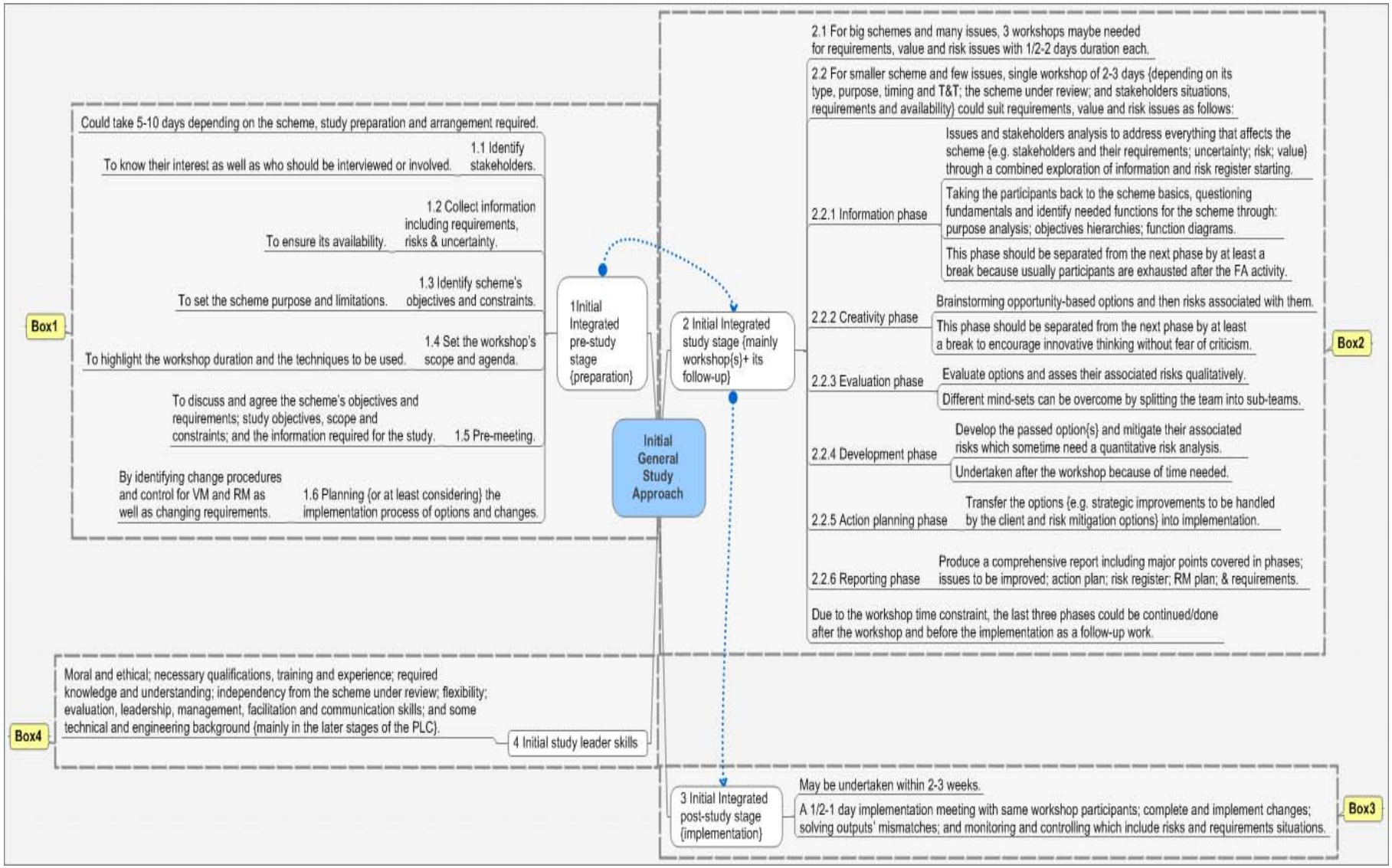

Figure 6.6: Conceptual general integrated study approach {source: The Author adapted from the literature}

6.6.2.2 The Conceptual Integrated Study Stage {mainly workshop{s}}:

There are some attempts to find alternatives to the workshop like an autonomous VM and electronic VM as indicated in Chapter 3 section 3.15. These alternatives are still in their conceptual stage and are not well-developed, so need improvement before being effectively used (Gronqvist et al., 2007 p12; IVM Seminar, 2007). Thus, they are not ready to be integrated with other methodologies like ReqM and RM. Furthermore, section 6.3.3 indicates that all ReqM, RM and VM need workshops. Therefore, the integrated approach will be based on workshop{s} and the study here refers to the workshop{s} and its follow-up work {e.g. options development and report writing}.

VM and RM workshops normally last for a half day to two days as indicated in Chapters 3 and 5. According to Weatherhead et al. (2005 p29) even their combined workshop lasts for the same range of time or more based on their types and purposes and stakeholder requirements. Phillips (2002 p70) does not give any time range for the combined workshop, arguing that the duration is not fixed and it is based on a particular scheme and stakeholders' situations. In a UK context, Mootanah et al. (1998b p272) argue a specific range of two to three days, based on timing and the adopted T&T. Therefore, the workshop duration for the integrated approach could range from two to three days depending on its type, purpose, timing and T&T; the scheme under review; and stakeholders' situations, requirements and availability.

Nevertheless, for big schemes {e.g. a portfolio with many programmes}, there might be a need to conduct three sequential workshops in the integrated approach. One for requirements, one for value options and the third for risks with the same duration's range as indicated above for separate workshops {half day to two days}. This is because it seems to be unlikely to be able to sort out all the issues in a single workshop. However, for smaller schemes with fewer issues to be considered, a single workshop could be appropriate for the integrated approach which will be argued through the VM job plan with some modifications regarding ReqM and RM issues as follows.

Firstly, in the information phase and according to Kelly et al. (2004 p56, p136) and Smith and Male (2007 p5), issues and stakeholder analysis are applied to address everything that affects the scheme such as uncertainty, risk, value, and stakeholders and their requirements through a combined exploration of information. This can be supported by BSI (2006 p27); Kirk (1995 p64); Mootanah et al. (1998b p270); OGC (2003h pp5-6, 2007j pp7-8); Phillips (2002 p71); and Stoughton (access on 20/4/2010b p1). However, risks should be recorded and Phillips (2002 p71) supports the start of a risk register here to do that. After that, purpose analysis, objectives hierarchies and function diagrams can be used to take the participant back to the scheme's basics, questioning fundamentals (Kelly et al., 2004 p137) and what functions are needed for the scheme to be briefed (Smith and Male, 2007 p5). This is supported by Mootanah et al. (1998b p270) and practiced in their integrated

approach. This phase should be separated from the next one by a break as usually participants are exhausted after the FA activity as noted by Male et al. (1998a p32, p58).

Secondly, in the creativity phase opportunity-based options should be brainstormed (Stocks and Singh, 1999 p255; Younker, 2003 p61). Kirk (1995 p64), Mootanah et al. (1998b p270), Norton and McElligott (1995 p177) and Phillips (2002 p71) advocate for their integrated approaches to be done as usual. Then, and according to Hammersley (2002 p6), Male et al. (1998a p58), and Smith and Male (2007 p6), risks associated with these options could also be brainstormed and investigated if appropriate. This is also highlighted by Chang and Liou (2005 p7) and Mootanah et al. (1998b p270) in their integrated approaches and practiced by Mootanah et al. (1998b p270) through asking 'what-if?' questions or taking into account risk scenarios. According to Male et al. (1998a p58), these risks could be identified and explored by grouping them into low, medium and high; establishing their potential impact as low, medium and high; and exploring interaction influences. Nevertheless, before brainstorming risk, a break is useful to allow mindsets to shift from value to risk issues as argued by Kelly et al. (2004 p139). However, this phase should be separated from the next one by at least a break to encourage innovative thinking without fear of criticism as noted by Hiley and Paliokostas (2001 p3).

Thirdly, in the evaluation phase and even for a risk and value combined approach, Norton and McElligott (1995 p177) suggest to conduct this phase as usual and sift out the best solutions. Whereas, the inclusion of qualitative risk assessment could be considered to help in choosing better options and to feed the risk register as indicated by Kirk (1995 p65) and Mootanah et al. (1998b p270). This is mainly because sometimes the risk profile is the only differentiator between alternatives being investigated as argued by Day et al. (2003 p10). Baguley (2005 cited in Alalshikh, 2010 p37) supports this when arguing that before selecting value alternatives in the evaluation phase of VM, an initial risk analysis should be applied for each of the three highest scoring alternatives which aids the decision analysis. However, as the workshop process could address the more negative aspects linked with risk analysis and mitigation, there is an obvious problem here, which is a different mindset. This can be overcome as indicated in section 6.3.3 by splitting the team into smaller sub-teams, some of which concentrate on value opportunities while others can address risks, and consequently this method can move to more quantitative risk assessments (Smith and Male, 2007 p6).

Fourthly, in the development phase and within the development of the best options, the top identified associated risks can be mitigated to complete the risk register, determine contingency and define risk owners who should be responsible for the mitigation (Mootanah et al., 1998b p272; Phillips, 2002 p71; Smith and Male, 2007 p5). Based on this situation, these developed options may need further quantitative risk management (Kelly et al., 2004 p139; Kirk, 1995 p65; Mootanah et al., 1998b p272; Norton and McElligott, 1995 p177; Phillips, 2002 p71; Smith and Male, 2007 p5).

According to Norton and McElligott (1995 p177), this further analysis might be carried out for a particular VM proposal so that risk improvement linked to the proposal could be appreciated in a realistic way. Nevertheless, it should be done after the workshop due to time constraints as recommended by Kelly et al. (2004 p139), Mootanah et al. (1998b p272), Phillips (2002 p71), and Smith and Male (2007 p5). However, because idea development techniques {e.g. LCC} are time consuming (Male et al., 1998a p60), this phase is often done after the workshop (Kelly and Male, 2002 p81; Male et al., 1998a p60). This is supported by Ellis et al. (2005 p490) when they found that this phase is often undertaken after the workshop stage due to time constraints. Therefore, there is enough time to do the quantitative risk analysis if it is needed.

Fifthly, the action planning phase aims to transfer options into implementation (Male et al., 1998a p61; Smith and Male, 2007 p5). For the integrated approach, these options may involve: strategic improvements to be handled by the client and risk mitigation options (Smith and Male, 2007 p5). Baguley (2005 cited in Alalshikh, 2010 p37) emphasises including risk responses into the implementation plan. However, in addition to presenting the main VM proposals, risks associated with them and their responses should be highlighted as supported by Kirk (1995 p65) and Mootanah et al. (1998b p272).

Finally, in the reporting phase and in addition to things mentioned in Chapter 3 section 3.13.2.6, the report should include the risk register and RM plan as indicated by Kelly et al. (2004 p302) and Mootanah et al. (1998b p272) respectively. Furthermore, it could be comprehensive to include other things like a list of the identified requirements (Hammersley, 2002 p5). However, the report would be prepared after the workshop as supported by Mootanah et al. (1998b p272).

Due to the workshop's time constraints; development, action planning and reporting phases could be continued/done after the workshop and before the implementation as follow-up work.

Chapters 4 and 5 in sections 4.8 and 5.4.11 indicate some common tools such as DOORS and ARM which could be used here to help in identifying and managing requirements and risks respectively.

6.6.2.3 The Conceptual Integrated Post-study Stage {implementation}:

In addition to the activities mentioned in Chapter 3 section 3.13.3, this stage should include the monitoring and control of the identified risk situations and highlighting and assessing new risks and ensuring the RM plan and responses are properly implemented (Chapman, downloaded on 24/2/2008 p217; Dallas, 2006 p57; Hillson, 2002 p239; Kirk, 1995; Norton and McElligott, 1995). It should also include monitoring and controlling changes in the identified requirements via change control (APM, 2006 pp52-53; Fernie et al., 2003 p360).

According to Kelly et al. (2004 p139), VM implementation may needs two to three weeks to be undertaken which is adopted here as this should be enough for the extended VM because most of the activities remain the same.

Having conceptualised the three stages of the integrated study, the next section discusses the skills needed to undertake such study.

6.6.2.4 Conceptual Study Leader Features and Skills:

The study leader here is the person who is responsible for managing the VM, ReqM and RM integrated study and facilitates its workshop{s}. However, it was assumed above that VM can accommodate requirements and risk issues {assumption A.4} and consequently, the value manger should have enough skills to be a study leader for the integrated study. Therefore, he should have the experience and suitable training in VM, RM, and ReqM as well as the appropriate skills that are mentioned in Chapters 3, 4 and 5 as indicated by BRE (2000 p3), Connaughton and Green (1996 p54), Dell'Isola (1997 p64) and Male et al. (1998b p36) for the value manager; by Jonasson (2008 pp20-29) for the requirements manager; and by Godfrey (1996 p26) for the risk manager. Furthermore, he should have other skills mentioned to manage VM and RM integrated processes as highlighted by Dallas (2006 pp103-105), The Highways Agency (1999 p14) and Weatherhead et al. (2005 p17).

However, all these skills are grouped in Table C.5 in Appendix C under the main headings of: moral and ethical; necessary qualifications, training and experience; required knowledge and understanding; independency from the scheme under review; flexibility; evaluation, leadership, management, facilitation and communication skills; and some technical and engineering background {mainly in the later stages of the PLC}. This indicates that the value manager has already most of the skills that allow him to lead the integrated study. Nevertheless, his lack of special skills like those needed in RM modelling may encourage him to bring a risk analyst to the study as indicated by Mootanah et al. (1998b p270) and Norton and McElligott (1995 p177).

The conceptual study leader features and skills are illustrated in Box 4 in Figure 6.6.

6.7 Chapter Summary:

This chapter has conceptualised an approach for the integration, introducing four models. The first model presents the organisation structure {Figure 6.3} to clarify the relationship between organisational levels and their investment decisions, and relates them to the value chain. The model was also used to indicate the integrated studies' timing for this research as shown in Figure 6.4.

The chapter identified the possibilities to integrate ReqM, VM and RM. They were lined theoretically through problem-solving, decision-making and value concept. Process integration would provide many benefits while there are a few disadvantages and barriers, most of which can be overcome. Their T&T can be integrated but only to a certain extent as not all of them can be used for all ReqM, VM and RM at the same time and there are also special ones that can only be used for one of these methodologies. Interventions integration would be the minimum option for integration to be done sequentially, complementing each other to maximise their benefits.

The second model was created by locating ReqM, VM and RM studies at the same intervention points to be a series of integrated studies. This series of studies proposes that ReqM, VM and RM should be considered together at different organisational levels and through the value chain to deliver the value to an organisation and produce a robust basis for investment decisions undertaken within it. The integrated studies {S1 to S4} have been conceptualised against seven features as indicated in Table 6.1. These will be investigated in the fieldwork which may lead to highlighting other features for them.

A process diagram {Figure 6.5} was conceptualised to be the third model based on Table 6.1 and Figure 6.4 to indicate the integrated studies flow throughout the organisational levels as a systematic process and gives more clarification to the integrated studies series.

The available approaches for integrating ReqM, VM and RM were identified and used to conceptualise the integrated study approach which is the fourth model. This was conceptualised as indicated in Figure 6.6 in Boxes 1, 2, 3 and 4 respectively. This model identifies the need to investigate if these three methodologies are being practically integrated and the ways to do that. Furthermore, common tools like ARM and DOORS will be investigated to highlight their understandings and applications within the construction industry to know their suitability for the integration approach. Moreover, study leader skills are important and should also be investigated.

The above models were conceptualised based on the literature and four assumptions {A.1, A.2, A.3 and A.4}. Although assumptions are facts/principles/ideas that are used as a basis, though you cannot necessarily prove them (Burgess, 2010; Fellows and Liu, 2003 p119; Longman Dictionary, 2005 p77), according to Fellows and Liu (2003 p119), they could be investigated {if possible} for more validity.

Having conceptualised the integration approach, the next chapter will review the research methodology literature to adopt and justify the most suitable one for this research.

7 CHAPTER SEVEN: RESEARCH METHODOLOGY:

7.1 Introduction:

Previous chapters have covered the research problems, aims and objectives, and PM, VM, ReqM, RM and UM literature. Furthermore, a conceptual approach has been built based on the literature. This chapter covers the research methodology that was used to carry out this research in order to satisfy its aim and objectives.

This chapter consists of two parts; the research theory and its process principles are reviewed and examined through the literature in the first part. Whereas, the research methodology, which is appropriate to the research problem {which has been highlighted in the previous chapters}, was adopted, argued and justified in the second part.

7.2 Part One: Overview of Research Methodologies and their Theories:

7.2.1 Research Design:

Research can be defined as "*the systematic investigation into and study of materials, sources etc. in order to establish facts and reach new conclusions*". Furthermore, it is "*an endeavour to discover new or collate old facts etc. by the scientific study of a subject or by a course of critical investigation*" (Thompson, 1995) cited by (Fellows and Liu, 2003 p4). From this definition it can be concluded that research is concerned with two elements which are *what* {fact and conclusion} as well as *how* {scientific; critical} (Fellows and Liu, 2003 p4). Furthermore, researching means answering a question or at least trying to answer it. Moreover, research is not essentially concerned with what is already known, but rather it is about what is unknown, unrealised, or misinterpreted (Watson, 1987 p29). In addition, Swetnam (2004 p1) supports the above argument when he argued that being systematic, critical and empirical, as well as having academic integrity, are essential features of research.

Research methodology is "*the philosophy or the general principle which guides the research*". Research methods are the techniques that are used to collect data (Dawson, 2007 p15).

Research design is "*the plan that guides the investigator in the process of collecting, analysing, and interpreting observations. It is a logical model of proof that allows the researcher to draw inferences concerning causal relations among the variables under investigation*" (Nachmias and Nachmias, 1992 pp77-78; Yin, 2003 p21). It gathers suitable data which addresses the research question{s} asked, as well as maintaining coherency and rigour (Dainty et al., 2000 p228; Mason, 1996 p10; Simister, 1995 p21; Yin, 2003 p19). Graham (2000 p30) argued that there are five main issues that underpin any research design: involvement degree {independent or involved researcher}; sample size; approach {testing existing theories or generating new theories}; style {experimental or fieldwork methods}; induction {verify or falsify}. Fellows and Liu (2003 p21) stated that the critical issue in choosing the most suitable methods is to ensure the logical links between data

gathering and analysis in order to yield results, and thence conclusions, to the key research question investigated. So, the questions of the research, required data and the analysis methods must be considered in the research design. Creswell (2003 p5) mentioned three significant questions in designing research which are: "*What knowledge claims are being made by the researcher {including a theoretical perspective}? What strategies of inquiry will inform the procedures? What methods of data collection and analysis will be used?*" He argued that the research approaches are formed by combining these components {knowledge claim, strategies and methods} as shown in Figure 7.1.

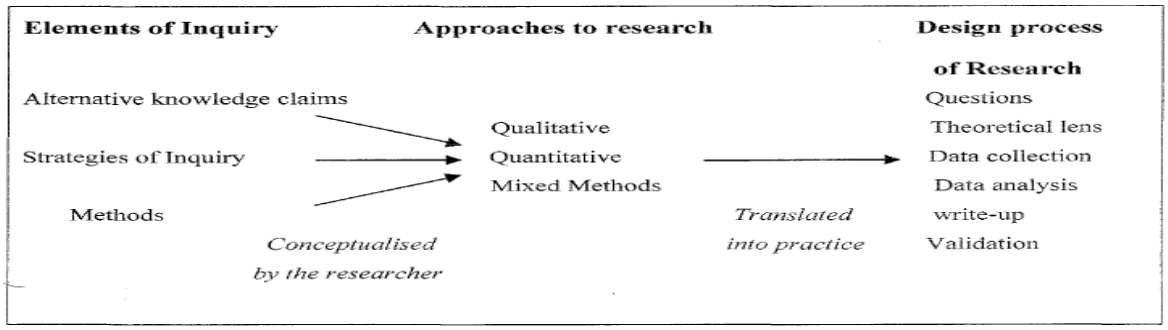

Figure 7.1: Knowledge claims, strategies and methods leading to approaches and the design process {source: (Creswell, 2003 p5)}

Leedy and Ormrod (2005 p285) generally stated that the research design should be obvious, certainly the approach, whether it is qualitative, quantitative or both, and highlighted the need to identify what the research strategy is, whether for example it is action research, a case study, a survey or a combination of them. However, to understand these issues, research types and styles will be investigated in the following sections.

7.2.1.1 Reasoning:

Walliman (2005 p10) defined reasoning as "*A method of coming to conclusions by the use of logical argument*". Generally, he put forward three types of reasoning as deductive, inductive and a combination of them, which is deductive-inductive.

7.2.1.1.1 Deductive:

Deductive is to go from a general statement towards a specific one (Fellows and Liu, 2003 p16). Graham (2000 p25) supports this by stating that deductive starts with a general principle acknowledged by most people as a fact, and assesses a certain case that seems to fit the principle. Furthermore, Gill and Johnson (2002 p34) stated that deductive entails the development of a theoretical approach {hypotheses} to be tested later through the empirical observation, such as what happens in experimental strategies. They divided the deduction process into five steps: concepts; rules; operationalisation; instructions; and testing by corroboration. In addition, they provided a summary of the process as shown in Figure 7.2.

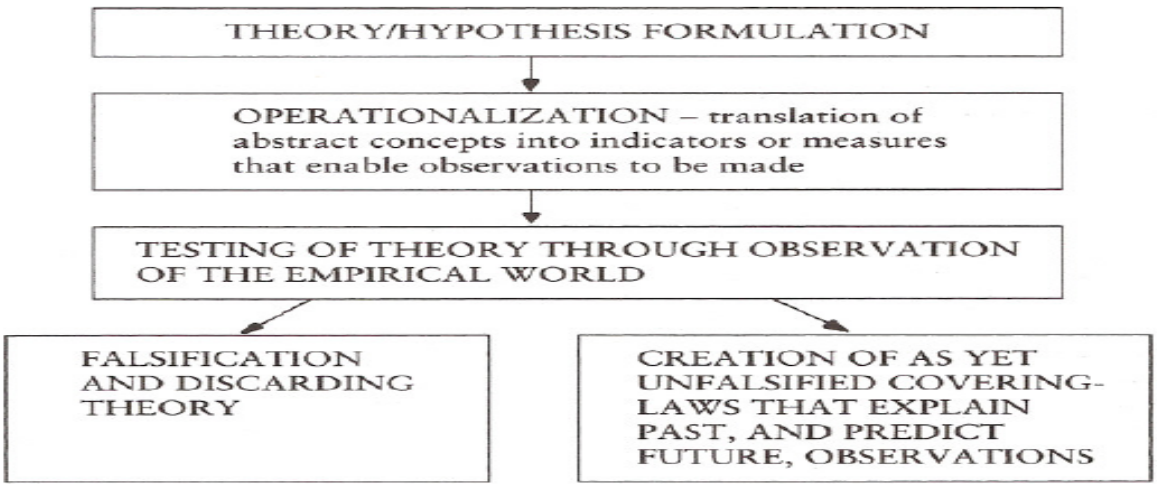

Figure 7.2: The process of deduction {source: (Gill and Johnson, 2002 p39)}

7.2.1.1.2 Inductive:

The logical sequence of induction is the reverse of deduction which is the transfer from the empirical world to the building of explanations and theories about what has been found (Gill and Johnson, 2002 p40). Fellows and Liu (2003 p16) provided an example of induction: if all clay that has been observed is brown in colour then one can conclude that all clay is brown. However, there are two main reasons to adopt an inductive manner in the social sciences; firstly, for a large number of researchers, working within the inductive tradition, explanations of social phenomena are relatively worthless unless they are grounded in observation and experience. There is an argument that is in contrast to the speculative and a priori nature of deductive theory, a theory which is developed inductively out of systematic empirical research, has more chance of fitting the data and consequently is more useful. The second reason is that the critique of some of the philosophical assumptions embraced by positivism enhances the inductive manner (Gill and Johnson, 2002 p40).

However, this research uses the inductive manner as it aims to develop a theory by initially investigating previous literature reviewed in the field and conceptualising an exploratory approach to focus the researcher on the data required in the data collection stage. Then, this data will be collected, analysed inductively and combined with the literature, in order to develop the research approach. Therefore, this type of reasoning is more suitable for conducting this research.

7.2.1.1.3 Deductive-inductive:

Deductive reasoning can only deal with specific kinds of statements and is increasingly separate from observation and experience, so, it was found to be limited. Furthermore, pure induction was considered to be unmanageable and haphazard, as well as rarely being carried out to the letter in practice (Walliman, 2005 p11). Bechhofer (1974 p73) stated that "*the research process is not a clear-cut sequence of procedures following a neat pattern but a messy interaction between the conceptual and empirical world, deduction and induction occurring at the same time"*. To clarify, induction is used to generate hypotheses while deduction can be made from it. Advances are made

by applying induction as knowledge advances; hypotheses might need qualifying statements to be appended to them (Fellows and Liu, 2003 p16). Regarding this, deductive and inductive can be integrated to form the deductive-inductive type which involves developing the hypotheses inductively and then testing them deductively and these will enhance the knowledge progress, certainly scientific knowledge practice (Walliman, 2005 p11). In addition, the argument of this integration is supported by noting that qualitative research {defined in the next section} is not entirely inductive, nor is quantitative research {defined in the next section} exclusively deductive and researchers apply the two reasonings in a continual manner (Leedy and Ormrod, 2005 p96). Alalshikh (2010 p114) provided an example for it as qualitative research can be applied to define a theme from qualitative data using an inductive reasoning. After that, this theme can be validated and modified deductively by more data. He also highlighted his research as another example of that.

7.2.2 Types and Approaches of Research:

Generally, there are three perspectives for research classification, which are according to; firstly, the applications of the research study {pure research and applied research}. Secondly, the purpose of the research: {instrumental, descriptive, exploratory, explanatory, interpretive and correlational research}. Thirdly, the enquiry mode employed or research methods adopted: quantitative, qualitative and mixed methods research (Creswell, 2003 p5; Fellows and Liu, 2003 pp7-12; Kumer, 2005 p9). Fellows and Liu (2003 p9) considered the last classification as a primary one. Furthermore, this classification is found to be the most common in the literature and its types will be reviewed as follows.

7.2.2.1 Quantitative Research:

This type is termed as a traditional, positivist or an experimental approach (Creswell, 1994 p4). It aims to test or verify a theory rather than building it. The investigator starts the research by advancing a theory by a deductive manner and gathers data to verify it and then reflects whether it was confirmed or not by the study findings (Standing, 1999 p36). This approach includes establishing measurements by gathering data and it builds upon previous work that has established principles, laws and theories to help to decide the data requirements of certain research (Fellows and Liu, 2003 p97). Quantitative research design tends to be a logical structure in which theories determine the research problem which is shown as a hypothesis or statement of a proposed link or relationship to be subjected to a test (Graham, 2000 p33). This type of research provides numerical data or data that can be converted into numbers. For example clinical trials {how many people have skin cancer?}. This type of research aims at {causal} explanation. It tries to answer primarily *why* questions (Mamia, 2006 p9). There are three key approaches to conducting quantitative research which are: asking closed questions through questionnaires and interviews; carrying out experiments; and 'desk research' using data gathered by others (Fellows and Liu, 2003 p98).

7.2.2.2 Qualitative Research:

This type is also termed as a constructivist or naturalistic approach (Creswell, 1994 p4). This approach is holistic, producing an understanding of a phenomenon and case as a whole. Furthermore, it is certainly appropriate when the topic is complicated, sensitive, an interaction or a change process (Standing, 1999 p36). Qualitative methods have been described as an "*array of interpretative techniques which seek to describe, decode, translate and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomena in the social world*" (Maanen, 1983 p9). Qualitative research includes the studied use and collection of a variety of empirical material such as case study, personal experience, introspection, life story, interview, observational, historical, interactional and visual tests which describe routine and problematic moments and meanings in people's lives (Denzin and Lincoln, 2000 p3). This type of research aims at understanding. It tries to answer primarily *how* questions (Mamia, 2006 p9).

Table 7.1 shows a comparison of the two approaches, which can help in choosing the most suitable approach.

Table 7.1: Comparison of quantitative and qualitative {source: (Leedy and Ormrod, 2005 p96)}

Question	Quantitative	Qualitative
What is the purpose of the research?	To explain and predict. To confirm and validate. To test theory.	To describe and explain. To explore and interpret. To build theory.
What is the nature of the research process?	Focused. Known variables. Established guidelines. Predetermined methods. Somewhat context-free. Detached view.	Holistic. Unknown variables. Flexible guidelines. Emergent methods. Contest-bound. Personal view.
What is the data like, and how is it collected?	Numeric data. Representative, large sample. Standardised instruments.	Textual and/or image-based data. Informative, small sample. Loosely structured or no standardised observations and interviews.
How is the data analysed to determine its meaning?	Statistical analysis. Stress on objectivity. Deductive reasoning.	Search for themes and categories. Acknowledgement that analysis is subjective and potentially biased. Inductive reasoning.
How are the findings communicated?	Numbers. Statistics, aggregated data. Formal voice, scientific style.	Words. Narratives, individual quotes. Personal voice, literary style.

7.2.2.3 Mixed Methods Research:

The term 'mixed methods' refers to research which combines alternative approaches within a single research project when both quantitative and qualitative are used (Denscombe, 2007 p107). Nowadays, the case tends to be more that research practices are placed somewhere on a continuum amongst quantitative or qualitative rather than one versus the other and it is better to say that the research seems to be more quantitative or more qualitative in nature (Creswell, 2003 p4). The idea of this approach is supported by Walker (1985 p20) when he states that quantitative and qualitative can be used to complement each other. There are many ways in which the qualitative approach acts as a precursor to the formation of problems and the instrument development for the quantitative

approach. For example, qualitative might act as a source of theories or hypotheses to be tested through quantitative. On the other hand, examples in which quantitative precedes and helps the qualitative data gathering are less obvious. Indeed, one of the ways is in the judicious selection of cases for deeper and further study (Bryman, 1988 pp134-136). However, many researchers use this approach for one or more of the following: to improve accuracy; to give a more complete picture; to compensate strengths and weaknesses; to develop the analysis; and as an aid to sampling (Denscombe, 2007 pp109-112).

The nature of this research is complex, and there is a need for understanding its concepts in the real context. Therefore, this research tends to be more qualitative in nature which will be justified more in the second part of this chapter.

7.2.3 Strategies {styles} for Research:

There are several styles of doing social science research. For example, Yin (2003 p1) highlighted five styles which are experiment {including quasi-experiments}, survey, archival analysis, history and case study. Other authors, such as Saunders et al. (2003 pp91-95), mentioned six styles: experiment, action research, ethnography, survey, case study and grounded theory. They argued that these styles could be grouped into induction, deduction or both. Experiment is deductive while ethnography, action research and grounded theory are inductive. Furthermore, survey and case study lie in between. Yin (2003 pp1-5) stated that each of the five strategies can be applied for all purposes {exploratory, descriptive or explanatory} and therefore this hierarchy does not distinguish the strategies, but rather three other conditions, as shown in Figure 7.3. Nevertheless, he argued that on most occasions, these conditions do not produce sharp boundaries between the styles. He justified this, as while each style has its distinctive features, there are big overlaps between them. He stated that the key issue is to avoid gross misfits and select the most beneficial strategies. However, the main styles will be reviewed as follows.

Strategy	Form of Research Question	Requires Control of Behavioral Events?	Focuses on Contemporary Events?
Experiment	how, why?	Yes	Yes
Survey	who, what, where, how many, how much?	No	Yes
Archival analysis	who, what, where, how many, how much?	No	Yes/No
History	how, why?	No	No
Case study	how, why?	No	Yes

Figure 7.3: Relevant situations for different research strategies {source: (Yin, 2003 p5)}

7.2.3.1 Experiment:

An experiment is "*an empirical investigation under controlled conditions designed to examine the properties of, and relationship between, specific factors*" (Denscombe, 2007 p48). Experiments are used when a researcher can manipulate behaviour directly, precisely, and systematically. Normally,

experiments are carried out in a laboratory setting but they can also be done in a field setting (Yin, 2003 p8). There some advantages of using experiments, which are that they are repeatable; precise; convenient; and creditable. On the other hand, their disadvantages are: deception and ethics; artificial settings; representativeness of the research subjects; and control of the relevant variables (Denscombe, 2007 pp58-59).

The whole range of experimental science also involves those cases in which the investigator cannot manipulate behaviour but the experimental design logic might still be applied. These cases are commonly known as 'quasi-experimental' (Yin, 2003 p8). It is noticed that in the situation of the Hawthorne Experiment, several investigators can produce different interpretations of results. The "Hawthorne Effect" is an outcome of a quasi-experiment, the results from which have been due to: indexicality, investigator effect and the subject's mediation through interpretation (Douglas, 1976; Goffman, 1969; Rosenthal, 1966; Rosenthal and Rosnow, 1975; Rossenberg, 1968; Shotter, 1975) cited by (Woodhead, 1999 p38). The experiment strategy cannot be applied in this research due to the geographical spread of research participants as well as the inductive nature of this research.

7.2.3.2 Action Research:

In 1946, Kurt Lewin established the term 'action research' to denote a pioneering way of conducting social research that integrated theory generation with changing the social system by the investigator acting on or in that system (Susman and Evered, 1978 p586). This strategy does not have an obvious, widely accepted definition (Altrichter et al., 2002 p125). However, Susman and Evered (1978 p587) stated that the most common quoted definition in the literature on the subject is the one provided by Rapoport (1970 p499) as "*action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical approach*". In addition, a more recent definition is that action research is "*a participatory, democratic process concerned with developing practical knowledge in the pursuit of worthwhile human purposes, grounded in a participatory worldview*" (Reason and Bradbury, 2001 p1). There are four main features of this strategy as it is: practical, change, cyclical process and participation (Denscombe, 2007 p123). Heale (2003 p163) mentioned that action research includes the systematic assessment, execution and evaluation of a process, including change. He highlighted five steps for the action research procedures as: diagnosing, planning, implementation, evaluation and learning. Data can be gathered using questionnaires and interviews in the diagnosing and planning stages while a focus group might be used to gauge opinion on the proposed change (Dawson, 2007 p18). Waser and Johns (2003 p373) argued that changing the status quo of the research case is a goal of action research. Furthermore, Altrichter et al. (2002 p127) stated that practice improvement is another goal of this strategy. However, general criticisms of this strategy include: the lack of detachment of the participants; weak identification of variables; time scale involved; and the risk that the work might degenerate into haphazard tinkering

(Swetnam, 2004 p33). The action research strategy is not appropriate for this research because of access problems to organisations.

7.2.3.3 Ethnography:

Ethnography has its roots as a research style in the works of the early social anthropologists, whose purpose was to produce a detailed and permanent account of lives and cultures of small isolated tribes (Denscombe, 2007 p61). Woodhead (1999 p39) stated that ethnography is drawn by the 'verstehen' concept, where the investigator is a non-influential participative observer. Verstehen is described by Gill and Johnson (2002 p229) as a concept that provides an understanding of the subjective behaviour of the actions of subjects. However, a description of persons or cultures is the literal meaning of the term 'ethnography' (Denscombe, 2007 p61). The investigator participates in the group under study and observes subjects' behaviour in order to have a clear understanding of what, how and why their behaviour patterns occur (Fellows and Liu, 2003 p23). Data is usually gathered through participant observations, conducting interviews and analysis of documents (Dawson, 2007 p19; Gill and Johnson, 2002 p128). There are several advantages of this approach which are: direct observation; it is empirical; it links with theory; detailed data; holistic; contrast and comparison; actors' perceptions; self-awareness; and ecological validity while its disadvantages are: tension with the approach; stand-alone descriptions; story-telling; reliability; ethics; access; and insider knowledge (Denscombe, 2007 pp72-73). Swetnam (2004 p37) does not recommended this approach due to the fact that it is time consuming and the complexity of its procedures. Furthermore, he added that it is unscientific, not generalisable, unrepresentative, and the investigator's personality causes bias. Therefore, ethnography strategy was avoided for this research.

7.2.3.4 Survey:

A survey tries to collect data from an entire group, or more normally a sample that can then be used to create interfaces, generate policy or reveal unsuspected facts (Swetnam, 2004 p33). It is applied on the basis of statistical sampling that represents the whole population and it is used for economy and speed (Fellows and Liu, 2003 p24). There are two types of survey which are the analytical {explanatory} and the descriptive survey (Gill and Johnson, 2002 p98; Swetnam, 2004 p34). Surveys can be used for gathering factual data or for decision-making (Swetnam, 2004 p34). In this strategy, data can be collected mainly through postal questionnaires, e-mail questionnaires, internet polls, face-to-face interview, telephone interview, documents and observations (Denscombe, 2007 pp8-12; Mamia, 2006 p35). The main benefits of the survey are that they provide empirical data; they have wide and inclusive coverage; they cost less and take less time than other strategies; and the survey lends itself to quantitative data. On the other hand, the main disadvantages are: the tendency to empiricism; low detail and depth of the data; accuracy and honesty of responses; sample bias with internet surveys; they are easily ignored (Denscombe, 2007 pp31-33). The survey

strategy is not appropriate for this research mainly because of its qualitative nature and the need of detailed and deep data.

7.2.3.5 Case Study:

A case study is an empirical inquiry, which studies a current phenomenon within its real-life context, certainly, when the boundaries between context and phenomenon are not evident. This approach as a research strategy involves all-encompassing methods, including the design logic, data gathering techniques and certain methods of data analysis (Yin, 2003 pp13-14). It concentrates on one or just a few cases of a specific phenomenon with a view to producing an in-depth account of events, relationships, experiences or processes happening in that specific case (Denscombe, 2007 pp35-36). This is supported by Fellows and Liu (2003 p24) when they stated that case studies are applied when there is a need for in-depth investigation of specific instances within the research subject. The most obvious strength of a case study is the use of a full variety of evidence such as documentation, archival records, interview, direct observation, participant observation, physical artefacts (Yin, 2003 p8). Furthermore, questionnaires can be used to produce specific information on certain points of interest. However, other benefits are: depth of study; the particular focus on relationship and process; holistic view; and the natural setting of this approach (Denscombe, 2007 p37). On the other hand, producing little basis for generalisation is considered the principle criticism of case studies (Craig-Smith, 1991 p150). Bell (1999 p11) supported this when he stated that case studies cannot always be generalised and the study value of a single event is questioned. He argued that the case study results can be generalised to other similar cases while a number of investigators think that the relatability of this strategy is more significant than generalisability. Moreover, Yin (2003 pp10-11) stated that as experiments, case studies are generalised to theoretical proposition rather than populations and therefore do not represent a sample, and the aim of carrying out this approach is to expand and generalise theories {analytic generalisation} and not to count frequencies {statistical generalisation}. Furthermore, Yin highlighted another complaint about the long time, massive results and unreadable documents for the case study. He stated that this is because of the confusion between case studies and other approaches such as ethnography. He argued that case studies as a form of inquiry are not based only on ethnographic or participant-observer data, but rather are based on the topic being investigated, and that a valid and high quality case study can be done without leaving the library and the telephone or internet. Finally, Yin argued that the biggest concern is the lack of case study rigour, which appears when the researcher does not apply systematic procedures or uses equivocal evidence or a biased view to affect the direction of the findings and conclusions. He stated that this problem occurs more frequently in case studies than with other strategies and can be overcome less easily. However, there are four key kinds of case study design: single-case {holistic}, single-case {embedded} multiple-case {holistic}; multiple-case {embedded} which are explained through the 2×2 matrix as shown in Figure 7.4. The

development of case study design requires optimising four conditions related to design quality, as shown in Table 7.2 (Yin, 2003 p19).

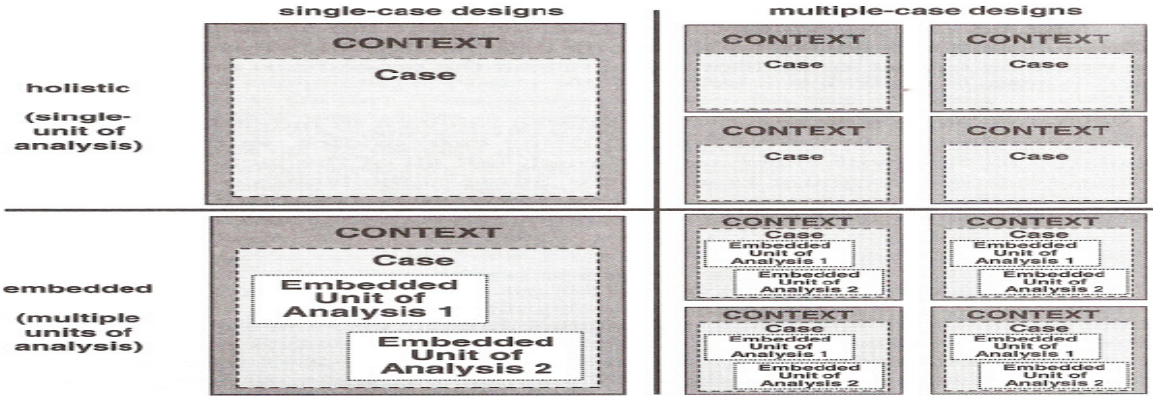

Figure 7.4: Basic types of design for case studies {sources: (Yin, 2003 p40)}

Table 7.2: Case study tactics for four design tests {source: (Yin, 2003 p34)}

Tests	Case study Tactic	Phase of research in which tactic occurs
Construct validity	Use multiple sources of evidence. Establish chain of evidence. Have key informants review draft case study report.	Data collection. Data collection. Composition.
Internal validity	Do pattern-matching. Do explanation-building. Address rival explanations. Use logic models.	Data analysis. Data analysis. Data analysis. Data analysis.
External validity	Use theory in single-case studies. Use replication logic in multiple-case studies.	Research design. Research design.
Reliability	Use case study protocol. Develop case study database.	Data collection. Data collection.

The research aims to develop a suitable approach that fits the practical context and the need for comprehensive and in-depth data, as well as the need to understand the subject in its real context. Therefore, the case study research method is appropriate to be utilised in this research and this will be justified more in the second part of this chapter.

7.2.3.6 Grounded Theory {GT}:

Fellows and Liu (2003 p14) described theory as ideas of a system that explain something; the exposition of the science principles. Traditionally, researchers develop theory by combining observations from past literature, common sense and experience (Eisenhardt, 1989 p532). In contrast, Grounded Theory is a methodology that first emerged in 1967, put forward by Glaser and Strauss. It is commonly used as an inquiry form in education and health research. Its emphasis is on the theory generation that is grounded in the data (Dawson, 2007 p20). In other words, theory is induced from the data and does not precede them (Lincoln and Guba, 1985) cited by (Cutcliffe, 2000 p1476). This is supported by Esteves et al. (2002 p131) when they stated that GT is not used for testing a hypothesis. They also stated that GT produces guidelines for data gathering, analysis and inductive theory building. They added that data gathering and analysis are applied in successive

stages and the data gathered in one stage helps the researcher to concentrate on the data gathering in the next stage. However, Kitchener (1994) cited by (Graham, 2000) advocated the intensive approach which is dependent on pragmatic modification of the GT strategy and it attempts to build conceptual approachs based on observations and is complemented by a dialogue with available literature rather than to test hypotheses that have been created a priori. Dainty et al. (2000 p228) stated that GT is suitable when there is no existing theory, or where theory is very remote or too abstract to produce definitive guidance. Nevertheless, Backman and Kyngas (1999 p148) argued that GT can also be applied when there is already some knowledge about the phenomenon of the research, but a new viewpoint is sought and therefore the investigator needs to be familiar with past knowledge in order to outline the research phenomenon. GT is considered as a method for analysing data (Star, 1998 p220). However, GT analysis can produce many problems such as data overload, complex procedures and a lengthy analysis phase (Dainty et al., 2000 p229). Esteves et al. (2002 p135), highlighted three approaches of GT which are those of: Glaser and Strauss (1967); Strauss and Corbin (1990); and Glaser {(1978); (1992)}. However, Backman and Kyngas (1999 p152) suggested that the researcher should follow one certain approach. Table 7.3 below illustrates the GT process.

Table 7.3: Grounded theory process {source: (Payne and Barlett, 1997 p183)}

Step	Activity	Comment
1	Collect data	Any source of textual data may be used, but semi-structured interviews or observations are the most common.
2	Transcribe data	It is necessary to produce full transcripts of the data in order to analyse them.
3	Develop categories	Categories are developed from data by open coding of transcripts.
4	Saturate categories	Further examples are gathered as one proceeds through transcripts until no new examples of a particular category emerge.
5	Abstract definitions	Once categories have been saturated, formal definitions in terms of properties and dimensions of each category may be generated.
6	Theoretical sampling	From the categories which have emerged from the first samples to help test and develop categories further.
7	Axial coding {the development and testing of relationships between categories}	Using the method of axial coding, possible relationships between categories are noted, hypothesised and tested against data which are obtained in ongoing theoretical sampling.
8	Theoretical integration	A core category is identified and related to all the other subsidiary categories by means of the coding paradigm, and links with existing theory are established and developed.
9	Grounding the theory	The emergent theory is grounded by returning to the data and validating it against actual segments of text.
10	Filling in gaps	Finally, any missing detail is filled in by the further collection of relevant data.

The GT strategy was avoided for this research. This is because this research aims to develop an approach, using initially the literature and then using case studies to provide data to improve and enhance the development of this approach. So, it is not purely from the data. Furthermore, the literature and the available theories are not very remote or too abstract and they were used to produce appropriate guidance as indicated in the previous chapter. Moreover, GT was not applied to

analyse the data because of its analysis problems mentioned above as well as a case study strategy has certain methods of data analysis as indicated earlier. Nevertheless, some of the general GT activities were used in the analysis such as coding, categorising and concepts which will be seen in the second part of this chapter.

7.2.4 Triangulation:

Triangulation is a manner in which "*multiple observers, theoretical perspectives, sources of data, and methodologies*" are combined (Denzin, 1970 p310). It includes the practice of seeing things from two or more perspectives which means the use of different methods, data sources, and researchers within a study in order to gain a better understanding of the thing being studied as it is viewed from different positions (Denscombe, 2007 p134). There are four types of triangulation which are: data triangulation {use different data sources}; investigator triangulation {using several researchers}; theory triangulation {applying different perspectives to interpret data}; and methodological triangulation {combining two or more methods to carry out the research} (Denzin, 1978 p295; Patton, 1987 p60). There are some advantages for triangulation: it improves accuracy {a means of validation}; it gives a fuller picture {a source of complementary data}; and increases confidence in research data and findings. On the other hand, the disadvantages are that it needs more time and money, it increases the complexity of data analysis, and it can be risky in terms of the gaining of contradictory results (Denscombe, 2007 pp138-139).

7.2.5 Research Sampling:

Normally, the population is too big to be worked with directly; rather, a sample is chosen and considered (Downing and Clark, 1996 p186). Therefore, sampling is the technique of examining a representative set of items {people or things} out of the full population under research in order to understand some characteristics or attributes of the complete population, depending on the sample features (Lucey, 2002 p82). The researcher should ensure that the sample is big enough to be significant, that it is as representative as possible, that its defects are acknowledged and that a rationale for it is provided (Swetnam, 2004 p43). Samples need to be carefully chosen. Generally, there are two types of sampling techniques. The first technique is random or probability sampling which is further divided into five types, which are systematic, stratified, quota, cluster and multi-staged. The second technique is non-random or non-probability sampling, which is further divided into four types, purposive, snowball, theoretical and convenience (Denscombe, 2003 pp11-16, 2007 pp13-18). The representativeness of random samples can be statistically determined, while it is never known in non-random samples and can only be guessed (Berdie et al., 1986 p10).

Regarding the sample size, Swetnam (2004 p43) stated that small sample results are less generalisable than large ones and judgement is needed of feasibility and cost against representative to determine the sample size. However, in qualitative research, a small size is required, in keeping with the nature of qualitative data. Furthermore, for qualitative researchers, the choice of people and

events for inclusion in the sample tends to be on the basis of non-random sampling (Denscombe, 2003 p24, 2007 pp28-29). Graham (2000 p29) supported this when he stated that these researchers normally use small, purposive samples from within a context that are investigated in depth.

7.2.6 Data Collection Methods of Research:

Data collection from respondents is a communication process that involves data transfer from the provider {respondent} to the collector {investigator} and vice versa (Fellows and Liu, 2003 p105). Data gathering is affected by the resources {especially time} available for the investigator. However, there are several methods for gathering data which can be used, based on the investigator and the study itself (Bell, 1999 pp102-103). Denscombe (2007 pp153-245) highlighted four main types of data collection methods which can be applied within different research strategies. These methods will be reviewed as follows:

7.2.6.1 Questionnaire:

Questionnaires are "*a series of predetermined questions*" (Berdie et al., 1986 p1). It is a tool which needs the systematic gathering of data from samples or populations and this includes the investigator seeking people that have been exposed to or experienced an event or process to ask them about it (Denzin, 1989 p139). In research, the use of questionnaires depends on one key, underlying assumption, which is that each single question will work. This indicates that the respondent will be willing and able to provide truthful answers (Berdie et al., 1986 p1). Questionnaires gather two types of information, facts and opinions, and there are two main methods of delivering questionnaires, post and internet. The latter is further divided into: email questionnaires; questionnaires sent as an attachment; and web-based questionnaires (Denscombe, 2007 pp154-160). There are three main types of questionnaires according to the question to be asked: closed-ended questionnaires; open-ended questionnaires; and a combination of both (Dawson, 2007 p32). Closed questions are those that have structured answers, which fit into categories, which have been created in advance by the researcher. It is suggested that 'other, please state' options should be added wherever possible to allow some freedom responses. The responses to these questions are quick and easy in terms of data analysis. On the other hand, open questions are those which leave the respondent to decide the answer wording and length as well as the subject to be raised in the answers. These questions tend to be short but their answers tend to be long, difficult, incomplete and difficult to analyse (Denscombe, 2007 pp165-166; Fellows and Liu, 2003 pp109-110). Questionnaire design cannot be learned from textbooks because each questionnaire seeks to investigate new issues and usually they are structured and include a combination of closed and open questions (Oppenheim, 1992) cited by (Hunter, 2006 p158). There are several advantages of questionnaires, e.g., they are cheap; easy to arrange; they have a wide coverage; they supply standardised answers; they have pre-coded answers; and the data is accurate. On the other hand, the disadvantages of questionnaires are: poor response rate; incomplete or poorly completed answers;

they limit and shape answers; and the truth of the answers cannot be checked and ensured (Denscombe, 2003 p161, 2007 p171). For this research, questionnaires are only used where possible to produce specific information on certain points of interest and fill gaps as discussed in the second part of this chapter.

7.2.6.2 Interview:

Kumer (2005 p123) defined interview as "*any person-to-person interaction between two or more individuals with a specific purpose in mind*". There are several types of interviews and their classification is according to different aspects: firstly, types of interview according to questions, which are: [1] structured interview, which is similar to a questionnaire and is conducted face-to-face with a respondent. The researcher has a predetermined list of questions and he offers limited option responses. [2] Semi-structured interviews in which the researcher still has a clear list of issues to be addressed and questions to be answered. The answers are open, and there is more emphasis on the respondent expressing his opinion. This is the most common type in qualitative research. [3] Unstructured interview, when the interviewer starts a topic and then lets the respondent develop his/her answers (Dawson, 2007 pp28-30; Denscombe, 2007 pp175-176; Fellows and Liu, 2003 p112). Secondly, there are types of interview classified according to interviewee, which are one-to-one interview, group interview or focus group. Thirdly, there are types of interview according to location which are face-to-face interview or telephone interview (Denscombe, 2007 pp10-11,177). Interviewers have the chance to probe or ask follow up questions. Other advantages include: depth of information; provision of valuable insights; simple equipment; they produce data that reflects informants' priorities; they are the most flexible method of data collection; high response rate; validity due to direct contact; and therapeutic. On the other hand, disadvantages of interviews are: they are time-consuming and resource intensive; they have low reliability; the interviewer effect; inhibitions due to audio or video recorder; invasion of privacy (Denscombe, 2007 pp202-203; Valenzuela and Shrivastava, downloaded on 2/7/2007 p1).

From a logical perspective, it is very difficult to capture all the information in human memory. Therefore, the best way to ensure the information is maintained is to record the data directly. There are three main types of data recording. The first type involves recording by writing on the field notes, which is the most cost-effective way. The second type involves the use of an audio tape recorder, which is more effective as it offers a permanent and full recording for all of the interviews. Finally, the most effective and expensive type is the recording using a video, which is a very good way to record the group or focus group interviews. Nevertheless, the audio tape recording is considered the standard way of capturing the data (Denscombe, 2003 pp175-176, 2007 pp194-195). For this research, interviews are useful because of its complexity and the need for in-depth data. Furthermore, the sample size is small {as discussed in the second part}. Therefore, interviews can be considered as an effective tool to be used in conducting this research.

7.2.6.3 Observation:

Observations include watching and listening to what is going on. They need the capacity to remain alert and to pick up important events. The research quality is based on the level at which the observers interact or participate with the subjects under study. Observation is not very good for probing and exploring relationships unless it is integrated with other data gathering techniques (Graham, 2000 p35). Generally, there are two types of observation. Firstly, direct observation, which includes the observation of a 'subject' in a specific case and often applies technology such as visual recording equipment or one-way mirrors. Secondly, participant observation, which is common amongst those who want to study another community, culture or context. This can be done by immersing themselves within that culture and may take months or years, as they need to establish a good relationship with those being studied (Dawson, 2007 pp33-34). Both direct and participant observations were not used in data collection because of the time limitation of this research as well as the difficulty of required access to the targeted organisations.

7.2.6.4 Documents:

Documents can be treated as a data source in their own right as an effective alternative to questionnaires, interviews or observations. Content analysis is the method used to analyse the content of a document as a way of quantifying the content of the text. It has six steps: select a suitable sample of the text or images; break the text down into smaller units; develop relevant categories for data analysis; code the unit in line with the categories; count the frequency with which these units occur; and analyse the text in terms of the frequency of the units and their relationship with other units that occur in the text. The benefits of using documents includes access to data; cost-effectiveness; and permanence of data while its weakness are: credibility of the sources; secondary data; social constructions (Denscombe, 2007 pp244-245). Documents are used in this research besides interviews.

7.2.7 Data Analysis Processes:

The analysis process includes searching for things which lie below the surface of the data content and the core elements, which clarify what the thing is and how it works. The job of the researcher is to probe the data in a manner which helps to define the important components which can be used to explain the nature of the matter being investigated, with the purpose of gaining some general principles and can be applied elsewhere to other cases (Denscombe, 2007 p30). Theory is made as a result of analysing data. Data analysis is a process of moving between description and explanation. Description is used to clarify complex matters by breaking them down into their component pieces while explanation is used to clarify complex matters by showing the relationships of their component pieces regarding some principles. Quantitative data analysis is a statistical approach which is a well-defined branch of mathematics (Graham, 2000 p30). Corbin and Strauss (2008 p1) defined qualitative data analysis as "*a process of examining and interpreting data in order to elicit*

meaning, gain understanding, and develop empirical knowledge". Furthermore, Marshall and Rossman (1999 p150) described it as the process of providing order, structure, and interpretation to the amount of gathered data. It is an untidy, unclear, time-consuming, creative, and fascinating process. It does not progress in a linear manner: it is not clear. Fellows and Liu (2003 p28) stated that usually qualitative data tends to be detailed and rich but unstructured and in their raw form and therefore their analysis is more difficult than that of quantitative data because they need filtering, sorting and other manipulation in order to make them appropriate for analytic techniques.

Different authors provide different techniques for qualitative data analysis and some of them will be reviewed. The choice of qualitative data analysis is based on the research topic, personal preferences, and availability of time, equipment and money (Dawson, 2007 p118). In case study analysis, Yin (2003 p109) emphasised the importance of having a general analysis strategy in order to define priorities for what should be analysed and why, and he provided three main strategies: relying on theoretical propositions; providing a approach based on rival explanations; and developing case descriptions. He added that any of these strategies could be applied when practicing the following five techniques of analysis: pattern matching; explanation building; time-series analysis; logical models; and cross-case analysis {particularly for multiple-cases}. Dawson (2007 p118) highlighted different types of qualitative data analysis by positioning them on a continuum, as seen in Figure 7.5. Tesch (1991 pp20-25) highlighted three categories of approach to the qualitative data analysis: language based, such as conversation, discourse analysis, ethno-methodology and symbolic interactionism; descriptive or interpretive; and theory-building, such as GT.

The guidance differs in just how systematic the authors consider that the procedures should be and there may be some areas of disagreement on emphasis. Generally, most specialists in the area would acknowledge that the five steps include qualitative data analysis, i.e., data preparation; familiarity with the data; data interpretation {codes, categories and concepts}; data verifying; and data representation (Denscombe, 2007 p288). However, there is no single right method for qualitative analysis. It is many things but not a rigidly codified process. It needs an intuitive sense of what is going on in the data; it needs trust in the self as well as in the study process, and the capability to remain creative, flexible, and true to the data, all at the same time. It is something that can only be taught by doing it and researchers should feel their way through it (Corbin and Strauss, 2008 p16). This is supported by Dawson (2007 p118) when he stated that qualitative data analysis is a very personal process, with few rigid rules and procedures.

Highly Qualitative	Combination	Almost Quantitative
e.g. Thematic and comparative analysis.	e.g. Discourse and conversational analysis.	e.g. Content analysis.
Reflexive intuitive takes place throughout data collection.	Uses a combination of reflexivity and counting.	Code and count mechanical. Can be left to the end of data collection.

Figure 7.5: Qualitative data analysis continuum {source: (Dawson, 2007 p119)}

Dedicated qualitative analysis software of different types are available which can be used for a number of different tasks (Dawson, 2007 p125). Denscombe (2007 p304) stated that computers help with managing data as well as with storing, coding and retrieving data. Dainty et al. (2000 p229) added that computer aided analysis can enhance the research quality by bringing the investigator closer to simultaneously investigated phenomena, both extensively and intensively, by using larger data sets. Dawson (2007 p125) stated that computers can undertake these tasks while they cannot think about, judge or interpret the data. Denscombe (2007 pp304-305) added that software takes time to be learned properly and there is a danger of data overload. However, Fellows and Liu (2003 p162) mentioned that computing helps in data analysis but is not fundamental.

7.2.8 Research Validity:

Silverman (2005 p224) stated that 'validity' is another word for 'truth'. In a research context, validity can be described as the provision of a faithful description of others' understanding and perception of the data's goodness and the research quality (Graham, 2000 p28).

There are four established tests of research quality: construct validity, which involves creating the right operational measures for the concept being investigated; internal validity {for explanatory or causal studies only} which is the demonstration of the cause and effect relationship; external validity which involves creating the domain to which research findings can be generalised; and reliability, which involves showing that a study can be repeated and provide the same results (Kidder and Judd, 1986 pp26-29; Yin, 2003 p34).

Moreover, the research quality can be judged through four concepts which are relevant to the above tests as: trustworthiness, credibility, confirmability and dependability (US General Accounting Office, 1990 p76; Yin, 2003 p33). Corbin and Strauss (2008 pp301-302) prefer to use the term 'credibility' when talking about qualitative research as it indicates the trustworthiness and reliability of the findings. Nevertheless, trustworthiness is used in parallel to validity in qualitative research and the last three concepts with 'transferability' are the four components of the trustworthiness (Lincoln and Guba, 1985 pp301-318). According to Seale (1999 p467), "*establishing the trustworthiness of a research report lies at the heart of issues conventionally discussed as validity and reliability*". Therefore, to achieve validity in qualitative research, trustworthiness assessment is important and this can be done by examining its four components.

However, an investigator should be able to prove that his new knowledge has appeared through the procedures. Raw data is not considered evidence on its own. It can be said that an investigator's claim is his own opinion unless he can provide evidence, which is the data that he understands to be related to his criteria and he can show this criteria in action (McNiff et al., 2003 pp135-137).

7.3 Part Two: The Adopted Methodologies for this Research:

7.3.1 The Adopted Approach for this Research:

There is no single best approach and the most effective one for solving the research problem should be chosen based on the research aims, problem type and the availability of resources (Gill and Johnson, 2002 p1, p162). This is supported by Denscombe (2007 p3) when he stated that approaches should be chosen because they are suitable for particular kinds of investigation and certain problem types. However, research methods and strategies are not normally mutually exclusive, although few will usually be used due to resource constraints (Fellows and Liu, 2003 p28). The most important stage in strategy selection is to define the research question, which can provide a significant idea regarding the most suitable strategy to be applied. The main issue is to understand that research questions have both: substance {what is the research about?} and form {is the investigator asking who, what, where, how or why questions?} (Yin, 2003 p7).

This research is about investigating and understanding the relationship between VM, RM, UM and ReqM and how they can be integrated in the appraisal stage of UK construction projects which are appraised within different organisation levels. Therefore, according to the literature in the first part of this chapter, qualitative research is the most suitable approach, which aims to understand and answer primarily *how* questions. Moreover, inductive reasoning was applied which reinforced the choice of appropriate data gathering methods and eased the understanding of the research process and its aspects. Furthermore, according to the comparison that has been illustrated in Table 7.1, qualitative approach is the most suitable because, firstly, the purpose of the study is to describe, explore, interpret and build an integrated approach. Secondly, the nature of the study is holistic, with unknown variables and emergent methods. Thirdly, the data is informative and was gained from a small sample. Fourthly, the data was analysed by searching for themes and categories with inductive reasoning.

7.3.2 The Adopted Strategy for this Research:

After the decision has been made to use a qualitative approach, the next stage is to choose the most appropriate strategy. A case study strategy was used for this research for two main reasons. Firstly, as indicated earlier, this research asks the question *how*. Furthermore, the integrated approach is developed to be used in a developing field and therefore should be as contemporaneous as possible. Moreover, there is no need to control the events. According to Yin (2003 p9) and as seen in Figure 7.3, the case study is the most suitable strategy when asking how and why about a contemporary set of events, over which the researcher has little or no control. Secondly, the nature of this research is about exploring processes, activities and events and this can be done using a case study strategy (Creswell, 2003 p183).

However, regarding the case study design, multiple-case {holistic} design was used. Multiple-case was chosen as it is considered better than a single one because firstly, it prevents the researcher

from putting all the eggs in one basket. Secondly, the analytical benefits from having more than one case might be significant. Thirdly, the chance of direct replication will emerge even when starting with only two cases and the conclusions will be stronger than those coming from a single case. In addition, normally the context of two cases is likely to differ to some extent and if the researcher can still provide common conclusions under these circumstances, the external generalisability of the findings will expand more than those from a single-case. Another reason is to avoid the criticism of the uniqueness or artificial environment that surrounds a single-case. Finally, having a multiple-case can start to blunt such criticism as well as scepticism about the researcher's ability to do empirical work beyond a single-case and will have a stronger effect. On the other hand, the case study design is holistic because generally there is one unit of analysis which is the organisation as a whole (Yin, 2003 pp53-76).

According to the case study type, it will be exploratory and descriptive not explanatory or casual. This is mainly because this research tries to explore and describe in a real life context the way of managing value, risk, uncertainty and requirements within the appraisal stage of UK construction projects in order to build and expand theory and not to test it.

However, because this research adopted the case study strategy, it should have a case study protocol. There are several reasons for using the case study protocol which are firstly, the development of a protocol is considered as the first stage in the case study strategy. Secondly, creating such a protocol will help the investigator in remembering what the research is about as well as the right data to be collected. Thirdly, having this protocol is thought to be desirable under all situations but it is considered essential when doing multiple-case studies which is the case of this research. Fourthly, the protocol is a significant approach to increase the reliability of a case study because it is intended to guide the researcher in data gathering. Finally, the protocol frames the case studies in such a way so that the detail about the report's structure and how it will be written becomes clear (Standing, 1999 pp45-46; Yin, 2003 p67). Details about the case study protocol and its structure can be found in Appendix D.

7.3.3 The Adopted Preliminary Information Gathering for this Research:

The literature review was used as the preliminary information gathering process. Generally there are several reasons for that which can be found in Denscombe (2003 p10), Gill and Johnson (2002 p25), and Scholes (2003 p6). However, the literature review was conducted for these general reasons and particularly to investigate: the projects and their appraisal and management within organisational levels; the current thinking on the use of VM, ReqM and RM in the UK construction industry as discrete disciplines; to establish the extent to which previous literature highlights the potential for their integration; to capture and identify the linkages between them, especially in the appraisal stage; to build the conceptual approach as a guidance for data collection and this was

produced in the previous chapter. According to Yin (2003 p33), building such a approach is an enormous aid in defining the suitable research design and data collection approaches.

Fellows and Liu (2003 p59) stated that in order to derive the operational approach from the conceptual one, past research findings are employed to determine what relationships have been corroborated and which remain to be investigated. Therefore, in this research, the conceptual approach was used to focus the data collection process on the required information as well as helping to generate the interview questions.

7.3.4 The Adopted Data Collection Methods for this Research:

The required scope and depth of the study as well as the resource availability affect the choice of the data collection methods (Fellows and Liu, 2003 p108). Moreover, data collection methods should be selected within time and cost constraints and the purpose of the research will indicate the most suitable one (Dawson, 2007 p39). Therefore, the adopted methods are as follows:

- Online in-depth review was conducted before all interviews. It aimed to have background information about the targeted organisations to demonstrate during the interview and reach the practitioners' expectations about this issue. Furthermore, this review was conducted to save time during the interviews through avoiding talking about this general information and focusing the interview on the more important issues that have not been found on the organisations' websites.
- However, in this research, the main data collection method was the interview as it is better than questionnaires because: firstly, it takes less time in terms of gaining responses. Secondly, it ensures the right person will answer the questions, as well as having a chance to clarify complex or unclear questions and will offer the chance to probe or ask follow up questions. In addition, it can provide rich and deep information and it is suitable for small samples, as is the case of this research (Denscombe, 2007 p174, p202).
  - In order to increase the validity of information, the types of interviews that were used are a combination of the following: firstly, according to the questions, a semi-structured interview was chosen to increase the level of control exercised by the interviewer over the nature of the responses and the length of the answers allowed by the interviewee. In addition, it was used to give some flexibility to the interviewees allowing them to raise and discuss their ideas freely. Moreover, the questions were open-ended asking interviewees about facts of a matter as well as their opinion about events. Also, they can suggest other persons to be interviewed or other sources of evidence. Secondly, the one-to-one interview was chosen because it is easier to arrange, control and transcribe than a group one. Furthermore, opinions and ideas arise from one person. Thirdly, according to the location, the face-to-face interview was chosen because the information obtained is more detailed and rich, which offers a direct means of information verification (Denscombe, 2007 p10, pp176-177; Yin, 2003 p90).

- Interviews were ideally one hour in duration but some interviews lasted up to two hours when the interviewees were happy to continue.
- Regarding the interview recording, field notes and audio recordings were used for all interviews to ensure the highest validity of information. These recordings were treated confidentially and will be destroyed by the end of this research. Detailed ethical procedures followed in these research to addressed ethical issues can be found in Appendix F.

❖ The interviews that were used in the case studies were combined with a second data collection method which is document analysis, and the two methods have been chosen as multiple sources of evidence {data triangulation} which will provide more benefits which are: allowing the researcher to address a broader range of historical, attitudinal and behavioural issues; developing converging lines of inquiry; and providing multiple measures of the same phenomenon to address the construct validity (Yin, 2003 pp98-99).

❖ Furthermore, short internet questionnaires were used with some interviewees as necessary and whenever possible in two ways: firstly, questions within email attachments to follow up issues that were missed in the interviews because of the meeting time. Secondly, questions within an email to fill any gaps and/or clarify any emerging issues in the cases which appeared after analysing the interviews and the documents. The usage of questionnaires in such ways is highlighted by Denscombe (2007 p37) and practiced by Male et al.'s (1998b p13) in their benchmarking study.

❖ Moreover, an opportunity was raised to present the research concepts and get feedback from nine practitioners within Client N, S and Y and Consultant A through one of the Institute of Value Management {IVM} Seminars (2010), an example of a focus group interview.

7.3.4.1 The Interview Questions:

The semi-structured interviews contain five sections and each section has several issues which have been written down as questions to work as reminders and guidelines during the interviews. Although most of these questions have been prepared before the data collection stage to be asked to interviewees, adjustments were made during pilot interviews, and other issues emerged also during the main interviews process outside of the themes to be investigated.

The researcher attempted to ask similar questions to all interviewees whenever possible and applicable depending on the meeting time and discussion. The researcher used the questions but also thought beyond them by listening carefully to the interviewees. Furthermore, because they are semi-structured interviews, prompt questions have been asked for certain areas of interest and the interviewees were allowed to speak freely {but within a time limit} about any issue that relates to or can benefit the research in order to gain a good understanding of deep rooted knowledge and values. Although the questions were presented in a particular order, interviewees were encouraged to discuss the issues they felt were important. Therefore, issues and questions were not necessarily

asked in the order presented to keep questions relevant to the direction taken in the interview. The questions asked to consultants were similar to clients' questions and the main difference is that client questions ask about their own organisation while consultant ones ask about regulated organisations in general and whether they have a different view across other sectors. These sections and their associated questions are indicated within the case study protocol in Appendix D.

7.3.4.2 The Research Pilot Study:

In keeping with the recommendations of Fellows and Liu (2003 p111), a pilot study was carried out on two big consultant organisations that had the knowledge of the sample organisations through interviewing one very expert practitioner {in the area of this research} from each organisation in order to check and test whether the interview questions were suitable, if they can be answered, if they are unambiguous. It also helps the researcher to predict the interview length and to identify and fill in gaps. Moreover, the information gained from the pilot study was used to feed the approach and update it (Bower and Moodley, 2009). In addition, the pilot study aimed to refine data gathering plans with respect to the data content as well as the approaches to be applied (Yin, 2003 p79). The pilot study was also used to understand VM, RM and ReqM within strategic, portfolio, programme, and project levels across different types of organisations and helped to refine the research scope.

However, the main criteria for choosing the pilot cases are convenience, access and geographic proximity (Yin, 2003 p79) and therefore all these criteria were considered when the pilot cases for this research have been chosen. Furthermore, the pilot organisations, Consultant A and B, are big consultants which have a broad view and wide experience of several big client organisations such as those in the main study. Moreover, the pilot interviewees R1 and R2 are experts in the area of this research and they work in a whole range of different organisations and across different activities.

7.3.4.2.1 The effect of pilot study on the research:

After the pilot data was reviewed and analysed, several key issues and their effects were considered in the research and are discussed as follows:

7.3.4.2.1.1 Issues and their effects on the research and the consequent actions:

- Public, regulated private and non-regulated private sectors are different and therefore, the regulated private sector was chosen for this research as it is considered very structured and is a combination between the other two sectors. Thus, the client organisations were selected from this sector as the main case studies.
- In the organisation structure of the research approach, an additional level was indicated above the organisation strategy level which is policy formation about vision, mission and values. However, the Board is responsible for both levels. Furthermore, for the regulated private sector, there is an intricate process with the regulators/funders. This is necessary for understanding the

assets of what regulated organisations have to build on against external requirements that are being imposed on them. This should also be considered and investigated.

- The choice of different definitions of portfolio and programme {as portfolio is a comprehensive meaning of all work within an organisation while programme is a group of related projects} was enhanced but needs more investigation.
- Generally, public and regulated private sectors tend to have a structured investment process and tend to use portfolio and programme management while the non-regulated private sector tends to be more unstructured and go from strategic level to project level without portfolios and programmes. This should be considered and investigated.
- The term Board is used in practice to represent the strategic management team who should form the organisational policy and set its strategies which was already demonstrated in the conceptual approach, but according to pilot study the Board usually deals with reports and does not develop strategy so this should be considered in the research and investigated in the main study.
- VM, RM and ReqM understandings in the field are the same in the conceptual approach but need more investigation.
- VM and RM are not fully integrated in practice as they are of different mindsets and mixing them can destroy the creative thinking within VM which will lead RM to be dominant as people naturally think about threats or problems more than opportunities. However, both methodologies are associated with each other as the risk associated with VM options are transferred to the RM process and the opportunities appearing within the risk process are developed within the VM proposal and so on. Therefore, these processes can be integrated but within different workshops. This should be considered and investigated as the conceptual approach integrated them in the same workshop.
- It can be seen that it is better to do VM before RM and this is supported by the literature and already considered in the conceptual approach but needs further investigation to confirm their logical sequence with ReqM.
- Regarding VM and ReqM, VM is used at the front end to sort out requirements. However, this indicated that ReqM should be enhanced by VM techniques such as FAST and this enhances the integration among them which is already done in the conceptual approach but needs further investigation.
- VM is used rarely at high levels compared with the project level and it is done at key interventions while RM is used much more at high levels than VM and it is done continuously. However, in public and regulated private sectors, VM which is followed by RM, is applied as a series of workshops from establishing the portfolio through programme and going to the beginning of the project to get strategic alignment. Also, VM is done in each programme to look at packaging strategy. Moreover, VM, which is followed by RM, is applied at key interventions

with big project phases. On the other hand, requirements might not exist yet at the strategic level and there are only aspirational targets which are assembled through the portfolio and programme while requirements are late established at the beginning of the project and then would be managed. All these should be considered and investigated.

- An expert study manager and the attendance of the right participants are consider CSFs for VM and RM. This should be considered and investigated more in the main study.
- VM and RM need the right study leader which should be an expert to do the job correctly. These skills should be considered but need more investigation.
- VM and RM might have the same participants, usually internal, sometimes needing a catalyst or a driver. These should be considered but need more investigation.
- Workshops are used in VM, RM and ReqM and this enhances the research approach which was built on the existence of workshops but should be investigated more in the main study.

7.3.4.2.1.2 Effect on the interview's questions and the consequent changes:

Generally, the interview questions were adequate. However, little changes have been made as a consequence from the pilot study. These changes are as follows:

- A question has been added within the general information section to ask about the role and experiences of the interviewees in order to ask questions based on that.
- A question has been added within the organisational level section to investigate the thoughts of the interviewees about using portfolios and programmes if the organisations do not use them.
- A question has been added within the VM, RM and ReqM integration section to investigate the thoughts of the interviewees about the integration of them if the organisations do not integrate them.
- A question has been added to be asked about the interviewees' views on the idea behind the research {using Chapter 6's diagrams and table} and how these can be implemented in the organisations. This question might be used if time remains during the interview in order to use the whole time effectively.

7.3.5 The Sample of this Research:

As this is qualitative research, purposive sampling will be selected which entails having the sample 'hand-picked' for the study. This type was chosen mainly because some organisations and practitioners are seen to provide the most valuable data (Denscombe, 2007 p17). Therefore, all the organisations and interviewees were selected based on their interest in the field and so they have deep knowledge of the research issues.

The weaknesses include the small size of sample used. However, in qualitative research like this, a small sample is acceptable with the nature of qualitative data, as discussed in the first part of this chapter. Furthermore, similar to Patanakul and Milosevic (2009 p220), it was recognised that each

organisation has been investigated based on one to two interviewees; conducting interviews with more people may enrich the fieldwork data. Nevertheless, those interviewees were chosen based on their high level of expertise and experiences within the area of this research. In other words, they are senior managers within their organisations. All of them had many years of experience in the area on this research ranging from five to 45 years. In addition, some of them had several years of experience from their previous employment. However, this small sample {12 + the IVM seminar as a focus group interview} produced sufficient data.

Furthermore, according to Graham (2000 p44) replication logic is the most suitable option when extending or creating theory and therefore it is applied here. In addition, using replication logic will enhance the external validity of the research {see Table 7.2}. In multiple-case studies, every case should be carefully chosen to either give similar results {literal replication} or contrasting results for predictable reasons {theoretical replication} (Yin, 2003 p47). A literal replication was used here as it is suitable for extending and creating theory while theoretical replication was avoided as it is for testing theory (Graham, 2000 p44).

It was planned to use three very large client organisations from regulated private industry in order to produce multiple-case studies. These organisations are Client N, S and Y. Documents related to VM, RM, ReqM as well as different organisation levels were asked for. Moreover, there were one to two interviews with expert practitioners in each case. The reason for talking to the clients is to know their way of doing things in the research area as a detailed inside perspective. Furthermore, six additional interviews within five very large consultant organisations {other than those used for piloting} were conducted to get a broader view and general understanding of how they see things are done within the regulated private sector as a general outside perspective as well as if they take a different view across other sectors. Moreover, the feedback from nine expert practitioners were considered as a focus group within the IVM Seminar (2010). However, all client and consultant interviewees, including the nine IVM Seminar participants, are senior and experienced managers in their organisations as well as having worked across different activities and been involved in different organisational levels with VM, RM, ReqM etc. Also, the consultant interviewees have worked with a whole range of different organisations. The following table summarises the interviewees' sample and their organisations:

Table 7.4: The research sample {source: The Author adopted from the research data}

Organisation ID	*Organisation Type*	*Construction involvement*	*Interviewee ID*	*Interviewee role*	*Construction involvement*
			Clients		
Client N	One of the largest rail client organisations in UK.	Over 100 yrs	R3	Senior risk and value managers.	Over 15 yrs
			R5		Over 20 yrs
Client S	One of the largest nuclear client organisations in UK.	Over 40 yrs	R4	Senior value manager; front end loading capability leader in the PM capability.	Over 27 yrs
Client Y	One of the biggest water client organisations in its county.	Over 36 yrs	R12	Senior risk and value manager in the asset delivery unit.	Over 5 yrs
			Consultants		
Consultant A	PM and construction management consultant organisations that also provide strategic, portfolio and programmes management.	Over 50 yrs	R1	Senior consultant.	Over 45 yrs
Consultant B		Over 125 yrs	R2	Senior consultant.	Over 33 yrs
Consultant C		Over 100 yrs	R9	Associate/programme director.	Over 25 yrs
Consultant G		Over 160 yrs	R11	Operations director across the UK for water consultancy business.	Over 20 yrs
Consultant I		Over 10 yrs	R6	Senior consultant.	Over 25 yrs
			R8	Senior consultant.	-
Consultant S		Over 90 yrs	R7	Director and global head of project and programme management.	Over 35 yrs
Consultant W		Over 41 yrs	R10	Senior technical director and the head of risk management.	Over 32 yrs
IVM Seminar (2010)	Clients and consultants organisations.	As indicated above	R1, 3, 4, 12 and other five participants.	The nine clients and consultant practitioners are senior managers in their organisations.	R1, 3, 4 and 12 as indicated above.

7.3.5.1 Gaining Access:

Because of the pilot study, the client organisations of the main study were chosen from the regulated private sector. They are the biggest organisations within the rail, nuclear and water industries. The interviewees were accessed through IVM.

Regarding the consultant organisations of the main study, they were accessed by contacting them using industry reference material such as the Consultant File within the New Civil Engineering website.

The detailed process of contacting and gaining access can be found in Appendix D.

7.3.6 The Adopted Data Analysis Process for this Research:

As indicated in the first part of this chapter, there is no single right way to analyse the qualitative data and therefore, the most suitable methods for the data analysis should be applied. Therefore, Denscombe's (2007 p288) five common steps identified earlier were used to analyse the data of

each case: data preparation; familiarity with the data; data interpretation {codes, categories and concepts}; data verifying; and data representation. Before the fifth step, cross-case analysis was applied through the different cases following Yin's (2003 p109) suggestion. This approach is also used by Patanakul and Milosevic (2009 p221). Moreover, data was analysed manually while computer software was used as a way to code, store and manage the data as well as write memos and notes. However, the adopted approach for data analysis and its steps are detailed and represented in their logical order as follows. Nevertheless, practically and as indicated by Denscombe (2007 pp288-289), the stages among initial gathering and the completed analysis of data were not nice logical sequences with each one being finished before the next one, as the researcher had to go back and forth among the stages especially in relation to data coding, interpreting and verifying. This is mainly because qualitative data analysis tends to be iterative with stages being revisited:

7.3.6.1 Preparing Qualitative Data for Analysis:

As indicated, all interviews have been recorded and therefore these recordings need to be transcribed to be used effectively. Therefore, each interview has been transcribed in a separate MS Word document for further analysis yielding about 16 to 30 pages.

Following Denscombe (2007 pp289-290), raw data like fieldwork notes, interview transcripts and documents were collected, processed and organised in a way that made them amendable to analysis. Also, Denscombe's four practical pieces of advice were applied as: back-up copies of all original material have been made; all material was collated and organised in a compatible format; data was collated in a way that allowed further notes and comments to be added alongside; each piece of 'raw data' material was identified with a unique label for reference purposes.

7.3.6.2 Familiarity with the Data:

Having done the preparation, the next step was to become familiar with the data by reading and examining them at least three times which provided the needed platform for the next step of data coding and categorising (Denscombe, 2007 p290).

7.3.6.3 Data Interpretation {developing codes, categories and concepts}:

Having prepared the raw data and become familiar with them, the next task was to start the formal interpretation process by following Denscombe's (2007 p292) essential tasks as: data was coded; these codes were categorised; themes and relationships were identified between the codes and categories; concepts were developed to arrive at some general statements.

Similar to Patanakul and Milosevic (2009 p221), after the transcripts were coded and the chains of evidence were developed, within-case analysis was applied to get an understanding of the research subject within each case. The parallel processes of data collection and analysis provided the opportunity to use the case analysis results to sharpen the next interview.

7.3.6.4 Data Verifying:

In order to ensure the data and particularly the interviews' data was true, they were verified by using four checks as suggested by Denscombe (2007 pp201-202) and these are: checking the data with other sources, corroborating with documents as multiple sources of evidence {data triangulation}; checking the data with the interviewees and this was done with all informants by sending each one a comprehensive summary of the interview's case analysis results; ensuring that the key players are chosen and this was done by selecting specialists, experts, and highly experienced practitioners in the field of research whose testimony carries a high degree of creditability; cross checking themes with other interviews and this was done by looking for themes emerging across a number of interviews.

7.3.6.5 Cross-case Analysis:

Following Yin (2003 pp133-137) and similar to Patanakul and Milosevic (2009 p221), cross-case synthesis was also carried out to analyse the consistency and inconsistency of the data across cases and to ensure the construct validity of the findings. This technique was applied to clients and consultants separately to gain two general views. Then it was applied again to gain their combined view. These were subsequently compared with IVM Seminar (2010) feedback to gain a comprehensive view that was presented in the findings chapter which has been compared with the literature as seen in the discussion chapter.

7.3.6.6 Data Representation:

Denscombe (2007 p303) argued that it is not feasible to present all qualitative data and the qualitative researcher needs to be selective in what to present and should identify key parts of the data/analysis and prioritise particular parts over others. Therefore, relevant issues were presented as cross-case analysis as seen in the findings chapter to disperse findings from the fieldwork throughout each issue.

7.3.6.7 Data Analysis Software:

As indicated earlier, qualitative analysis software is available and the common one is NVivo8 which can help in this type of analysis. Such software is a powerful tool for managing and organising data; developing coding and themes; and writing memos. Therefore, it was used, for these reasons, to analyse the interviews' transcriptions. The first six interviews' transcriptions were coded manually {as well as by NVivo8} to be tested against each other and they gave similar results, while the work was done faster through the software. However, the main weakness of this tool is the improper reading of diagrams and tables and therefore, this type of document was processed manually.

7.3.7 The Validity of this Research:

Validity is claimed for the research results, on the basis of:

- The case studies' quality is ensured by considering the tactics for judging their quality as shown in Table 7.2 which lists the four common tests and the suggested case study tactics with cross references to the research stage of their use. Nevertheless, the internal validity test is not conducted as this study is exploratory and descriptive not explanatory or causal which was discussed in section 7.3.2.
- The four components of the trustworthiness are applied as follows:
  - Credibility depends on instrument construction in quantitative research while "*the researcher is the instrument*" in qualitative research (Patton, 1990 p14, 2002 p14). This enhances the researcher's role in the quality of the qualitative research. However, 'member checking' is the most important technique for creating credibility (Lincoln and Guba, 1985 p314), which is one of the three techniques highlighted by Driessen et al. (2005 p214) as follows: triangulation, which is combining various information sources; prolonged engagement which is investing enough time by the researcher; and member checking, which is testing the data with their providers. For this research all these techniques were used as indicated earlier and this achieves credibility.
  - Transferability {external validity or generalisability (Denscombe, 2007 p299)} has been achieved through the tactics for external validity as indicated above. Although, as indicated earlier, the aim of carrying out case studies is to expand and generalise theories {analytic generalisation} and not to count frequencies {statistical generalisation}. Nevertheless, it can be generalised to regulated organisations because client case studies were selected from different regulated industries {rail, nuclear and water} while consultants were talking generally about regulated organisations.
  - Dependability {or reliability} has been achieved through the tactics for reliability as indicated above. Also, there are additional techniques to strengthen dependability such as fully describing the methods used to collect and analyse data and using consistent methods of data coding and recoding (Alalshikh, 2010 p219; Denscombe, 2007 p298). These techniques were used for this research to satisfy dependability as the methods of data collection and analysis are fully described in the above sections and the data was coded, assembled and systematically and rigorously analysed, as illustrated in the findings chapter.
  - Confirmability {or objectivity} is *"concerned with establishing the fact that the data and interpretation of inquiry were not merely figments of the inquirer's imagination. It called for linking assertions, findings, interpretations, and so on to the data themselves in readily discernible ways*" (Schwandt, 2001 pp258-259). It is about ensuring that the researcher is unbiased during the data collection, analysis and interpretations (Denscombe, 2007 p296). This bias can be mitigated by providing the reader with the raw materials from the data, so that he may evaluate the quality of the researcher's interpretations (Alalshikh, 2010 p219).

Therefore, quotations from the raw material are presented in the findings chapter to satisfy confirmability.

- Transparency is used as one of the indicators of quality both for quantitative and qualitative studies (Bryman, 2004 p284). It refers to the clarity of the researcher's explanation for all the study's phases {e.g., who the participants were, how were they chosen, how the data was analysed, and how the conclusions were drawn}(Bergman, 2008 p108). This has been achieved through the clear description of the fieldwork in the above sections.

The strategies above ensure the quality of the research as well as the validity and trustworthiness of its results. Therefore, it can be concluded that these procedures achieved validity for this research. Consequently, the approach resulting from this research should be valid according to the following:

- Yin (2003 pp33-34) as a recognised expert in case study based research, emphasises considering the Table 7.2 tactics to achieve validity through its four common tests. Moreover, he and Seale (1999 p467) agree that examining trustworthiness through its components is the core of ensuring validity.
- The research approach and its models were developed incrementally in line with Male et al.'s (1998b p12) incremental validation approach. This has been done through four stages as follows:
  - The research approach has been conceptualised from the literature as argued in Chapter 6. This was used as a datum to be continually updated throughout the research. According to Yin (2003 p33), such theoretical approach also becomes the main vehicle for generalising the research results, achieving external validity.
  - In the pilot study, the conceptual models were discussed with the interviewees and their views were considered when discussing the models with others interviewees {see section 7.3.4.2.1.1}.
  - In the main study, the models were discussed with the interviewee, updated accordingly, and then discussed with the next interviewee and so on. This stage also includes discussing and updating them according to the IVM Seminar (2010).
  - Finally, the findings were discussed and compared with the literature to update and develop the research approach through critiquing and improving the conceptual one. According to Patanakul and Milosevic (2009 p221), this also ensures external validity for the approach.

7.4 Chapter Summary:

In this chapter, research design, approaches, strategies and methods have been studied as well as their features, strengths and weaknesses. Furthermore, other aspects such as data analysis, sampling, triangulation and validation were discussed in the first part of this chapter. Moreover, in the second part, the adopted methodology for this study has been chosen and justified after considering all

possibilities and comparing them. The methodology is a qualitative approach based on the case study strategy. The data was collected mainly using interviews and documents {data triangulation}. Data analysis was carried out using the five steps that have been mentioned earlier as well as cross case analysis. The validity of the research was highlighted. After that, the integrated approach was generated using the fieldwork data and in comparison with other theories. Finally, conclusions and recommendations were drawn and the thesis was written up. However, Figure 7.6 summarises the adopted methodology for this research as indicated below.

Having reviewed the research methodologies and adopted and justified the most appropriate one for this research, the next chapter will illustrate the findings as cross case comparisons.

Adopted Methodology:-

1/ Research type: qualitative research.

2/ Preliminary information gathering: literature review.

3/ Pilot study.

4/ Fieldwork research strategy: case study.

4.1/ Case study design: multiple-case {holistic}.

4.2/ Case study types: exploratory and descriptive not explanatory or casual.

4.3/ Fieldwork data collection: 12 semi-structured interviews, one focus group and documents.

4.4/ Gaining access: the following steps were used as necessary:

4.4.1/ Identify subject by phone/email to the interviewee, his/her secretary or company's reception.

4.4.2/ Ask for the interviewee's email or mail address.

4.4.3/ Send out formal illustrative letter/email from the supervisor with formal letter to the interviewee.

Reply.	No reply.
	4.4.4/ Send reminder letter.

Decision to contribute in the research.

Yes.	No.
	4.4.5/ Send polite acknowledgment letter.

4.4.6/ Contact to arrange a meeting.

4.4.7/ Send out information pack before the meeting.

4.5/ Conduct interview with some considerations as follows:

Early cancellation	Last moment cancellation	15 minutes	30 minutes	1 hour	1:30-2 hours
-Arrange another one if possible OR; -Send questions as a questionnaire & contact for return date.	-Leave questions as a questionnaire & contact for return date.	-Leave questions as a questionnaire & discuss for return date. -Identify other actors. -Tape & note recording.	-Ask some targeted questions. -Tape & note recording. -Leave other questions as a questionnaire & discuss for return date.	-Ask prioritised questions. -Tape & note recording. -Leave other questions as a questionnaire {if necessary} & discuss for return date.	-Ask all questions. -Tape & note recording.

4.6/ Verification of the interview data by: transcript each interview; send a summary of each transcription to its respondent for review & comments.

5/ Data analysis using the five mentioned steps for each case with cross case comparison through all cases.

6/ Discussion → to develop the approach using the fieldwork data and in comparison with other theories.

7/ Drawing conclusion and recommendations and writing up the thesis.

Figure 7.6: The adopted research methodology {source: the Author}

8 CHAPTER EIGHT: FINDINGS:

8.1 Introduction:

This chapter presents the findings from the empirical research. These findings constitute the combined results of three client organisation case studies, eight consultant interviewees, and the focus group from the IVM Seminar {2010}. The chapter consists of two main parts. The first part provides a brief description of those three groups that are used as the data collection sample. This is used to focus the reader by identifying key contributors from which the data was collected, analysed and presented as findings.

The second part organises and produces the findings which are relevant to this research and will contribute to the development of the research approach. These findings will be presented mostly under headings similar to the interview questions introduced in Chapter 7. However, some issues emerged from the fieldwork and they are included as they are relevant to the research. This part of the chapter starts by highlighting the differences between public, regulated and non-regulated private sectors and emphasises choosing one of them. Then, it presents findings about key strategic issues regarding organisational levels; investment processes; and skills profiles across those levels in client organisations. Next, findings about client organisations' understandings and applications of ReqM, VM and RM within different organisational levels will be presented. Then, the findings about study managers and participants of ReqM, VM and RM studies will be highlighted. Following that, the findings about ReqM, VM and RM integration within client organisations will be illustrated. After that, the application of an early VM process will be presented, showing how client organisations use VM study to accommodate requirements and risk issues. Finally, the conclusion section summarises the chapter and lists the lessons learnt.

8.2 Part one: The Three Sample Groups:

This part of the chapter clarifies the sample groups from which the data was gained as follows:

8.2.1 Client Organisations as Case Studies:

From the client companies' websites and their interviewees, the client case studies use asset management, corporate governance, portfolio management, programme management, construction management, PM, VM, RM and informal ReqM. They have large numbers of employees ranging from 3000 to 35000. They have different internal and external stakeholders of which the core ones are similar. Their internal stakeholders are mainly shareholders and employees while the main external stakeholders are regulators and funders. They provide rail and IT infrastructure, nuclear, water and sewerage services respectively. For confidentiality purposes, these client case studies have been referred to as Client N, Client S and Client Y while the individual client interviewees were referred to as R3, R4, R5 and R12.

8.2.2 The Consultant Interviewees:

From the companies' websites and the interviewees, the consultants' organisations provide several consultancy services including asset management, corporate governance, strategic management, portfolio management, programme management, construction management, PM, ReqM, VM and RM. For confidentiality purposes, the consultants' organisations were referred to as Consultant A, B, C, G, I, S, and W while the individual consultant interviewees were referred to as R1, R2, R6, R7, R8, R9, R10 and R11. They were interviewed mainly about their views on client organisations' investment processes; organisation levels; and understanding, applications and integration of ReqM, VM and RM methodologies within different organisation levels.

8.2.3 The IVM Seminar:

There was an opportunity to present the conceptual models and some initial findings of this research at an IVM seminar as a focus group interview. This results in gaining feedback from the participants about the research models.

Another presentation was undertaken about VM {including requirements and risk issues} interventions within different organisational levels. This was developed and fed from bringing together the literature, experience, and senior managers' experience of VM at the early stages and also initial results of this research. Results gained from these interventions are summarised in Table 8.1.

Feedback was gained from a range of discussions about the presented issues through and after each presentation. Only information related to the research was used {which is not necessarily the whole presented and/or discussed issues at the event}.

Table 8.1: VM interventions {source: The Author adapted from {IVM Seminar, 2010}}

Study / Features	Level Zero S0 {Organisation Policy}	Level One S1 {Organisation Strategy}	Level Two S2 {Portfolio Level}	Level Three S3 {Programme Level}	Level Four S4 {Project Level}
Purposes	Establish core vision. Mission. Values. Requirements for investment needs. Investment priorities in outline terms.	Test individual business plans back against vision, mission and values.	Clarity of core vision, mission, and values against particular portfolio investment vision {intent} and capability building via programmes.	Clarity of vision, mission, values against particular portfolio investment vision and programme Level vision.	Establish need. Project vision.
Outputs	Organisation policy with list of requirements and risks. Series of strategic business plans by portfolio need.	Confirm strategic business plan against need and investment priorities to confirm strategic fit.	Series of programme level business plans.	Programme need. Capability identification. Confirm programme level business case.	Project strategic brief. Project level business case.
Accountabilities	Board.		Portfolio manager.	Programme manager {if appointed otherwise its sponsor}.	Project manager {if appointed otherwise its sponsor}.
Key Participants	Board.		Board & portfolio manager{s}.	Board, portfolio manager, programme manager.	Programme manager.
Typical Techniques	Issues Analysis. Strategic Function Analysis. Needs Analysis. Value System Analysis. Risk Analysis.	Issues Analysis. Strategic Function Analysis. Needs Analysis. Value System Analysis. Risk Analysis.	Issues Analysis. Strategic Function Analysis. Needs Analysis. Value System Analysis. Time Cost, Quality Trade-offs. Strategic time line. Identify programme requirements: needs and investment requirements outlined. Capability building.	Issues Analysis. Strategic Function Analysis. Needs Analysis. Value System Analysis. Time Cost, Quality Trade-offs. Strategic time line. Identify project requirements: needs and investment requirements outlined. Capability building. Consider Procurement Strategy {s}.	Same as S2 and as International VM Benchmarking Study.
Workshop No. for each study	It could be one workshop or multiple workshops, depending on the scheme size and the number of issues to be addressed.				

8.3 Part two: The Findings:

This part of the chapter presents the key findings of the research that are used to develop the research approach in the next chapter.

8.3.1 Public, Regulated Private and Non-regulated Private Sectors:

As indicated in the research methodology chapter, the pilot study distinguishes between public, regulated private and non-regulated private sectors and this influences the direction of the fieldwork to focus on the third one for the reasons indicated in section 7.3.4.2.1.1.

This issue was discussed with all consultants who indicated the following. Most consultants {R1; R2; R6; R8; R10} indicated that public, regulated private and non-regulated private sectors are different {mainly in their investment processes and VM, RM and ReqM applications} and one should be chosen in a single research. One of them {R2} stated that the "*public sector might be the best choice as it has got more meaning on this research because it is very structured"*. Whereas, half of the consultants {R7; R8; R10; R11} support the second option as: it is a combination of the other two {private organisations regulated and funded by government} and may lead to a hybrid approach; and it has in place procedures and processes that work to deliver the project. On the other hand, in the non-regulated private sector there is much less concern about process and more about achieving the outcome, staying in front of the competition. The public sector tends to be very bureaucratic and not always in a productive way.

Therefore, all client case studies {Client N, Client S and Client Y} are regulated private companies in different sectors. One is in transport, one in nuclear and one in water {Client N, access on 28/4/2009; Client S, access on 9/7/2009; Client Y, access on 13/7/2009; R3; R4; R5; R12}.

Having presented the findings that indicate the differences between the sectors in their investment processes and ReqM, VM and RM applications and hence confirming the pilot study indicating choosing the regulated sector. The following sections start to present the findings about the regulated sector investment process; and its ReqM, VM and RM applications and integration.

8.3.2 Organisation Levels and the Investment Processes:

The literature review highlighted the need for more investigation of organisational levels, their relationships, the investment process, creation of programmes and projects and the skills profile to manage the levels. Therefore, this section presents the findings relating to this investigation as follows:

8.3.2.1 Level above Organisational Strategy:

This issue emerges from the fieldwork for clarification purposes as it is not clear in the literature. This section presents the findings as follows.

All consultants indicated that for all sectors there is a level above the organisational strategy level which is policy formation of vision, mission and values. One of the consultants {R2} added that "*the regulated private sector has an intricate process with the regulators/funders before policy*

formation which is to understand the base of which they have to build on against external requirements that are being imposed on them".

The client case studies support the consultants' view of regulated organisations. Furthermore, the client case studies have different statements about their visions, missions, and strategies which relate to their work and are used to represent: the best future situations to be reached by the organisations; state the reason for their existence; and define their approaches to reach their visions respectively. Client N's determination, respect, teamwork and pride are examples of values of the organisation. However, one consultant {R7} and Clients N and S indicated that policy and strategy tend to be similar and this issue will be discussed in the next chapter.

Having presented the findings about the corporate level including policy and strategies, the next two sections present the findings about the next levels down in the hierarchy which are portfolio and programme, highlighting their definition and usage in the field.

8.3.2.2 Definition of Portfolio and Programme:

The literature review indicated some confusion in the meaning of portfolio and programme and therefore they were investigated in the fieldwork to understand practice as follows.

Half of the consultants {R6; R7; R8; R11} indicated that portfolio and programme concepts are confused and not well understood in practice. They believe that is because some client organisations do not understand the difference between these concepts; or do not think about portfolios and just think about programmes.

Furthermore, one consultant {R11} and Client Y indicated that some regulated private organisations such as water companies use different terminologies as they term portfolio and programme in a different way as 'stream' and 'batch' respectively.

All consultants and client case studies distinguish between portfolio and programme. They define programme as a group of related projects and/or works which together lead to achieve common business benefits/objectives. Whereas, they have two views on portfolio. Commonly it is a comprehensive meaning for all work within an organisation; and occasionally a grouping of related and/or unrelated programmes and/or projects that are categorised together to manage their development and delivery to allow more effective resource management. This indicates that portfolios are being used in two ways in practice but commonly it is used to manage all the programmes and projects within an organisation.

8.3.2.3 Usage of Portfolio and Programme:

The literature review indicated an unclear use of portfolio and programme and therefore their uses were investigated in the fieldwork as follows.

The focus group at the IVM Seminar {2010} indicated that different client organisations might have different uses which may be because of different terminologies. For example, some have portfolio then programmes then smaller portfolios {sub-programmes} which then have projects. Also, the

majority of consultants {R1; R2; R7; R10; R11} indicated that this is different among sectors. They think that generally organisations within the regulated private sector tend to use portfolio, programme and their techniques.

The client case studies support the consultants' view of regulated organisations that they use portfolios and programmes.

Nevertheless, some consultants {R6; R7; R8} indicated that within the regulated private sector, portfolio and programme tend to be used interchangeably by some client organisations. Although, these organisations focus mainly on the programme, they do not use it properly as they use it just for grouping existing projects.

Having presented the findings about portfolios and programmes, the next section deals with the findings about major projects, indicating their definition, features and structure within regulated private organisations.

8.3.2.4 Major Projects within Organisations:

Although the conceptual models focus on the organisations' normal delivery, major projects emerged from the fieldwork as an important issue to be considered and thereby investigated as follows.

Two consultants {R7; R10} and all the client case studies indicated that within regulated organisations, there might be a particular type of project which might be of high value but that does not fit within regular activity; day-to-day operation; or business as usual. It tends to emerge out of these as a major project. It links directly to the organisational strategy level and has a completely separate structure because of its scale, uniqueness, urgency and/or has a critical mission due to its drivers {value, risk, business impact, time etc.}, or other terms which merit special arrangements. Techniques and complexity issues which surround normal projects are different for major projects because the latter: need different control and organisational structures; have much more stakeholder involvement; are likely to have a separate project control office and a dedicated team under the direct control of a nominated person; and may have a much longer lifecycle because they usually need parliamentary power and have a complex funding mechanism. It might have a programme management structure to it but should not be considered as a programme as its underlying projects are not necessarily related because some of them can be done without the need to complete the others. Thus, it should not be considered as a typical project or even a programme and therefore it is a special case which operates outside the structure of normal delivery.

Having presented the findings about organisational levels and major projects, the next section presents findings about investment processes, highlighting how these processes go through the organisational levels.

8.3.2.5 The Investment Processes:

The literature review highlighted the importance of the investment process in the appraisal stage and thus it was investigated in the fieldwork as follows.

Most consultants {R1; R2; R6; R7; R10; R11} indicated that investment processes are different within different sectors but generally organisations within the regulated private sector tend to have structured investment processes.

The client case studies support the consultants' view of regulated organisations that they have a structured investment process. They look to what needs to be achieved, from a strategic view and develop their plans. These plans should be discussed with main funders to get funds which are broken into portfolios, programmes and projects.However, one consultant {R6} makes a useful comment: "*although, regulated private organisations' investment processes are structured, sometimes they are not working properly. The main reason for this problem is people as they are still doing what they have been doing before even if there is a new, structured process. This is because many people in the profession will undertake projects in accordance with their experience rather than pull out a manual and follow it. Therefore, they should be trained and changed. This can be done by bringing in people with expertise like consultants who are going to manage the change and physically change the people because they will have to work with them and hold their hands through this new process"*. This indicates that regulated private organisations have structured investment processes but people need to be trained to use these processes effectively.

Having dealt with the findings about the investment process, the next section presents findings about business cases as key documents within this process.

8.3.2.5.1 Business Case:

Within the structured investment process, the business case emerged from the fieldwork as an important issue to be considered.

The client case studies indicated that a business case is used to define why a project or a programme is needed through defining scope, budget and financial justification for the proposed investment. It is a live document and must be updated throughout the investment lifecycle. It is driven by the level of business risk and main stakeholders' {like regulators and funders} requirements.

Two consultants {R8; R10} indicated that within regulated organisations, there is a business case at the programme level because usually programme does not deliver any benefit until all its projects are completed. Furthermore, each project should have its own business case for authorisation by the programme board which has delegated authority from the main Board. So at the programme level, there would be a business case developed but then the benefits would be spread across a number of projects and then those would be picked up at project level. Business cases are determined and developed by the sponsors. This indicates the need to develop business cases at both programme

and project level. ReqM, VM and RM come together to do this effectively as indicated by half of the consultants {R2; R6; R9; R10} and all client case studies.

Having introduced the findings about the organisational levels and investment process, the next two sections highlights findings which show how these levels are linked in practice.

8.3.2.6 Linking between Organisation Levels:

Figure 6.4 links between these levels but because of the unclear use of portfolio and programme, this was investigated in the fieldwork as follows.

All consultants and client case studies indicated that the diagram shown in Figure 6.4 is applicable for client organisations {mainly regulated ones}, but just for the fact of having policy formation before strategy.

A majority of consultants {R1; R2; R7; R10; R11} indicated that generally, regulated private organisations tend to link these levels as organisational policy → strategy → portfolio → programme → project but with various levels of clarity.

Generally, the client case studies support the consultants' view of the structure of regulated organisations. Nevertheless, it is not a straightforward relationship as there is a lot of crossover between portfolio, programme, and projects within the companies and they also might have major projects and investment portfolios which both link directly to organisational strategy level. The following figure is used to show this crossover within the client case studies.

<table>
<tr><td>Level 0</td><td colspan="4">Organisation policy {about vision, mission and values} which is formed by the Boards in conjunction with main funders
[Clients N, S and Y]</td></tr>
<tr><td>Level 1</td><td colspan="4">Organisation strategy and objectives which is set and owned by the Board
[Clients N, S and Y]</td></tr>
<tr><td>Level 2</td><td colspan="3">Investment Portfolio{s}
{may be more than one for large organisations like Clients N and S}
[Clients N, S and Y]</td><td rowspan="5">Major project{s}
[Clients N, S and Y]</td></tr>
<tr><td>Level 3</td><td colspan="2">Portfolios
[Client N, and stream as compartment name for Client Y]</td><td rowspan="3">Programmes
{Related and/or unrelated}
[Clients N and S]</td></tr>
<tr><td>Level 4</td><td>Programmes.
{Related and/or unrelated}
[Client N, and batch for Client Y]</td><td rowspan="3">And/or unrelated projects
[Client N]</td></tr>
<tr><td>Level 5</td><td rowspan="2">Related projects
[Clients N and Y]</td><td>Related projects within the programme which may be grouped as sub-programmes
[Clients N and S]</td></tr>
<tr><td>Level 6</td><td>Related projects
[Clients N and S]</td><td>Related or unrelated projects
[Clients N, S and Y]</td></tr>
</table>

Figure 8.1: Linking between organisation levels within client case studies {sources: {IVM Seminar, 2010; R3; R4; R5; R12} adapted by the Author}

Having illustrated the findings about the linkage between organisational levels which indicate that there are generally linked as policy → strategy → portfolio → programme → project within regulated private organisations but some crossover might be existed which should be discussed

further in the next chapter. The next section presents findings about how portfolios and programmes are created, highlighting the possible direction for investments within organisations.

8.3.2.7 Structuring of Portfolios and Programmes {Top-down ↓ or Bottom-up ↑}:

The literature review indicated the ambiguity of how programmes and projects are created and this was investigated in the fieldwork as follows.

All consultants highlighted two approaches for that which are top-down and bottom-up. Firstly, the traditional way is the top-down ↓ approach {similar to Figure 6.4}. This is when an organisation forms its policy and then this should drive organisational strategy and objectives and these should drive the investment portfolio which allocates resources across capabilities and drive programmes which drive projects. Although this approach provides a structured investment process, it is not well understood in practice.

However, half of the consultants {R2; R7; R10; R11} indicated that regulated private organisations tend to have a top-down approach. Client S supports that as it uses this approach.

Secondly, there is the bottom-up ↑ approach. Figure 8.2 clarifies the concept of this approach as the Board's members are usually skilled to make decisions and they are good in setting business planning and strategy which produce capital investment process/requirements. People at the project level generate projects to satisfy these requirements as possible and to solve problems existed at their level. In some organisations, these projects are grouped at the programme level either rightly or wrongly, depending on how these organisations decide to group them {sometimes the only linkage between them is technical requirements for example}. So, a programme exists here to group a set of project requirements together and there may or may not be logic to it and this is where the gap sits {this gap can be filled by a skilled sponsor as detailed in the next section}. Finally, some organisations group these programmes under a portfolio. These two bottom-up groupings are done to try to link projects to the strategy. According to consultant {R6}, methodologies such as ReqM, VM and RM are used at this approach in managing at project level and rarely at programme levels.

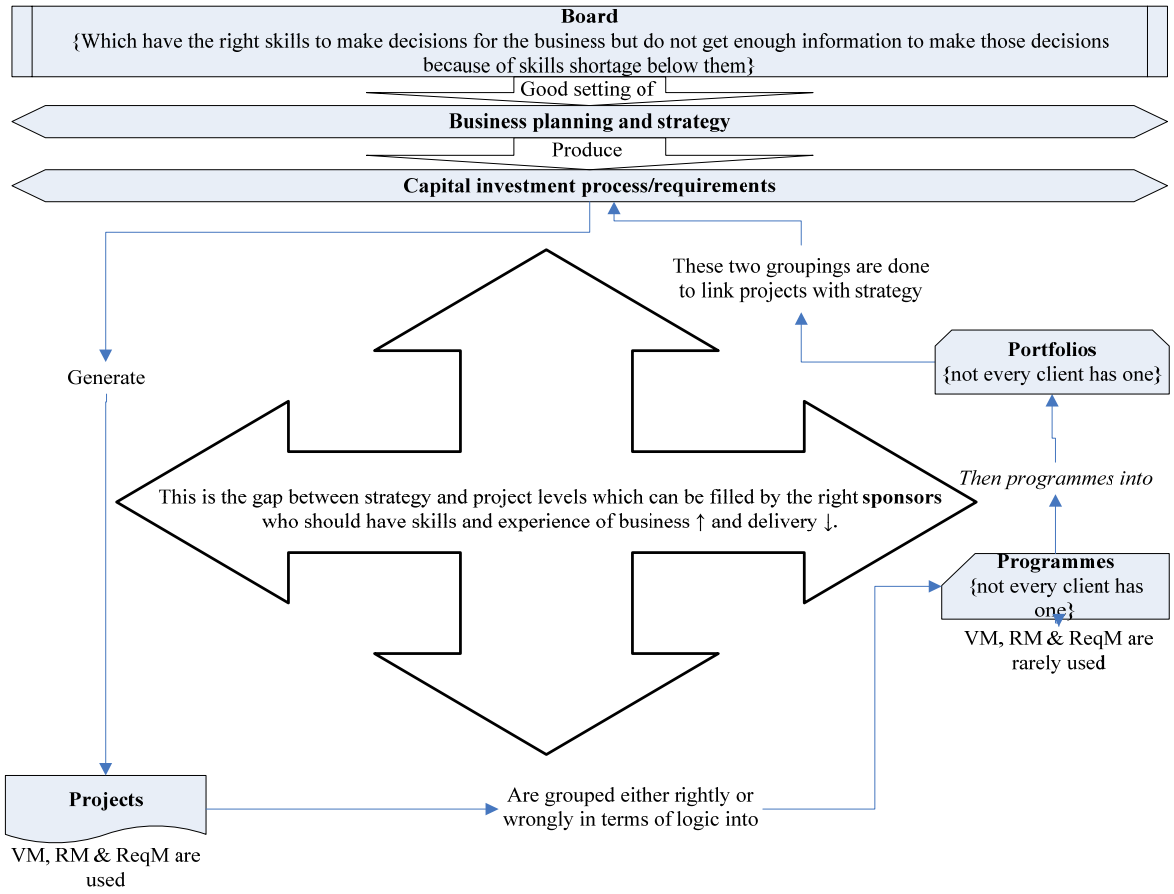

Figure 8.2: Structuring of portfolios and programmes in reality {source: {R6} adapted by the Author}

Two consultants {R6; R8} indicated that many client organisations {including some regulated private ones} use this approach. Whereas, half of the consultants {R2; R7; R10; R11} indicated that some regulated private organisations start the investment process by a bottom-up approach to create programmes and projects but they manage them using a top-dawn management structure similar to Figure 6.4. This is similar to what Clients N and Y are doing.

Having produced the findings about organisational levels and investment process, highlighting the linkage between these levels and the possible directions of investment decisions, the next section highlights findings about the importance and problems of the connection between strategies and projects.

8.3.2.8 The Stage between Strategies and Projects, its Importance and Problems:

The literature review highlighted the importance of the appraisal stage. Some problems in the front-end {portfolio, programme and the front of the projects} emerged from the fieldwork to emphasise this importance as follows.

The focus group at the IVM Seminar {2010} and a majority of consultants {R1; R6; R7; R8; R11} indicated that for all client organisations, the front-end is very important as:

- ❖ It has great risk and uncertainty;

- ❖ It includes investment decisions and strategic alignments which are needed to deliver projects that align with the overall strategic objectives;
- ❖ It is not dealt with effectively and is poorly managed which creates a gap and disconnection between the organisational strategy and the project;
- ❖ There is a need for strong project governance and great communication routes to strategic managers as well, because if that is not working, then there is a disconnection.

Some consultants {R6; R7; R11} indicated that usually organisations are good at setting policy, strategy and corporate goals but they fall down on how to translate those into implementation and delivery. So, they need effective processes {e.g. ReqM, VM and RM} to align projects to strategies. Also, they need somebody who understands both business strategy and project delivery and can make decisions that represent the best compromise. These consultants indicated that sponsors can solve the gap between strategy and projects but they need effective processes.

Otherwise, consultant organisations such as Consultant G, I, and S try to solve this problem and fill this gap by:

- ❖ Ensuring that effective processes of linking the project with the organisational strategy are in place;
- ❖ Taking the client's strategy and translating it into a robust platform for delivery; and
- ❖ Acting as an augmentation to the client's organisation as they sit at sponsor level and help them in sponsorship and decision-making over project managers, making a bridge between the project and the client.

Having introduced the findings about the linkage between strategies and projects and the problems, the next section produces findings about the skills of the key roles that are required to manage all these issues.

8.3.2.9 Key Roles and their Skills Profile within Organisation Levels:

The literature review identified the key roles for managing organisational levels, highlighting their importance and indicating the need for more investigation about the required skills for these roles. This section presents the findings about that as follows:

8.3.2.9.1 The Board:

All consultants indicated that the term 'Board' is used in the field to represent the strategic management team in an organisation that should form the organisation policy as well as set and own its strategies and objectives.

The client case studies support that for regulated organisations as their Boards do that in conjunction with their main funders and after considering their regulators' requirements.

However, one consultant {R1} indicated that, "*often all Boards tend to just receive and reject reports and none of them get involved in strategy developing and usually strategy is developed and comes from somebody who puts a report to the Board"*. Nevertheless, another consultant {R6}

indicated that, "*Boards have the skills as they are on that level to make decisions for and on behalf of their businesses. However, the problems start as they do not get that level of requisite information to make the right decision and this is because there are not enough skills below the Board to pull it together*". Client N supports consultant {R} as its Board members have engineering, operations and business backgrounds and they do their job effectively.

8.3.2.9.2 The Portfolio and Programme Managers:

One consultant {R8} and all client case studies indicated that within regulated private organisations, portfolio managers should have the key skills of: excellent people management; excellent influencing and negotiation skills; a real understanding and appreciation of the business and its policy, strategy, and business-as-usual operations; excellent management of internal and external stakeholders; good experience in managing programmes and very good experience in managing projects to be able to understand how they work and link to each other.

Two consultants {R9; R10} and all client case studies indicated that within regulated private organisations, programme managers should have the key skills of: excellent people management; a proven track record of delivering programmes and projects; and the required project management skills and training.

8.3.2.9.3 The Sponsors:

Within regulated private sector, one consultant {R8} and all client case studies indicated that generally, every programme or project should have a sponsor. However, another consultant {R10} indicated that, "*sponsors are often lead the programme management teams for sponsoring the programme and its underneath projects*". Nevertheless, two consultants {R6; R8} and Client Y indicated that, there is a lack of understanding of the sponsor's role and that sponsors do not really have all the tools or the knowledge of the capital programme.

Regarding the skills, one consultant {R10} indicated that there is a very short supply of sponsors with the required skills while there are some excellent sponsors in the field. This consultant and Client S highlight skills of these sponsors as: good experience, knowledge and understanding of the organisation and the business needs; ability to work with the Board to get approval and resources for programme or project; ability to handle the business case; and good people management skills.

Having introduced the organisational levels key skills findings, the next section reports the findings of ReqM, VM and RM methodologies and their applications.

8.3.3 Applications of ReqM, VM and RM:

The literature review indicates a lack of and unclear applications of ReqM in construction at all organisational levels and VM and RM above project level. Therefore, these were investigated in the fieldwork to identify and evaluate how these methodologies are understood and applied in practice.

8.3.3.1 ReqM Applications:

Individual consultants and client case studies have a similar understanding of formal ReqM as a method of capturing and managing requirements during the investment lifecycle {particularly at project level} and it comes originally from IT.

One consultant in the IVM Seminar {2010} indicated that "*formal ReqM is seen as a new trend as ReqM is not different from good VM because VM is all about defining the functions and the outputs*". These are supported by two other consultants as one of them {R7} indicated that "*outside the rail industry, a lot of project managers in the construction industry would not even understand the meaning of ReqM. Furthermore, formal ReqM is not applied very thoroughly in the construction environment at all"*. Whereas, the other consultant {R11} indicated that "*some regulated organisations such as water companies do not distinguish between ReqM and stakeholder management and they would ideally identify requirements in the VM process, but they do not talk about it separately"*.

The client case studies support that for regulated private organisations as ReqM is generally done informally within VM and/or stakeholder management and there is no indication that it is used as a formal aspect. Nevertheless, within Client N, it is likely that at corporate level, formal ReqM is done and it is done differently throughout different programmes.

The focus group at the IVM Seminar {2010} indicated that while stakeholder conflicts need to be managed, in a big organisation if there is a big project and all the stakeholders produce their wish list, formal ReqM could not be done if the organisation has 1000 live projects. This is because they would need a couple of hundred staff to get it down to that level of detail and that amount of work. Therefore, formal ReqM cannot be done on all projects, unless they are massive ones where one can justify that amount of time and effort. So, it might be done on certain projects while not on others and therefore projects which need this type of formal ReqM need to be distinguished from others which do not need that. ReqM sometimes can be done on small projects but informally within VM and in a simpler way by using FA and a FAST diagram which should be done unambiguously and that can only be read one way. Thus, the informal ReqM is commonly used.

8.3.3.1.1 ReqM tools:

Half of the consultants {R6; R7; R8; R10} indicated that DOORS is a software system which is a very structured way to capture and track requirements. Nevertheless, even with a system like that, ReqM can become enormously cumbersome on large programmes with large numbers of requirements. DOORS is better than many other processes or even tools that exist. Nevertheless, requirements often seem to be managed through different tools other than this one such as using MS Word documents.

However, half of the consultants {R6; R7; R8; R10} and Client N indicated that some regulated private organisations such as in the rail sector {e.g. some schemes within Client N} use DOORS in

their programmes and mainly in projects. Whereas, one consultant {R11} and all client case studies indicated that DOORS is not used within most regulated private organisations. Thus, ReqM tools such as DOORS are not common and their usages are limited to programme and project levels.

8.3.3.2 VM Applications:

Individual consultants and client case studies have a similar understanding of VM as a method to manage value through functions analysis and providing better options in one or several interventions within the investment lifecycle. So, it is about achieving optimum functionality {satisfaction of need} for the lowest input in terms of resources like cost and time.

A majority of consultants {R2; R6; R8; R9; R10} indicated that generally within client organisations, VM is not applied thoroughly as a structured intervention and they use it as an audit; as a cost-cutting exercise; or when they require it. This indicates the need for more research on VM to encourage their effective use within organisations.

8.3.3.3 RM Applications:

Individual consultants and client case studies have a similar understanding of RM as a method of understanding and managing risks {both opportunities and threats in the same process but the latter tend to be dominant as human beings think naturally about negative aspects} in a continuous manner.

Half of the consultants {R6; R7; R9; R10} indicated that the requirement for risk assessment is actually aimed more at health and safety and environmental aspects. Within client organisations RM is conducted sometimes as a fairly continual process but is generally not applied thoroughly as a structured process or an ongoing management methodology during the scheme's lifecycle. This also indicates the need for more research on RM to encourage their effective use within organisations.

8.3.3.3.1 RM tools:

Clients N and S use ARM which is an enterprise software tool to hold identified risks and associated treatment actions across schemes. However, some consultants {R6; R7; R8} indicated that clients' organisations like Client N have RM systems, like ARM, in place as people will populate that database but they do not necessarily understand it and use it very well. Also, one of these consultants {R7} indicated that "*generally within the regulated industry, RM tools like ARM are rarely used"*. This is supported by Client Y as it does not use that or any others. Thus, RM tools such as ARM are not common.

8.3.3.4 ReqM, VM and RM Current Uses within Organisational Levels:

Table E.1 in Appendix E details the ReqM, VM and RM applications within different organisational levels and whether they are linked or not within these levels. The key issues from this table can be summarised as follows:

- It is evident from the table that the application of ReqM, VM and RM and their tools and techniques increase and become more formalised, going from organisational policy and strategy

through portfolio and programme into projects and their phases. These methodologies are normally used in projects; sometimes in programmes; occasionally in portfolio; and rarely in organisational policy and strategy. This means that companies focus more on the project level rather than what they are trying to do as organisations.

- Client case studies indicated that RM and VM are jointly important for all client case studies and the scheme's needs and stakeholders' interest will increase the importance of each. Nevertheless, two consultants {R1; R2} indicated that RM is seen as more important and it is used more than VM and ReqM at corporate levels and within decision-making, as can be seen in Table E.1. They justified this as RM is the focus of the Turnbull Report; has the backing of the stock exchange; and is not a challenge to perceptions like VM.
- The table indicates that the integration of ReqM, VM and RM increases at lower levels. They are integrated rarely in policy and strategies; occasionally in portfolios and programmes; and sometimes in projects.
- It is clear from the table that ReqM, VM and RM are used both formally and informally. Formal ReqM, VM and RM are defined above. The table indicates that informal ReqM is when requirements are identified and managed within other processes such as VM and stakeholder management; Informal VM may be called strategic studies which may be undertaken in workshops and challenged environment to a certain extent or generally without workshops; and informal RM is when people undertake risk issues individually or in small meetings without workshops and modelling.
- The purpose and focus of ReqM, VM and RM changes clearly for different levels and the main reasons for using them within each level are highlighted in Table E.1.

8.3.3.5 Similar Levels for Using Methodologies like ReqM, VM and RM:

Two consultants {R7; R11} and all client case studies indicated that within regulated private organisations, the general principles of the VM, RM and ReqM processes are the same for all stages, which fit all organisational levels and project phases. Whereas, the differences are in the levels of detail; focus {what needs to be looked at in each stage}; and key participants. This is because these processes have certain standard techniques which can be used at any level such as issues, stakeholders and function analysis but with a different focus. For example at portfolio or programme level, they are looking at a bigger group of works than a project and the key stakeholders are different. Also, information on stakeholders, risks and requirements change each time and become more detailed going down from organisation policy and strategy through portfolio and programmes into projects. So, by definition, the focus changes as it is not possible to look at the same things, whether value, risk or requirements.

8.3.3.6 The Most Important Level to Use ReqM, VM and RM:

Some consultants {R7; R10; R11} and all client case studies indicated that within regulated private organisations, organisational strategy is the most important level to use ReqM, VM and RM. This is because of the following:

- Organisations need to have clarity at the beginning about reasons, expected benefits and barriers of doing something. This is because once they have got that in place everything cascades from that to other levels;
- This is where the companies gets confirmation of their business needs and wants as well as their business risks;
- Starting at the top with the right direction then the right path will be gained at the bottom;
- Getting their strategy and their companies' objectives right is very important. This is because if ReqM, VM and RM are applied at the strategic level, the benefits will feed throughout the lifecycle. These filter downwards through the portfolio, programme and projects as if they can get thinking brought into them at the high level, it works a lot easier below that; and
- Organisations need to understand the strategic risks as many companies have failed because of risks at this level.

Having introduced the findings of VM, RM and ReqM methodologies and their applications, the next section reports the findings about their inputs and key issues to be considered for them.

8.3.4 ReqM, VM and RM Study Managers and Participants:

The literature review highlighted the importance of the study managers and participants in ReqM, VM and RM and their integrated approach and the need for more investigation for them. This section presents the findings about that as follows:

8.3.4.1 Study Managers of ReqM, VM and RM:

Some consultants {R2; R7; R11} and all client case studies indicated several skills for the value manager within regulated private organisations as: good at summarising; inclusive; able to understand technical concepts; diplomacy; resilience; perseverance; courage; impartiality and can apply a structured approach. Furthermore, they seek the same skills for a risk manager with others like: understanding people in terms of their reaction to risks. Moreover, one consultant {R11}, Clients N and Y indicated that, the key skills of the requirements manager within regulated private organisations such as water companies are the same for the value manager as ReqM is done within VM. Client S emphasises diplomacy; resilience; perseverance because requirements manager has to dig out requirements; pulling out the intangible articulation of requirements, pulling out the problems. Client S has internal independent requirements managers who are from the staff but not full-time specialists.

Some consultants {R7; R10; R11}, all client case studies and the focus group at the IVM Seminar {2010} indicated that regulated private organisations use both occasionally external and usually

internal independent {has no interest in the scheme apart from the study} value and risk managers {they are the same person in Clients N and Y}. Nevertheless, external consultants are employed but mainly where there is a shortfall in the internal study manager's time.

8.3.4.2 Key Participants of ReqM, VM and RM:

One consultant {R2} indicated that within regulated private organisations, "*VM and RM should have virtually the same participants*". Nevertheless, one client interviewee {R3} {from Client N} indicated that "*sometimes there is a need for slightly different people for the risk side than the value side and vice-versa. Nevertheless, generally, you will not be doing a VM workshop on the scheme with one group of people and doing risk on the same scheme with a completely different set of people as they will have interrelationships. However, it depends on the stage of the scheme but they are generally linked in one way or another"*. Therefore, two consultants {R7; R11} and all client case studies indicated that studies participants might be different for each VM/RM study but the key early participants within regulated private organisations might be the: scheme manager; sponsor; independent official challenger; and external stakeholders depending on the scheme.

Consultants {R7; R11} and Client N indicated some considerations when choosing the participants as; certain seniority; attendance of key stakeholders; multi-disciplined team and involve the actual problem owners for the particular scheme; and the studies should be viewed from the widest possible range as there should be at least one representative from each of the technical, commercial, operational, schedule, cost, risk, health and safety, and environmental aspects as a mix is important to maximise different viewpoints. Nevertheless, it is important to keep the number to a manageable level by involving essential stakeholders only.

On the other hand, one consultant {R11}, Clients N and Y indicated that, the ReqM participants within regulated private organisations such as water companies are the same as VM participants because ReqM is done as a part of VM study. Whereas, Client S involves a range of people both internal and external {specifically the direct requirements owners at all stages if possible}.

Half of the consultants {R1; R2; R7; R11} and all client case studies indicated that regulated private organisations usually use an internal VM/RM team. However, sometimes it is just internal and sometimes it includes other external stakeholders or support from external consultants.

Having introduced the findings of ReqM, VM and RM study managers and participants. This indicates to the use of internal and external study managers and participants as well as the need for similar participants and study managers' skills within ReqM, VM and RM studies. The next section reports the findings about their integration.

8.3.5 ReqM, VM and RM Integration:

The conceptual integrated approach identified the need for more investigation about the advantages and barriers of ReqM, VM and RM integration; ReqM, VM and RM logical order; and approaches to their integration in practice. This section presents the findings about that as follows:

8.3.5.1 Advantages of ReqM, VM and RM Processes Integration:

Half of the consultants {R2; R6; R9; R10} and all client case studies indicated generally a number of reasons to integrate ReqM, VM and RM processes within regulated private organisations as follows:

- ReqM, VM and RM are linked together very much. Therefore the team should recognise what they are doing when they are thinking of these methodologies and understand the logic between them to use their outputs together effectively;
- ReqM, VM and RM are done together to get the most benefit from knowing stakeholder requirements which drives the needed value while managing the risk around that value;
- Combining ReqM, VM and RM is more efficient due to the optimum use of resources {study manager, team, workshop}, less time and cost and less interruption to the schemes and staff;
- ReqM, VM and RM are linked to be a powerful way of establishing a brief and testing it and making it more robust;
- ReqM, VM and RM come together effectively in producing a business case or indeed going through an assurance gate for review;
- ReqM, VM and RM should be linked to provide and assess options that satisfied stakeholders;
- Although value and risk management require some different skills, most of the skills are comparable; and
- VM and RM are integrated to manage the trade off as value depends on where the business risk is.

8.3.5.2 Barriers of ReqM, VM and RM Processes Integration:

Half of the consultants {R2; R7; R9; R10} and one client interviewee {R5} {from Client N} indicated generally a number of barriers to not fully integrating ReqM, VM and RM within regulated private organisations as follows:

- ReqM, VM and RM are rarely integrated because most of the regulated private organisations have a patchy understanding of them and would not use formal ReqM;
- ReqM, VM and RM are different methodologies with different objectives and things are already complicated and it is better to have relatively simple tools that are easy to apply and then as they move from phase to phase they can start to build those up;
- Organisations do not recognise the benefits from this integration; and
- The structured/formal ReqM problem is in the detail and it makes sense for it to be managed by a team who are technically knowledgeable {engineers}. Whereas, it is not essential for risk and value people to be engineers and that is why it is separate from VM and RM in some organisations.

8.3.5.3 ReqM, VM and RM Logical Orders:

One consultant {R2} indicated that "*it is not a matter of which one is first, it is more important to be done sequentially*". Nevertheless, this consultant always prefers to do VM before RM because firstly, the information phase of VM gives a better introduction into the scheme than RM does. Secondly, VM is a good context for providing background, the holistic view of the scheme, which puts it in its environment. This is because VM can deal with all these factors whereas RM tends not to deal with them so much. Finally, because VM is challenging perceptions and getting alignment with the stakeholders before going into the downstream pieces. Whereas another consultant {R1} indicated that, "*at early stages, client organisations identify the need and the scope first and then use RM and then VM comes more at the design stage*". This is how it works but the consultant considered this as not right because VM should be undertaken before RM for better introduction and background.

The client case studies clarified for regulated private organisations, whether ReqM, VM and RM are done in the same workshop or separately, ReqM are done first in order to identify needs and wants; to get the business case developed; and to understand the functional specification. Then, the best value options to satisfy those needs and wants are provided through VM. After that, risks are managed around those options in RM. Because informal ReqM is often a part of the VM study, VM is normally done before the RM study as VM helps look at the functional drivers and rationale for the scheme. Whereas, formal RM requires the defined need of that scheme to look at what could impact negatively or positively on those needs. Moreover, people need an understanding of the objectives before they can get into what the risks are to those objectives. It should be like this because it is the logical flow of events and primarily that is the logic of the relationships.

8.3.5.4 The Approaches to ReqM, VM and RM Integration:

Most consultants {R1; R2; R6; R7; R9; R10; R11} and all client case studies indicated that, within most client organisations {mainly regulated ones}, all value, risk and requirements management are linked together but in different ways.

Most consultants {R1; R2; R6; R7; R9; R10; R11}, and Clients N and S indicated that generally, most client organisations {mainly regulated ones} often use ReqM {formally or within stakeholder management}, VM and RM separately without integrating them as one methodology or in a single workshop. Nevertheless, they are used sequentially and are associated with each other by the scheme team. So, they are not fully integrated but they are associated, as requirements identified by ReqM are used in VM and RM. Also, the risks associated with VM options are transferred to the RM process while the opportunities are developed within VM when they appear within the risk process and so on. In this way, VM and RM are managed often by a risk and value manager and similar teams while ReqM is managed by a requirements manager.

Two consultants {R1; R2} highlighted that VM is used sometimes at the front-end to sort out requirements as it is important to go back to basics through VM. Clients N and S support that for regulated organisations because ReqM is done informally as a part of VM as they look at requirements for the scheme by using a FAST diagram and defining the true need and remit for the scheme. Therefore, they should all be part of the same thing as requirements are identified through VM. Then, options to satisfy them are provided. After that, the risk associated with VM options can be identified and assessed separately at the end of the VM workshop. However, the best thing is to have VM issues in a workshop and then use the same team building to do a sequential RM workshop. Nevertheless, in the same workshop, one consultant {R2} and client case studies indicated that the risk associated with VM options can be evaluated to give a rough profile, saying that one is more risky than the other one. This is done but without detailed analysis of risk exposure at that stage as the high level risks are identified and some analysis may be undertaken. Otherwise, the thought process of 'what else can I do?' will be destroyed.

One consultant {R11} and Client Y indicated that Consultant G and some regulated organisations such as water companies undertakes ReqM, VM and RM together in the same workshop as ReqM is done informally through stakeholder and function analysis as a part of VM. Then, the preferred value options are produced. After that, risks associated with these options are managed. However, risk analysis is used to select between options only if the decision could not be made without them.

The focus group at the IVM Seminar {2010} indicated another approach as all have been done in a project within the VM process. VM was done by a value manger. Requirements were captured through DOORS by its specialist. Risks were thought through by a risk manager. Also, the DOORS specialist was listening to others when they generated issues, looking at risks and defining functions and he was translating that into his statements about requirements as well. Then, he was testing them back during the workshop process. So, there was an interaction between the three as part of the VM process. However, in a typical VM study, all of that can be done but informally as the value manger does a bit of everything as requirements are identified before even starting doing the VM and then risks are managed. Nevertheless, potentially some areas need to be more detailed by having some specialists listen, capture requirements and look at conflicts while there are others who are more skilled in risk analysis.

Having introduced the findings of ReqM, VM and RM integration which indicate to the reasons and barriers for integration as well as several approaches to do so. The next section reports the findings about early VM and how it accommodates requirements and risk issues.

8.3.6 Early Value Management Process:

The conceptual integrated approach highlighted the need for more investigation on how the VM process is undertaken at organisational levels and whether it can accommodate requirements and risk issues. This section presents the findings about that as follows:

8.3.6.1 VM Pre-study {pre-workshop/orientation and diagnostic} Stage:

Two consultants {R10; R11} and all client case studies indicated that regulated organisations have a realistic target for the pre-study stage which requires two to six weeks but the effort really takes two to four working days from the value manager{s}.

They indicated that regulated organisations usually collect information; identify key stakeholders, scheme objectives and constraints; hold pre-workshop meetings; and set the workshop scope and agenda before the workshop{s}.

Moreover, regulated organisations gather information about requirements, risks and uncertainty to: partly define inputs to know the actual issues; inform the workshop participants, start them off and get them thinking in terms of what they are looking to achieve; highlight the pre-meetings of the key risks to focus people's attention and get other key risks brought out; discuss high level requirements in the form of business drivers and objectives to ensure the context of the workshop is known; discuss high level major risks; and gather general background information about the scheme to determine exactly the type of workshop intervention required and focus the agenda topics.

Furthermore, two consultants {R7; R11} and all client case studies indicated that regulated organisations have general structured and formal change procedures to apply and control any important changes including ReqM, VM and RM changes. This involves looking at the costs of the change and the schedule implications of it as any accepted change is likely to have an impact on scope, time, cost and/or quality of the final deliverable. These are identified at the pre-stage.

Additional to the above, two consultants {R10; R11} and all client case studies indicated that regulated organisations use others activities like: some form of function analysis; criteria weighting technique; root cause analysis; and filling a VM requisition form.

8.3.6.2 VM Study Stage {workshop}:

Most consultants {R1; R2; R7; R9; R10; R11} and all client case studies indicated that workshops are significant and client organisations {mainly regulated ones} use them within VM and RM. Whereas, half of them {R1; R2; R9; R11} and all client case studies indicated that, client organisations {mainly regulated ones} use workshops within ReqM. However, one consultant {R11}, Clients N and Y indicated that they are used in ReqM but as part of VM in some regulated organisations such as water companies. Whereas, they are used as a part of stakeholder management within Client S.

Regarding workshop{s} duration, two consultants {R10; R11} and all client case studies indicated that regulated organisations use half a day to two day workshops for ReqM, VM and RM. This range is based on the scheme sizes. This could be extended to two to three days for VM studies. The range in VM workshop duration depends on the size and the complexity of the scheme, number of stakeholders and how many options need to be worked up for ease of understanding. However,

according to these two consultants and all client case studies, regulated organisations deal with requirements and risk issues within the VM job plan as follows.

In the information phase, requirements are identified through: looking at the key drivers and requirements of the scheme moving forward; identifying the problems through discussion with key stakeholders to identify needs and wants; function analysis and function diagrams; multi-attribute analysis; objective hierarchy; issues analysis; stakeholder analysis; requirements generation; or simply a brainstorm of requirements.

In the creativity phase, one consultant {R11} and all client case studies indicated that regulated organisations identify risks associated with each option. Whereas, another consultant {R10} indicated they do not as risks are better identified separately or after the creativity phase when actually needed, otherwise the risk mindset can stifle creativity.

In the evaluation phase, consultants {R10; R11} and Client N indicated that regulated organisations sometimes qualitatively assess risks associated with options. Whereas Clients S and Y do not as risks are not used to select between options unless the decision could not be made without them.

In the development phase, consultants {R10; R11} and all client case studies indicated that regulated organisations quantitatively assess risks associated with the preferred options but it is quite a high level risk assessment at the early stages which tends to be more qualitative. Also, these two consultants and Clients N and Y indicated that regulated organisations try to mitigate risks associated with the preferred options in the development phase of a VM study. Whereas, within Client S, the identified risks are usually placed as actions for the scheme to be addressed in the normal course of definition. These consultants {R10; R11} and all client case studies indicated that regulated organisations usually conduct this phase after the workshop because usually it: is time consuming; is detailed; is more convenient; gives the team time to reflect on the workshop outcome and how to incorporate it into the scheme approach; and normally there is not enough information within the workshop to do that.

They indicated that regulated organisations put almost everything related to the study in the VM report such as: business needs; scheme and study background and objectives; agenda; used tools and techniques; study terms of reference; agreed things; pre and post risk profile level; options; risks with each option; discounted options and why; preferred options and why; risks of the preferred options; scope confirmation; workshop records; RM plan; risk register; recommendations; and feedback. This report is the main input and basis for the implementation stage.

8.3.6.3 VM Post-study Stage {implementation}:

Two consultants {R10; R11} and all client case studies indicated that within regulated organisations and generally in the workshop, the VM team identify the extent of the follow-up work and agree a timescale for completion.

However, these consultants {R10; R11} and all client case studies indicated that regulated organisations carry out a number of activities after the VM workshop such as: do/continue the development phase activities; formulate the action plan and agree its implementation; and report writing, drafting, checking, getting reviewed by the scheme manager and then circulating. Furthermore, under the supervision of the value manager and to ensure implementation of the study recommendations, other activities are undertaken by people indicated in the action plan. These include a follow-up meeting with one or two individuals to clarify what the outputs were; solving output mismatches; complete and implement changes; monitor and control situations and progress. This includes requirements and risk situations. However, monitoring and controlling is normally done via general project management only. The implementation is typically undertaken within a month or less depending on the schemes.

Having introduced the findings of early VM which show how VM process accommodates requirements and risk issues in practice. The next section highlights the interviewees' views on integrated studies series

8.3.7 The Interviewees' Views on Integrated Studies Series and how they can be implemented in Regulated Private Organisations:

There was an opportunity raised to introduce the integrated studies table {Table 6.1} to some interviewees who showed an interest in that. Therefore it was discussed with R3, R4, R5 and R12 client interviewees as well as R7 and R11 consultant interviewees. Furthermore, it was fed from the focus group at the IVM Seminar {2010}. This issue will be discussed in the next chapter as it highlights some literature presented in Table 6.1.

8.4 Chapter Summary:

There are several lessons which have been learnt from the fieldwork as follows. The findings confirm the pilot study that public, regulated private and non-regulated private sectors are different and that the regulated private sector is the appropriate choice. Policy formation comes before setting strategies for all organisations. Regulated private organisations also have an intricate process with their regulators before that.

Investment processes tend to be structured in regulated private organisations. Business cases are determined and developed by the sponsors to define why the programmes/projects are needed and to justify their investments. Generally, regulated private organisations tend to link organisational levels as policy → strategy → portfolio → programme → project but with some crossovers as seen in Figure 8.1. There are two approaches for structuring portfolios and programmes which are: top-down ↓ which is used by most regulated private organisations such as Client S and provides a structured investment process; and the bottom-up ↑. Although, this approach creates a gap between strategy and project levels, it is used by some regulated private organisations. Some regulated

private organisations such as Clients N and Y start with the bottom-up approach but they end up with a top-down management structure.

There is general agreement that portfolio, programme and the front of the projects are important. Nevertheless, this front-end is poorly managed which creates a gap between organisational strategy and projects. This gap can be filled by skilled sponsors and effective processes {e.g. ReqM, VM and RM} or by consultants.

Board members are normally skilled to form the organisational policy and strategies. Portfolio and programme managers need skills which differ from the ones at project level as indicated in section 8.3.2.9.2. Generally, every programme or project should have a sponsor who should be properly skilled for the role as indicated in section 8.3.2.9.3.

There is a common understanding of ReqM, VM and RM in the field as indicated in sections 8.3.3.1, 8.3.3.2 and 8.3.3.3. ReqM, VM and RM are applied and used in regulated private organisations as indicated in section 8.3.3.4. The ReqM, VM and RM processes fit all organisational levels while the differences are in the levels of detail, focus and some participants. The organisational strategy level is the most important level to use ReqM, VM and RM for the reasons mentioned in section 8.3.3.6.

Within regulated private organisations, the findings identified study managers skills and key participants for ReqM, VM and RM studies which tend to be similar throughout the studies.

ReqM, VM and RM linkages in client organisations {mainly regulated} are firstly, that the integration increases at lower organisational levels. Secondly, there are a number of mentioned reasons to support the integration of ReqM, VM and RM processes and others that prevent the full integration. Thirdly, logically these processes are undertaken as ReqM, VM then RM for the reasons indicated in section 8.3.5.3. Finally, there are several approaches to integrate ReqM, VM and RM processes which are highlighted in section 8.3.5.4.

Within regulated private organisations, the findings indicate that the VM process can accommodate requirements and risk issues through a number of activities and/or techniques within pre and post VM study stages as well as within each phase of the study stages as indicated in section 8.3.6.

Table 6.1 was discussed with several interviewees, fed from the focus group at the IVM Seminar {2010}. This will be argued in the next chapter.

The findings of the fieldwork data presented in this chapter will be combined with the literature to develop the research approach as will be discussed in the following chapter.

9 CHAPTER NINE: DISCUSSION AND APPROACH DEVELOPMENT:

9.1 Introduction:

In this chapter, the findings presented in Chapter 8 will be discussed and combined with the literature {Chapters 2 through to 6} where possible through discussions of key themes. These are used to investigate and confirm the assumptions used in conceptualising the integration approach and its models in Chapter 6. They are also used to critically review and update the conceptual approach and its models, leading to its improvement and development as follows. Firstly, the targeted sector for the approach will be highlighted and justified. Moreover, the investment process and the linkages between organisational levels as well as the skills profile within these levels will be discussed, clarified and used to critique and update the organisation structure and the studies timing conceptualised in Figure 6.4. Furthermore, these will be used to critique the bottom-up approach of structuring portfolios and programmes presented in Figure 8.2 in the previous chapter. Secondly, the study types and their information conceptualised in Table 6.1 will be critiqued and updated. Thirdly, the improved versions of Figure 6.4 and Table 6.1, besides other findings, will be used to critique and update the process diagram of the integrated studies conceptualised in Figure 6.5. Fourthly, the linkages between ReqM, VM and RM including integration levels will be discussed, clarified and used beside the early VM process {section 8.3.6} to critique and update the integrated study approach conceptualised in Figure 6.6. Also, the conceptual study leader skills for the integrated study will be discussed and updated.

9.2 The Key Assumptions Investigation:

Before updating the conceptual approach and to increase its validity as indicated by Fellows and Liu (2003 p119), the key assumptions of Chapter 6 that were considered in conceptualising it will be investigated as follows:

Assumption {A.1}: it was assumed that ReqM, VM and RM are used at each organisational level and project phase:

The literature {see Table C.4 Appendix C} emphasis the use of these three methodologies over the PLC and the importance of using them at all organisational levels as value, risks and requirements exist at all stages and should be managed. The findings {section 8.3.3.4} showed that organisations use these methodologies at all organisational levels and project phases whether formally or informally. However, the application of ReqM, VM and RM and their tools and techniques increase and get more formalised, going from organisational policy and strategy through portfolios and programmes into projects. Thus, this assumption has been confirmed.

Assumption {A.2}: it was assumed that undertaking ReqM, VM then RM is the logical sequence:

It is evident from the findings that it is not a matter of which one is first, it is more important that they are carried out sequentially. Nevertheless, if both VM and RM are undertaken and linked, the literature and the findings give priority to VM over RM within organisational levels for the reasons mentioned in sections 6.3.5.1 and 8.3.5.3. However, whether ReqM, VM then RM are done in the same workshop or separately, the literature and the findings give priority to ReqM over VM within organisational levels. This is because stakeholders and their requirements should be identified first in order to: highlight needs and wants; get the business case developed; and understand the functional specification. Then, the best value option{s} to satisfy those needs and wants are provided. After that, risks are managed around that option{s}. It should be like this because it is the logical flow of events and primarily that is the logic of the relationships. Thus, this assumption has been confirmed.

Assumption {A.3}: it was assumed that ReqM, VM and RM processes and standard techniques are generally similar for organisational levels and project phases and thereby their integrated approach while the differences are mainly in the focus, key participants and some detailed techniques for each intervention point:

The review of ReqM, VM and RM literature such as Dallas and Clackworthy (2010a pp27-42); Dick (2004 p4); Kelly et al. (2004 pp51-66); Male et al. (1998a pp32-47); and OGC (2007x pp65-82) leads to this assumption. The findings {section 8.3.3.5} showed that organisations apply the same principles and general tools and techniques of ReqM, VM and RM at all organisational levels and project phases because these processes have particular standard techniques which can be used at any stage such as issues, stakeholders and function analysis. However, they are applied for different focuses, through various details and with some different key participants because for example at portfolio or programme level, people are looking at a bigger group of works than a project and the key stakeholders are different. Also, risks and requirements change each time and become more detailed going down from organisational policy and strategy through portfolios and programmes into projects. So, by definition, the focus changes as it is not possible to look at the same things, whether value, risk or requirements. Thus, this assumption has been confirmed.

Assumption {A.4}: it was assumed that VM process can partially accommodate requirements and risk issues and activities to deal with them:

Chapter 6 {section 6.6.1} indicates several approaches that use the VM process to deal with risk issues through undertaking risk identification, assessment and mitigation within a VM study. Fernie et al. (2003 pp354-358) argue the same thing for requirement issues. Smith and Male (2007 p5) support the use of the VM process to deal with risk and requirements when they present a case study about the Library Project, drawing them together within the VM process. The findings

{section 8.3.5.4} highlighted various integration approaches which are used by consultants and client interviewees. These approaches use the VM process to deal with risk and requirements as requirements are sorted out informally within the information phase of VM, using techniques like stakeholder and function analysis with a FAST diagram and defining the true needs and the remit for the scheme. Then, the options to satisfy the requirements are highlighted, evaluated and developed. Whereas, risks associated with these options are identified and assessed at the VM workshop or immediately after it. Also, the findings {section 8.3.6} showed how an early VM process addresses RM and ReqM issues and activities within the VM pre-study, study and post-study stages. Thus, this assumption has been confirmed.

Having investigated the key assumptions, the next section discusses several issues to update the conceptual organisation structure and the studies timing {Figure 6.4} as the first model of the research approach.

9.3 The Organisation Structure and the Studies Timing:

This section identifies the targeted sector for the approach and then discusses the organisation levels, the structured investment process and the linkages between organisation levels. Moreover, it highlights the skills profile which is needed to manage those levels. Following these discussions, several issues emerge with their consequential changes to update the conceptual organisation structure and studies timing presented in Figure 6.4 as the first model of the research approach.

9.3.1 The Targeted Sector for the Research Approach:

Generally, the conceptual approach does not target any specific sector. Nevertheless, the pilot study indicated the differences between public, regulated private and non-regulated private sectors. Furthermore, it highlighted the need to target one of them for this research which led to collecting the fieldwork data mainly from and about the regulated private sector, as it is structured. The findings emphasised these differences and supported the choice of this sector for the reasons mentioned in section 8.3.1. Therefore, the research approach will be developed for the regulated sector.

Having targeted the regulated sector for the research approach, the next section discusses organisation levels and the investment process, mainly about this sector, to be used in updating the conceptual organisation structure.

9.3.2 Investment Process and the Organisation Levels Relationship:

These will be clarified and discussed logically as follows:

9.3.2.1 Organisation Policy and Strategy:

Naaranoja et al. (2007 p659) highlighted the current importance of using vision, mission and strategy in most organisations. The findings support that as the case study client organisations have

different statements for their visions, missions, and strategies related to their work. These statements sit very well with the definitions provided by Naaranoja et al. (2007 p659) in Chapter 2.

The findings indicated that organisation policy concerns vision, mission and values and provide examples of the latter. Whereas, organisation strategy covers the long-term strategies and objectives. This also sits well with Chapter 2 literature such as Kelly et al. (2004 p159) as the strategic decisions are made according to the long-term directions of the organisation, and these are usually specified in terms of objectives.

However, the findings indicated that within all sectors, policy formation of vision, mission and values is a level that comes before organisation strategy level and drives organisation strategy and objectives. This fits very well with Male's (2008 p12) pyramid diagram {Figure 2.2} in the literature of Chapter 2 as vision and mission lead to strategic objectives. The findings indicated that those two levels tend to be similar which might be because both are strongly related {vision is needed to formulate strategies while strategies are needed to reach the vision}. This can explain why vision is not treated as a separated level in the literature. Furthermore, before these two levels, the findings indicated that regulated organisations have an intricate process with the regulators/funders to understand the base of which they have to build on against external requirements that are being imposed on them. Thus, this should be also considered.

9.3.2.2 Portfolio and Programme:

The findings indicated that portfolio and programme concepts are confusing and not well understood by some client organisations while others use different terms for them. This is supported by several authors within PM literature as indicated in Chapter 2.

Nevertheless, all client and consultant interviewees understand them and use different definitions for them similar to most key literature indicated in Chapter 2, such as a programme is a group of related projects and/or works. However, they have two views on portfolio which are also similar to the literature presented in Chapter 2. The dominant understanding of portfolio is similar to most key literature as an investment portfolio which is a comprehensive meaning of all work within an organisation. Whereas, the second view is a grouping of related and/or unrelated programmes and/or projects that are categorised together, to manage their development and delivery, to allow more effective resource management. This view is similar to some literature such as Turner (2009 p326) and it is not common. Therefore, the first view should be adopted for this research as it is the most common in both literature and findings as well as it seems to be more concerned with strategic issues and managing at strategic level which is the focus of this research.

The findings also indicated that portfolio and programme are used in different ways across client organisations which may be because of different terminologies. Although portfolio and programme are used in regulated organisations, some of these organisations use them interchangeably and they

focus mainly on programme but they do not use it properly as they use it just for grouping existing projects. This mirrors Chapter 2 literature as different terminologies can confuse the portfolio and programme usage and a pyramid hierarchy can clarify that at the top of the pyramid is portfolio, then programme and then project.

9.3.2.3 Major Project:

The findings defined a major project as a high value project which does not fit within the regular activity; day-to-day operations; or business as usual. It may be something unique, urgent and/or has a critical mission. This can be confirmed by Morris and Hough's (1987 p14) definition stated in Chapter 2.

Also, the findings indicated that techniques and complexity issues which surround normal projects are different for major projects because of several reasons mentioned in section 8.3.2.4. This sits well with the Major Projects Association {MPA}'s (2008 pvi) argument highlighted in Chapter 2. Furthermore, regarding that, Turner (1993 pp482-483, 2009 p324) indicates that usually no one organisation is able to undertake such a project on its own as it needs collaboration.

The findings indicated that major projects link directly to organisational strategy level and as a completely separate organisation's structure because of its scale. Chapter 2 literature confirms that this type of project often needs corporate structures governing it, as indicated by MPA (2008 pvi).

9.3.2.4 The Structured Investment Process:

Generally the investment process tends to be structured within the regulated private sector. Nevertheless, sometimes this structured investment process is not undertaken effectively because people are still doing things using only their experiences rather than following the new structured process. Therefore, they should be trained and changed through others like consultants.

However, within the structured investment process, both findings and Chapter 2 literature indicated that organisation strategy and objectives should drive investment portfolio{s} which allocates resources across capabilities and drive programmes which drive projects. Therefore, the findings and literature such as Male (2008 p12) and OGC (2006d p5) link between organisation levels generally as policy → strategy → portfolio → programmes → projects. Nevertheless, this is done with various degrees of clarity within regulated organisations, it is not a straightforward relationship and there is a lot of crossover between portfolio, programme, and projects within companies. Also, they might have major projects and investment portfolios which both go under the strategy level. However, these crossovers are clear in Figure 8.1 in the findings chapter and in Figure 2.7 in the literature. These figures and their crossovers can be combined to provide three other main lanes of relationships as follows:

- Policy → strategy → investment/high level portfolio{s} → low level portfolios → programmes → projects.

- Policy → strategy → investment/high level portfolio{s} → high level programmes → low level/sub-programmes → projects.
- Policy → strategy → major project{s} → projects.

The general linkage and the other three lanes are drawn together in the following table for more clarification.

Table 9.1: Organisational level relationships {source: The Author adapted from PMI (2008 p8) and findings}

General relationship	Lane1: Two levels of portfolio	Lane2: Two levels of programme	Lane3: Major project{s}
Organisation policy	Organisation policy	Organisation policy	Organisation policy
Organisation strategy	Organisation strategy	Organisation strategy	Organisation strategy
Portfolio	Investment/high level portfolio{s}	Investment/high level portfolio{s}	
	Low level portfolios		Major project{s}
Programmes	Programmes	High level programmes	
		Low level/sub-programmes	
Related projects	Related projects	Related projects	Related or unrelated projects

Business Case:

For the structured investment process, the findings signify the role of the business case as client case studies indicated that it justifies the proposed investment and must be updated throughout its lifecycle. This mirrors the APM (2006 p68) definition stated in Chapter 2. Furthermore, client case studies stated that a business case is driven by the level of business risk and main stakeholders' requirements.

The APM (2006 p68) argues for the business case at the project level. Nevertheless, the findings indicated that it can be developed at the programme level as well. Also, the programme business case is mentioned in some literature, like Lycett et al. (2004 p293) and OGC (2004b p4) and it is detailed in OGC (2007y p105). Therefore, business cases are developed for programmes and projects to justify their investments. Thus, they should be considered in the integrated studies at the programme and project levels. There is no indication either in the literature or the findings to develop a business case for portfolios. OGC (2007y p218, 2011 pp115-116) support this as it stated that at the portfolio level, the business case might be conceptual or might not exist and it is not listed within the key documents for this level.

The findings indicated that business cases are actually owned, determined and developed by the programme and project sponsors. This can be confirmed by APM (2006 p68). Therefore, this can be considered as a general rule. This signifies the sponsor role and emphasises their contribution in the investment process and thereby their involvement in the integrated studies.

9.3.3 Top-down or Bottom-up Investments:

Having discussed the relationships between organisation levels, this section discusses the structuring of portfolio and programme, showing the two investment directions for creating programmes and projects. The findings indicated two general approaches for structuring portfolios and programmes as follows:

- Bottom-up ↑ {similar to Figure 8.2} as defined in section 8.3.2.7. Although this approach creates the gap {indicated in section 8.3.2.7} between strategy and project levels, it is used by many client organisations including some regulated private ones.
- Top-down ↓ {similar to Figure 6.4} as defined in section 8.3.2.7 and indicated in the previous section 9.3.2.4. Although this approach provides a structured investment process, it is not well understood in practice. However, regulated organisations tend to be more top-down like Client S. Nevertheless, some of them start with the bottom-up approach and then end up with a top-down management structure such as Client N and Y.

The concept of the second approach is in line with most diagrams that draw organisation levels in the literature such as Haughey (2001 p6), Male (2008 p12) and OGC (2006d p5). Nevertheless, portfolio and programme definitions in the key literature do not indicate the top-down creation of programmes and projects respectively as they just normally state "*it is a grouping or a collection of...*" and this statement does not indicate either approach. However, it might be useful to add '*and creation of new programmes'* in portfolio definitions as well as *'and creation of new projects'* in programme definitions. This is because portfolios and programmes are used to create programmes and projects respectively as evident by the findings in the top-down approach.

9.3.4 The Disconnection {gap} between Organisation Strategy and Project Levels:

As discussed above, the bottom-up approach creates a gap between organisation strategy and project levels. According to the findings, this concurs with the perception of poor management of the front-end including portfolio, programme and front of project. Nevertheless, this front-end is very important and should be undertaken properly for the reasons mentioned in section 8.3.2.8.

As this front-end involves the appraisal stage, the justification of its importance, argued in Chapter 2, can also be applied here. Therefore sufficient attention and resources should be given in order for it to be undertaken properly. This supports the need for the integrated studies at portfolio, programme and front of project, to align projects with strategy.

However, the findings indicated that this problem can be solved and the gap can be filled by the introduction and use of skilled sponsors who should have the skills and experience of business investment and technical delivery as well as the use of effective processes. Otherwise, consultants can be employed to try to fill the gap through the three approaches mentioned in section 8.3.2.8.

9.3.5 Key Roles and their Skills Profile within Organisation Levels:

Having discussed and clarified the linkages between organisation levels as well as their investment approaches and the problems with that, this section highlights the key roles and the skills that are required to manage the organisational levels as follows.

For the policy and strategy levels, the findings and Chapter 2 literature indicate that both levels are the Board's responsibility in all organisations. However, the findings indicated that regulated organisations' Boards form the policy and set the strategies in conjunction with their main funders and after considering their regulators' requirements. One consultant indicated that often Boards tend to not do that properly. Another consultant justified this as Boards do not get enough information because of a skills shortage below them in the hierarchy. This supports the need for the two integrated studies at these levels to help the Board in policy and strategy formulation. However, the Board members normally have the right skills such as those indicated in section 8.3.2.9.1.

For other organisation levels, Chapter 2 {sections 2.5.2.5 and 2.5.3.4} and the findings {section 8.3.2.9.2} indicate the key skills required at portfolio and programme levels. On the other hand, the skills of a project manager are very well developed in the literature and some of the key ones are mentioned in Chapter 2, section 2.3.8.3.

According to the above, it can be seen that the skills profile across organisational levels tends to focus more on leadership skills at high levels like the Board and portfolio levels as the organisation concerns more about vision, strategies and long terms objectives here. Then while going down through programmes into projects, the focus tends to be more on managerial skills and day-to-day delivery as organisation concerns are more about strategy implementation and investment delivery here. Moreover, each level requires good experience and knowledge in managing lower levels to know what is going on there and to understand how they are being managed. For example, the portfolio manager should have good experience and knowledge in managing programmes and projects.

The findings indicated that every programme or project should have a sponsor who is often sponsoring above the programme management team. This sits well with Chapter 2 literature as there should be one sponsor per project or programme who sits over the programme level. Regarding skills, the findings indicated a very short supply of sponsors and their proper skills while recognising that there are some excellent sponsors in the field. The skills of these excellent sponsors were mentioned in Chapters 2 and 8, sections 2.3.8.4 and 8.3.2.9.3 respectively. However, Male (2008 p13) concluded that all these skills have a 360 degree orientation requirement which can only be developed through experience, as indicated in Chapter 2.

9.3.6 Consequential Changes for the Conceptual Organisation Structure and its Studies Timing:

From the above discussions, the conceptual organisation structure and its studies timing presented in Figure 6.4 should be updated as follows:

- The organisation structure of Figure 6.4 starts with organisation strategy at the top while as discussed above, it is evident to add a level of policy formation before that which drives organisation strategies and objectives. Also, it is found that both levels are similar and managed by the Board which also should be considered and indicated. Furthermore, another integrated study {S0} should be developed to aid the decision-making of policy formation and increase value at this level.
- As indicated above, the research approach targets the regulated sector. Therefore, the intricate process with regulators/funders highlighted above should be considered and positioned at the top of the organisation structure of Figure 6.4. This process should feed the policy and strategy of a regulated organisation.
- The organisation structure of Figure 6.4 links organisation levels. Nevertheless, it does not specify what is exactly in each link between levels. Therefore, this should be added to clarify the use of a top-down approach as an organisation strategy and that objectives should drive investment portfolio{s} which allocates resources across capabilities and drives programmes which drive projects.
  - Although many client organisations use the bottom-up approach, this research approach generally adopts the top-down approach to apply the integrated studies because: the studies cascade through the same direction {top-down}; a top-down approach produces a structured investment process without a gap between organisation strategy and projects; regulated organisations tend to be more top-down; and some regulated organisations that use bottom-up, end up with a top-down organisation structure.
- The organisation structure of Figure 6.4 is straightforward in that it generally links the four organisation levels as strategy → portfolio → programme → project which has been seen to be applicable by all interviewees. However, it does not show all real situations. This is mainly because it is found that this is not a straightforward relationship and there are a lot of crossovers between portfolio, programme and project as showed by the first two main lanes discussed above in section 9.3.2.4. However, the general linkage should still be used to indicate the integrated studies while these two lanes should be appreciated and positioned next to the general one to show the nature of the relationship.
- As this research focuses on the normal delivery from a large organisation, the organisation structure of Figure 6.4 does not include major projects. Whereas, it is important to show their

linkage with the organisation levels as indicated in the third main lane of relationship {section 9.3.2.4} to show that they are outside of the normal activities of an organisation. This is because these types of projects are considered special cases and need special arrangements as discussed in section 9.3.2.3. Therefore, they need further research and thereby no integrated study will be developed here.

- The organisation structure of Figure 6.4 does not indicate sponsors. Whereas, they are very important in improving the management of the front-end and strongly link projects with strategies. Therefore, 360 degree skilled sponsors should be positioned around programmes and projects while their level is above the programmes.
- The organisation structure of Figure 6.4 does not mention anything about the key roles or the skills to manage the organisation levels. Whereas, it is important to do that and as a minimum a note should be added to briefly describe them and indicate further information about them.
- The above points represent the changes that are applied in red and *italic style* to update Figure 6.4 and replace it with Figure 9.1 below, to be the first model in the research approach.

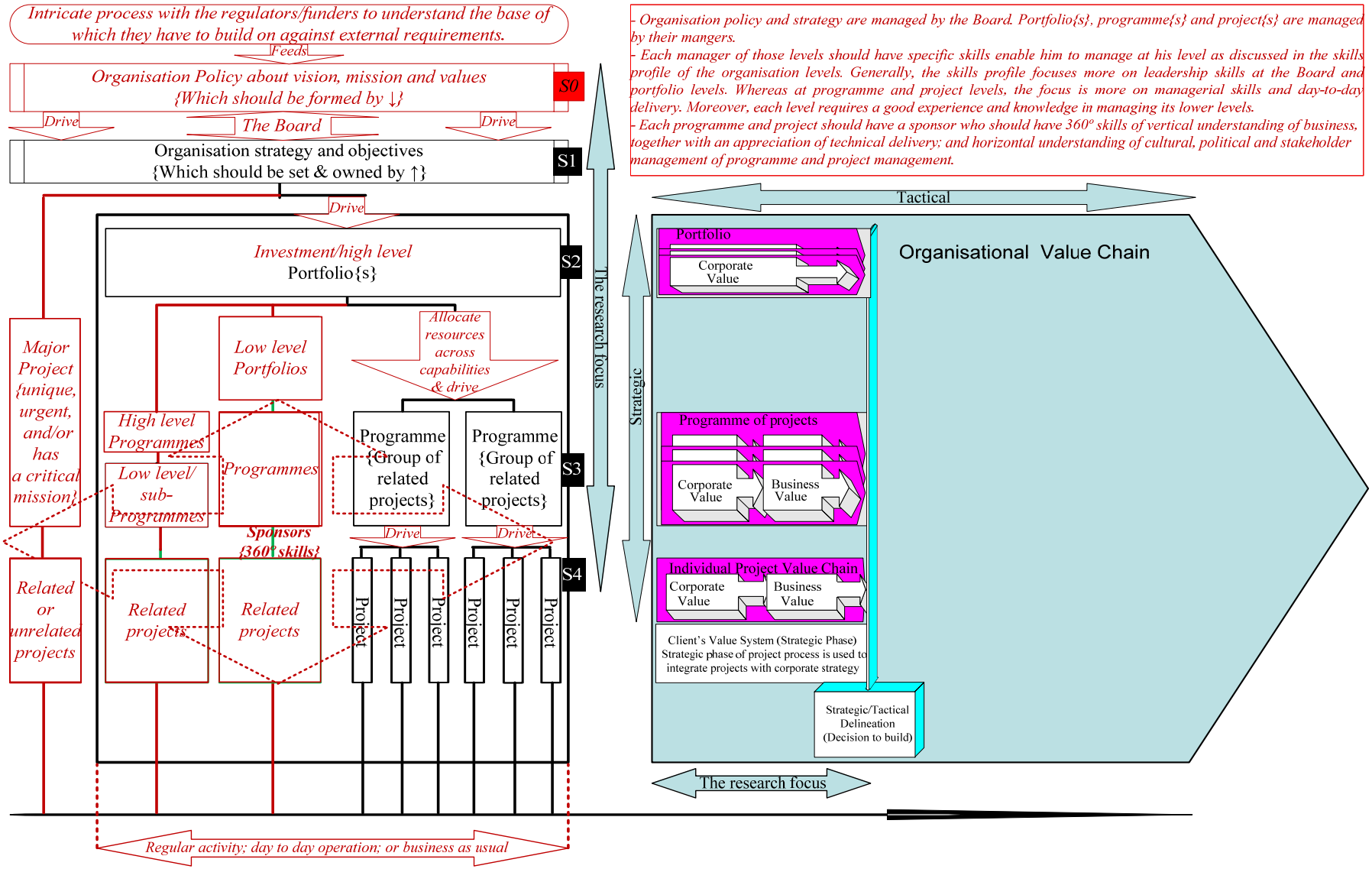

Figure 9.1: Organisational structure and studies timing {source: The Author adapted from the literature and findings}

Nevertheless, there might be some regulated organisations which use the bottom-up approach without ending up with a top-down organisational structure as evident in the findings. This can be considered as a special case and Figure 8.2 will be updated as follows to indicate this approach, its problems and solutions:

- Figure 8.2 shows that the gap between organisation strategy and project levels can be filled only by the right skilled sponsors. Whereas, it is evident in section 8.3.2.8 to add effective processes with that.
- Figure 8.2 shows ReqM, VM and RM to be used in projects and rarely in programmes only in reality. Whereas, it should indicate their uses as normally at project level, sometimes at programme level, occasionally at portfolio level and rarely at the Board level, as evident by the findings in section 8.3.3.4.
- The above points represent the changes that are applied in red and *italic style* to update Figure 8.2 and replace it with Figure 9.2 below:

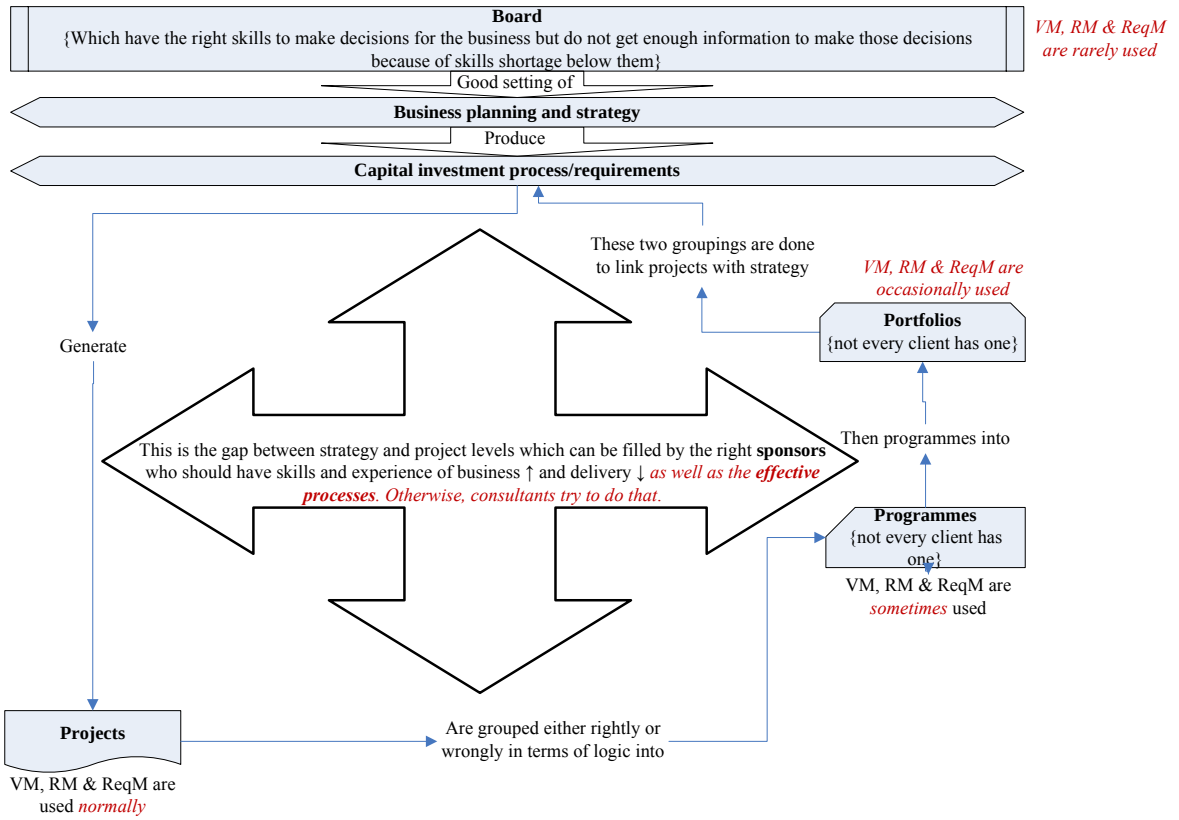

Figure 9.2: Bottom-up approach of structuring portfolios and programmes {sources: The Author adapted from the findings}

Having developed the organisational structure and studies timing as the first model of the research approach. The next section discusses other findings to update the conceptual studies types and their information {Table 6.1} as the second model of the research approach.

9.4 The Integrated Studies Series within the Organisation Levels:

This section will be used to update the integrated studies series conceptualised in Chapter 6. This is done through critically reviewing the studies and their information presented in Table 6.1 to be developed as a second model of the research approach. The process of developing Table 6.1 is undertaken in two stages as follows.

In the first stage and as indicated in the previous chapter, Table 6.1 was discussed during the fieldwork with several interviewees and fed from the focus group at the IVM Seminar (2010). The table was discussed and updated continually progressing from one interview to another to be developed and validated incrementally. This stage will be discussed as follows:

- Table 6.1 was discussed with R3. Then, the comments and suggestions were applied to update the table {version 2}. These are:
  - The purpose of S1 should be edited from "strategy formulation/confirmation" to "strategic thinking {to formulate or confirm strategies}". This is because at this stage, the Board's members mainly do the required thinking about what they need to achieve as an organisation and the strategy moving forwards and the S1 study should help them in that. However, this thinking leads to the formulation of new strategies or the confirmation of existing ones. Furthermore, they talk about the projects but not in detail.
  - The key participants' number at Board level should be changed from "10-20" to "10-15". This is because the number of required stakeholders is smaller at a high level while it increases at lower levels.
- The updated Table 6.1 {version 2} was discussed with R4 and confirmed with no comments or suggestions.
- The same table {version 2} was discussed with R5. Then, the comments and suggestions were applied to update the table {version 3}. These are:
  - In the purpose of S1, "regulatory fit" should be added but this should be considered before the strategic thinking. This is because they are regulated organisations.
- After that, the IVM Seminar (2010) was conducted and feeds the table {version 3} with the following:
  - Additional study {S0} with its features {see Table 8.1} at organisation policy level which helps in policy formation and this emphasises the change identified in section 9.3.6.
  - Further two features which are typical techniques to be used in each integrated study and accountabilities for each study {see Table 8.1}.
  - It suggests some improvements within the key participants. These are the inclusion of: the Board in the key participants of S2 and S3; the portfolio manager in S3; and the programme

manager in S4. This is because each scheme manager is interested in and concerned about strategic alignment of schemes under their control.

- It suggests additional issues to be addressed within the studies purposes and their outputs {see Table 8.1}.
- All the above issues were used to update the table {version 4} to be ready for further discussion.

❖ The updated table {version 4} was discussed with R7. Then, the comments and suggestions were applied to update the table {version 5}. These are:

- In the purpose of S4 which comes from the IVM Seminar, "establish need" should be changed to "clarify need". This is because the need already exists at this stage and just needs more clarification.
- The inputs for S0 should be "macro issues from external environment". Whereas, the inputs for the others integrated studies should be the outputs from the previous ones. For example, the inputs for S1 should be the outputs from S0 and so on. This is because they are a series of studies.
- The ReqM, VM and RM focuses for S0 should be "broad performance requirements, major benefits for the company and global risks" respectively. This is because at this level, the company is concerned with external issues.
- These studies should be cascaded top-down as a flow of progressive definitions while they can be checked back.

❖ The updated table {version 5} was discussed with R11. Then, the comments and suggestions were applied to update the table {version 6}. These are:

- In the inputs of S0 "regulators/funders' objectives" should be added. This is because they are regulated and funded organisations and these objectives should be considered as macro things from the external environment.
- In the views of the key participants of S2 and S3 {which come from the IVM Seminar}, the Board is unlikely to participate in these studies. This is because its members are concerned more about their level and it is unnecessary to be involved if the strategies are right. They might be involved in the final sign off but not in the workshops.

❖ The updated table {version 6} was discussed with R12. Then, the comments and suggestions were applied to update the table {version 7}. These are:

- In the inputs of S0, "regulators/funders' requirements and their risks" should be added. This is because they are regulated and funded organisations and these requirements and their risks should be identified and considered also as macro issues from the external environment.

- In the ReqM focus of S0, "regulators/funders' requirements" should be added. This is because they are regulated and funded organisations and these requirements should be identified and managed.
- In the VM focus of S0, "major benefit" should be replaced by "policy formation according to regulators/funders' requirements". This is because policy options are the main issue at this level.
- In the RM focus of S0, "risks of not meeting the regulators/funders requirements" should be added. This is because they should be assessed to avoid problems with regulators/funders.

However, the findings raised other issues which should be discussed and their consequential changes should be used to confirm the above changes or to further update the studies types and their information as a second stage as follows:

- The findings indicated that generally, organisation strategy is the most important level to use ReqM, VM and RM within regulated organisations for the reasons mentioned in section 8.3.3.6. This sits well with the literature of Chapters 2 to 6 as they highlight the significance of applying PM methodologies such as ReqM, VM and RM as early as possible in the investment life cycle which benefits later stages in the life cycle. This most important level was investigated to develop the integrated approach within it if ReqM, VM and RM processes are different across levels. Although the similarities were evident in the examination of the fifth assumption {section 9.2}, the most important level can still be used to indicate the importance of applying these methodologies and thereby their integrated approach at the strategic level. Also, it indicates that the importance of the methodologies' application increases bottom-up as the benefits from them cascade top-down.
  - Table 6.1 does not indicate the degree of importance of integrated studies and how the benefits flow between levels while these should be clearly highlighted as previously discussed to give more clarification of the studies series.
- The findings indicated that VM and RM tend to have similar participants as they have interrelationships, and this depends on the stage of the life cycle, but they are generally linked in one way or another. This also indicated that they have slight differences at different stages but the findings indicated some common participants at the early stages like scheme managers and sponsors. Furthermore, the findings indicated that some regulated organisations use VM participants for ReqM as ReqM is done within VM. Others use a range of people, internal and external {specifically the direct requirements owners at all stages if possible} who also can be within the VM participants. Moreover, the findings indicated some consideration and criteria for selecting participants while keeping the number to a manageable level by involving essential stakeholders only. This sits well with Chapter 3, 4, 5 and 6 literature as there is a wide range of stakeholders to be involved but the important thing is to select people who are actually needed,

to gain the most benefit from each study. This is done by the study manager with his client based on specific tests or criteria. However, when a larger number is needed, another study manager or recorder can be involved for the reasons indicated in Chapter 3, section 3.9. On the other hand, the findings indicated using internal stakeholders with sometimes other external stakeholders or consultants. The literature of Chapters 3, 4, 5 and 6 supports this as it is common in the UK and acknowledged internationally to use internal stakeholders supported by externals as needed. Thus, it is clear from the above that, ReqM, VM and RM teams are similar at the early stages which should involve core internals like scheme managers, sponsors and other internal or externals as needed which can be chosen through criteria as mentioned in the literature and the findings.

- The above discussion on key participants support the ones indicated in Table 6.1 and highlighted the need to involve 'others as needed' which should be indicated as well.

- The findings {Table E.1} indicated reasons for using ReqM, VM and RM at each level of the organisation. Generally, these sit well with the focus of them in Table 6.1 and nothing needs to be changed on that.

The above points from the two stages represent the changes that are applied in red and *italic style* to update Table 6.1 and replace it with Table 9.2 as indicated below.

Table 9.2: Studies types and their information with skills profile {sources: The Author adapted from the literature and findings}

Integrated Study / Feature	*→→→ It is a cascade flow of progressive definition →→→ ←←← But always it needs to be checked back ←←←*				
	S0 {organisation policy level}	**S1 {organisation strategy level}**	**S2 {portfolio level}**	**S3 {programme level}**	**S4 {project level}**
Importance degree	*←←← Importance of using VM, RM and ReqM increase bottom-up ←←←*				
Benefits direction	*→→→ VM, RM and ReqM benefits cascade top-down →→→*				
Purpose {issues addressed}	*Establish core vision, mission, and values. Requirements for investment needs. Investment priorities in outline terms. Regulatory fit.*	*Test individual business plans back against vision, mission and values. Strategic thinking {to formulate or confirm strategies}.*	*Clarity of core vision, mission, and values against particular portfolio investment vision {intent} and capability building via programmes.* Portfolio organisation. Linking portfolio to fit with organisation strategy.	*Clarity of vision, mission, values against particular portfolio investment vision and programme level vision.* Programme organisation. Linking programme to fit with portfolio strategy.	*Clarify need. Project vision.* Project organisation. Linking project fit with programme strategy.
Inputs	*Macro issues from external environment which include mainly regulators/funders' objectives, requirements and their risks.*	*Organisation policy*, culture, environment, resources and strategic capability with list of requirements *and risks. Series of strategic business plans by portfolio need.*	*Confirm strategic business plan against need and investment priorities to confirm strategic fit.* Organisation strategies and objectives with list of strategic risk and requirements.	*Series of programme level business plans.* Portfolio brief. Value and risk profiles across programmes and projects. Risk allocation and management plan.	*Programme need. Capability identification. Confirm programme level business case.* Programme brief. Value and risk profiles across projects. Risk allocation and management plan.
Outputs	*Organisation policy with list of requirements and risks. Series of strategic business plans by portfolio need.*	*Confirm strategic business plan against need and investment priorities to confirm strategic fit.* Organisation strategies and objectives with list of strategic risk and requirements.	*Series of programme level business plans.* Portfolio brief and requirements. Value and risk profiles across programmes and projects. Risk allocation and management plan.	*Programme need. Capability identification. Confirm programme level business case.* Programme brief and requirements. Value and risk profiles across projects. Risk allocation and management plan.	Project strategic brief. *Project level business case.* Project requirements. Value and risk profiles. Risk allocation and management plan.
Accountability	*The Board.*		*Portfolio manager.*	*Programme manager {if appointed, otherwise programme sponsor}.*	*Project manager {if appointed, otherwise project sponsor}.*
Key Participants	*10-15, Board, all at senior level in the client organisation. And others as needed.*	10-*15*, Board, all at senior level in the client organisation. *And others as needed.*	10-20, *Board {unlikely},* portfolio manager, programmes and projects sponsors. *And others as needed.*	10-20 *Board {unlikely}, portfolio manager,* programme manager {if appointed} and programme and projects sponsors. *And others as needed.*	10-20, *programme manager,* project manager {if appointed} and project sponsor. *And others as needed.*

Typical Techniques	*Issues Analysis. Strategic Function Analysis. Needs Analysis. Value System Analysis. Risk Analysis.*	*Issues Analysis. Strategic Function Analysis. Needs Analysis. Value System Analysis. Risk Analysis.*	*Issues Analysis. Strategic Function Analysis. Needs Analysis. Value System Analysis. Time Cost, Quality Trade-offs. Strategic time line. Programme requirements: needs and investment requirements outlined. Capability building.*	*Issues Analysis. Strategic Function Analysis. Needs Analysis. Value System Analysis. Time Cost, Quality Trade-offs. Strategic time line. Project requirements: needs and investment requirements outlined. Capability building. Consider procurement strategy {strategies}.*	*Same as S2 and as International VM Benchmarking Study.*
ReqM Focus and Activities	*Identify and manage broad performance and regulators/funders' requirements.*	Identify and manage strategic requirements	Identify and manage portfolio requirements	Identify and manage programme requirements	Identifying and manage project requirements.
VM Focus and Activities	*Policy formation according to regulators/funders' requirements.*	Identifying and evaluating strategic options	Portfolio definition: Ensuring that programmes and projects within portfolio conform to its overall objectives.	Programme definition: Ensuring that projects within programme conform to its overall objectives.	Project definition: Develop the project strategic brief.
RM Focus and Activities	*Assessing global risks and risk of not meeting the regulators/funders' requirements.*	Assessing the strategic risk which could influence the business, survival, continuity and growth in the long term.	Identifying and managing portfolio risks.	Identifying and managing programme risks.	Identifying and managing projects risks.

Having discussed the study types and their information table, this identifies improvements in the existing features of the integrated studies. Moreover, it highlights other important features. This leads to an update of the series of integrated studies as the second model of the research approach. The next section uses Figure 9.1 and Table 9.2 to update the conceptual process diagram as the third model of the research approach to show how these integrated studies flow throughout the organisational levels.

9.5 The Process Diagram of the Integrated Studies throughout Organisation Levels:

The conceptual process diagram {Figure 6.5} was developed mainly from Table 6.1 and Figure 6.4 to give more clarification to the conceptual studies series by showing the study flow as a systematic process. Therefore, in the same way it will be updated mainly from the information in Table 9.2 and Figure 9.1 as the third model of the research approach. The changes are as follow:

- According to Figure 9.1 and Table 9.2, S0 and its ReqM, VM and RM activities and outputs should be added as there is an evident need to drive and feed S1. So, the process diagram will start by identifying the need for beneficial change to improve performance and value for money for an organisation, leading to creating or updating its vision, mission and thereby strategies to do that. After that, the integrated studies activities are undertaken at S0 to aid the policy formulation exercise through producing policy options for the Board to make informed decisions about vision, mission and values. Then, if this policy is agreed with regulators/funders, the integrated studies activities continue to cascade to be undertaken at other organisational levels similar to Figure 6.5. Otherwise, S0 activities should be revisited again.
- It is evident from the findings that regulated organisations should seek agreement with their regulators and funders to develop their policy and strategies which should be indicated.
- The above points represent the changes that are applied in red and *italic style* to update Figure 6.5 and replace it with Figure 9.3 as indicated below.

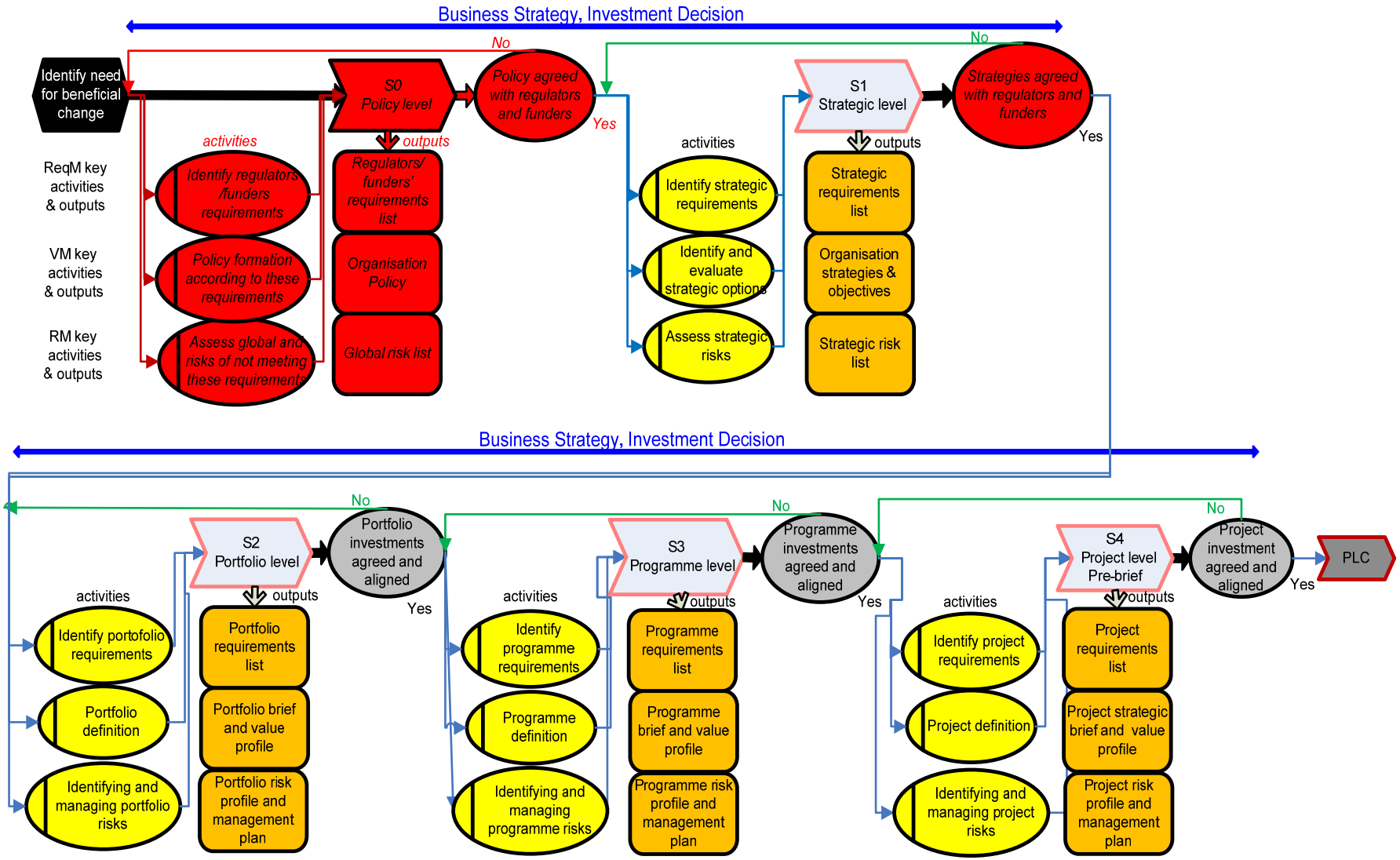

Figure 9.3: Process diagram for the integrated studies {sources: The Author adapted from the literature and findings}

Having shown the integrated studies flow in a systemic manner, the next section argues how ReqM, VM and RM come together as an integrated approach.

9.6 The General Integrated Study Approach:

This section confirms the need for ReqM, VM and RM integration established in Chapter 6; clarifies the linkages among them through discussing their integration levels and their approaches. Following these discussions, several issues will emerge to be discussed with the early VM process investigated in the previous chapter {section 8.3.6} to update the conceptual VM extended process. Besides that, the conceptual study leader's skills will be updated as the integrated study approach for the appraisal as the fourth model of the research approach as follows:

9.6.1 The Need for ReqM, VM and RM Integration:

Chapter 6 highlighted the need for ReqM, VM and RM integration through four possibilities of theoretical underpinning, processes, tools and techniques and interventions. The findings do not indicate the theoretical integration while they support intervention integration as ReqM, VM and RM are mostly undertaken sequentially. Moreover, the findings identify reasons to integrate ReqM, VM and RM processes with some common techniques as mentioned in the previous chapter, section 8.3.5.1. However, the frequency of their integration currently increases at lower organisation levels as they are integrated rarely in policy and strategy levels, occasionally in portfolio and programme levels and sometimes in project level.

9.6.2 Levels of Integration and their Approaches:

The findings indicated that within most organisations value, risk and requirements management are linked but in different ways as usually they are used sequentially {intervention integration}. Whereas, sometimes they are combined {process integration with some integrated tools and techniques}.

Chapter 6 highlighted the need for more investigation on ReqM, VM and RM integrated approaches and the use of them to develop the conceptual integrated study approach. The findings indicated that all ReqM, VM and RM should be part of the same process and in practice a variety of approaches are used to integrate them. These indicate mainly three levels for the integration and their approaches. In other words, there are three options for ReqM, VM and RM integration as follows:

Level 1: ReqM, VM and RM are linked but not integrated in the same process. This is the same as the intervention integration argued in Chapter 6. So, they would be used on a scheme as separate formal/informal processes running sequentially and associated with each other by the scheme team. This is undertaken through communicating their outputs. In this case, the identified requirements are used in VM and RM processes; the risks associated with VM options are transferred to the RM process; and the opportunities are developed through VM when they appear within the risk process and so on. Also, as indicated by Hammersley (2002 p11), RM after the VM is used to increase the

value and manage the risks that might occur from applying the VM outputs and changes. In this approach, requirements are managed by the requirements manager and team. Whereas, VM and RM processes are managed often by the same value and risk manager and similar teams.

Level 2: ReqM, VM and RM are semi-integrated as one methodology in the same process. This is the same as process integration argued in Chapter 6. They are used as one methodology as requirements are sorted out informally within the information phase of VM, using techniques like stakeholder and function analysis with a FAST diagram and defining the true needs and the remit for the scheme. Then, the options to satisfy the requirements are highlighted, evaluated and developed. Whereas, risks associated with these options are identified and assessed in a separate RM phase at the end of the VM workshop, similar to the second approach of Hammersley (2002 p11) or in a different, full RM workshop running sequentially. However, according to the findings, the best thing is to have VM issues in a workshop and then use the same team building to do the sequential RM workshop. In this approach, ReqM, VM and RM are managed by the same manager and team.

Level 3: ReqM, VM and RM are fully integrated as one methodology and occur in the same workshop. This is also a type of process integration argued in Chapter 6. So, they are undertaken by applying ReqM and RM activities within the VM job plan phases similar to Smith and Male (2007 p5). This approach can be undertaken in two ways as follows:

1. Requirements are sorted out in the information phase of VM as indicated above {in semi-integrated}. Then, the options to satisfy the requirements are highlighted, evaluated and developed. However, within the evaluation phase and similar to the first approach of Hammersley (2002 p11), risks are used to select between options but mainly if the decision could not be made without them. So, risks associated with options can be evaluated to give a rough profile, saying that one is more risky than the other one. This is undertaken without detailed analysis of risk exposure at that stage to avoid destroying the thought process of ‘what else can I do?’ After that, risks associated with the preferred option{s} are managed as part of the development phase. In this approach, ReqM, VM and RM are also managed by the same manager and team
2. Within the VM workshop, VM can be undertaken by a value manager; requirements can be captured through DOORS by its specialist; and risks can be thought through by a risk manager who may use ARM. So, a DOORS specialist can listen to others when they are generating issues, looking at risks and defining functions and can translate that into statements about requirements and then test it back during the workshop. Nevertheless, the team structure and cost of doing these are critical issues which should be carefully considered. Furthermore, tools like ARM and DOORS are not commonly used within construction and the latter’s application are mainly limited to programmes and projects.

However, this is similar to VM as above, all of this is undertaken as the value manager does a bit of everything but potentially some areas need to be more detailed by having some specialists for requirements and risk.

However, as indicated by the findings {section 8.3.3.1}, formal ReqM, like the one indicated in Level 1 integration or the second way of Level 3 integration cannot be undertaken on all projects, unless they are massive ones where one can actually justify the required amount of time and effort. So, they might be conducted on certain projects but not on others. Therefore they need filtering.

The findings also indicated that ReqM can be undertaken in small projects but informally and in a simpler way. This is by using a FAST diagram which should be done unambiguously, similar to the semi-integrated {2} approach and the first way of the full integration {3.1}. However, all of the key weaknesses mentioned in Chapters 6 and 8 {sections 6.3.3 and 8.3.5.2} are mainly applied to full integration when ReqM, VM and RM are undertaken in the same workshop. Although, they can be overcome through two approaches: firstly, splitting the team into smaller sub-teams as suggested by Smith and Male (2007 p6) which was indicated in Chapter 6, section 6.3.3. Secondly, choosing a study leader with some engineering/technical background or bringing in people with these specialisms when required. Moreover, Hiley and Paliokostas (2001 p1) concluded that the benefits from VM and RM integration far outweigh any disadvantages. This can also be emphasised if the weaknesses are overcome through the above two approaches.

9.6.3 The VM Extended Process:

The VM extended process conceptualised in Chapter 6 will be discussed and updated using the above discussions {section 9.6.2} and the early VM process indicated in the previous chapter {section 8.3.6}. It will be discussed and updated as integrated pre-study {preparation}; integrated study {mainly workshop{s}}; and integrated post-study {implementation} stages. These are discussed as follows and shown in Figure 9.4, Boxes 1, 2 and 3 respectively as an updated version of Figure 6.6. The differences among the two figures are applied in red and *italic style*.

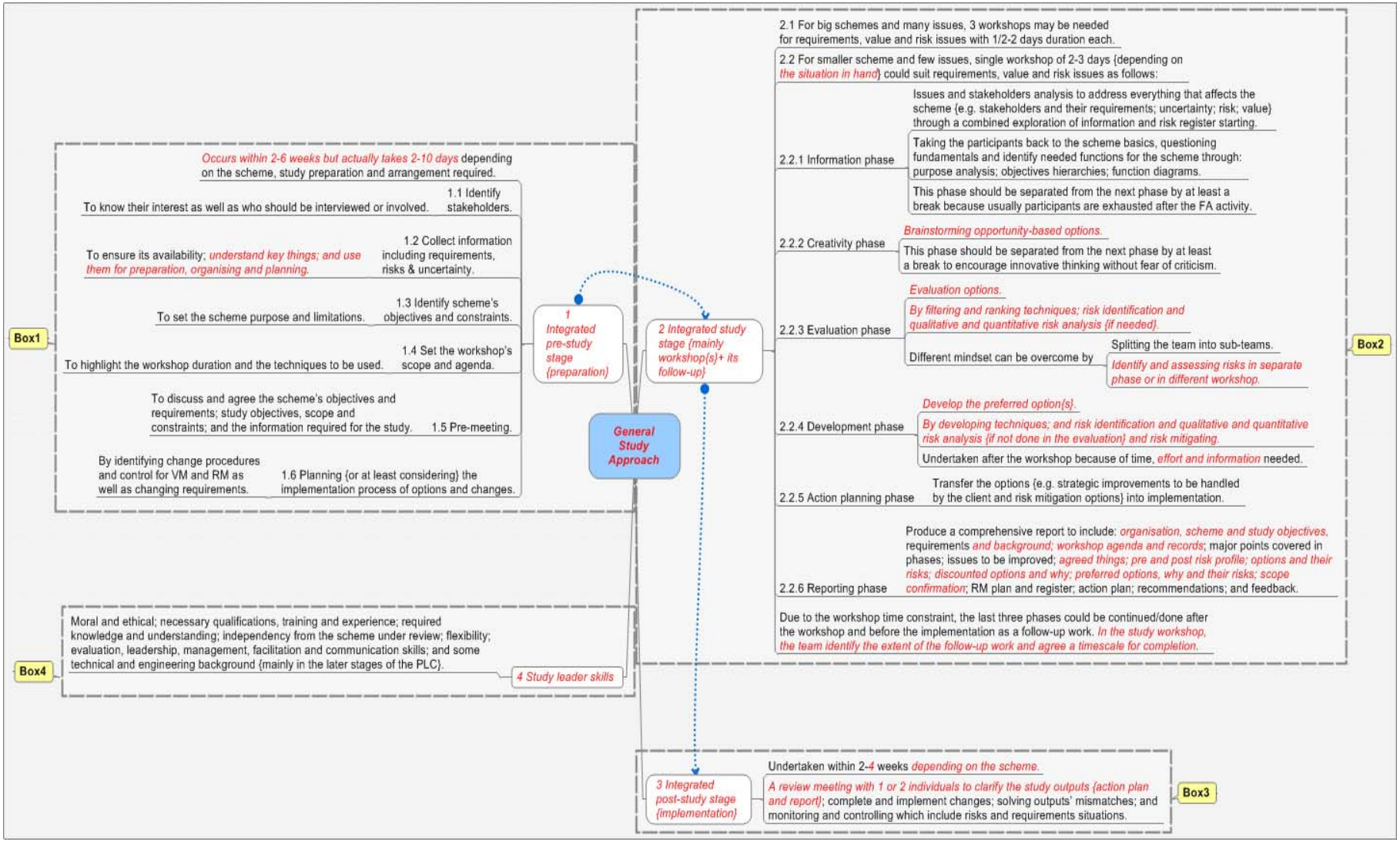

Figure 9.4: General integrated study approach {sources: The Author adapted from the literature and findings}

9.6.3.1 The integrated pre-study {preparation} stage:

- The conceptual VM extended process adopted the five key pre-stage activities indicated by Male et al. (1998b p40). These are: identify stakeholders, collect information, identify scheme's objectives and constraints, determine the workshop scope and agenda, and pre-meeting. The findings indicated that all these activities are used within regulated organisations and this confirms their adoption for the VM extended process.
- In the conceptual VM extended process, it was argued that information about requirements, risk and uncertainty should be gathered in the preparation stage. The findings confirm this as this type of information is collected for the reasons mentioned in section 8.3.6.1. These reasons can be summarised as: ensure information availability; understand key issues; and use them for preparation, organising and planning.
- The conceptual VM extended process indicated that setting and planning the implementation process could be undertaken through highlighting change procedures and control for ReqM, VM and RM changes. The findings {section 8.3.6.1} confirm that regulated organisations have general structured and formal change procedures for important changes including ReqM, VM and RM changes which are identified at the pre-stage.
- At this stage, the findings {section 8.3.6.1} highlighted other activities/techniques which could also be used.
- The findings indicated that generally this stage is undertaken within a period of two to six weeks but the effort and the actual work requires two to four working days to be completed. As the whole study is based on the information that is gathered and analysed in this stage, the literature indicates a longer time of five to ten working days which was adopted in the conceptual VM extended process. Nevertheless, the findings suggested that, this could be changed to be two to ten working days depending on the particular scheme and the study preparation and arrangements that are required.

9.6.3.2 The integrated study stage {mainly workshop{s}}:

- The findings {section 8.3.6.2} signify the use of workshops for ReqM, VM and RM within regulated organisations. These sit well with Chapters 3, 4 and 5 literature as workshops are important and commonly used for these methodologies. This indicated that for the integrated study, workshop{s} should represent a significant part of the study stage which confirms Chapter 6's {section 6.6.2.2} argument for that.
- The IVM Seminar {see Table 8.1} confirms Chapter 6's {section 6.6.2.2} argument of conducting three sequential workshops in the integrated study stage for big schemes with many issues to be addressed. These address requirements, value and risk issues respectively following the logical sequence discussed in section 9.2. The conceptual VM extended process assigns

durations of half a day to two days for each of these individual workshops. The findings {section 8.3.6.2} confirm this as the normal duration for them.

- However, for smaller schemes and with fewer issues to be considered, the conceptual VM extended process argued for a single integrated workshop to deal with requirements, value and risk issues together. This was undertaken by including ReqM and RM issues within the same VM workshop. The integrated approach discussed within the fully-integrated level supports this. Nevertheless, additional benefits like increased flexibility and focus and decreased fully-integrated weaknesses can be achieved by considering the semi-integrated level as well. The range of two to three days was assigned to this integrated workshop in the conceptual VM extended process. The findings confirm that VM workshops' durations could be like that. The literature and the findings relate these range differences to factors such as: size, nature and complexity of the scheme under review; stakeholder numbers and availability; workshop purpose; and the number of options to be worked up for ease of understanding. So, it depends on the situation at hand and therefore it is difficult to generalise and therefore only a range can be given.
- The conceptual VM extended process and the findings {section 8.3.6.2} indicated that this integrated workshop is undertaken through several phases similar to Figure 3.6 as follows:
  - The conceptual VM extended process indicates that the information phase should include requirements identification. The findings support this as they indicated that regulated organisations do this at this phase through techniques mentioned in section 8.3.6.2.
  - In the creativity phase, the conceptual VM extended process includes risk identification and exploration if appropriate. This approach is currently used in regulated organisations as indicated by the findings {section 8.3.6.2} as they identify risks associated with options in this phase. Therefore, this could be undertaken here. Nevertheless, this is seemed unnecessary as there is no real need for this at this stage and doing so could cause problems in creative thinking. This is because the risk mindset can stifle creativity. One consultant {R10} indicated that it is better to defer this until after the creativity phase when it is actually needed, which is supported by Day et al. (2003 p10).
  - In the evaluation phase, the conceptual VM extended process includes a qualitative assessment for risks associated with the VM alternatives to help in choosing the best option{s}. The findings {section 8.3.6.2} support this but indicate that some organisations do not do so unless the decision could not be made without a risk analysis. This is in line with Day et al. (2003 p10) as they found that sometimes the risk profile is the only differentiator between alternatives being investigated. Therefore, risks associated with options should be identified and analysed at the end of this phase, mainly to choose between options if the decision could not be made without them. Nevertheless, this should

be a high level analysis and not a detailed one as indicated in the conceptual integrated study {section 6.6.2.2} and supported in the fully-integrated level {3.1} {section 9.6.2}. However, the conceptual integrated study indicates the problem of different mindsets which can be overcome by:

- Splitting the team into smaller sub-teams as indicated in Chapter 6; or
- Similar to the semi-integrated level {2}, risks are identified and assessed in a separate RM phase at the end of the workshop or in a different workshop immediately after the VM workshop with the same leader and participants.

➢ In the development phase, the conceptual VM extended process includes a mitigation of risks associated with the best VM options. It also includes a quantitative risk assessment if needed. The findings {section 8.3.6.2} support all of these. However, the risk assessment here is at a high level assessment at the strategic stage which tends to be more qualitative. These risks can be placed as actions for the scheme to be addressed in the normal course of definition. Moreover, the conceptual VM extended process indicated that this phase should be undertaken after the workshop {as it is time consuming} and allows enough time for the quantitative risk analysis if needed. The findings {section 8.3.6.2} support this and added other reasons for conducting this phase after the workshop. Thus, risks associated with the best option{s} should be identified and analysed qualitatively and quantitatively if needed after the workshop {if not undertaken in the evaluation}; and then mitigated.

➢ In the reporting phase, the conceptual VM extended process includes several issues in the study report. The findings {section 8.3.6.2} added other issues which should also be considered.

➢ The conceptual VM extended process highlighted that development; action planning and reporting phases could be continued/done as follow-up work after the workshop and before the implementation due to workshop time constraints. The findings support this as indicated in section 8.3.6.3 and found that generally in the study workshop, the team identifies the extent of this follow-up work and agrees a timescale for its completion.

9.6.3.3 The integrated post-study stage {implementation}:

❖ Chapter 3 highlighted several activities which were adopted in the conceptual integrated post-study stage. Nevertheless, it also indicated a review meeting with the client for the final report and action plan as the most common approach to this stage. The findings {section 8.3.6.3} support this as they indicate that generally; regulated organisations do all of these activities with monitoring and controlling undertaken via PM. The findings also indicated that the review meeting is conducted with only one to two individuals.

- ❖ The conceptual VM extended process adopted two to three weeks duration for this stage. This can be confirmed by the findings as regulated organisations carry out this stage within typically a month or less depending on the scheme. So, the range should be amended to two to four weeks to recognise the real-world situation of the findings.

Having developed the VM extended process, the next section identifies the skills required to manage it.

9.6.4 Study Leader Features and Skills:

Chapters 3, 4, 5, and 6 indicated similar skills and features that are needed to manage ReqM, VM and RM studies which have been combined under general headings as indicated in Table C.5 in Appendix C. These headings were adopted in the conceptual integrated study approach in Chapter 6. However, the findings {section 8.3.4.1} indicated additional skills that were grouped in the same table within the existing headings. So, these headings {see Box 4 in Figure 9.4} are the most common skills which should be considered as the key ones. They relate to and include all the skills indicated by the literature and the findings. They are also needed for all ReqM, VM and RM studies' managers and thereby for the integrated study leader.

However, because the skills are common for all ReqM, VM and RM studies, the study managers for ReqM, VM and RM can be the same person. Furthermore, it is evident that the VM process can accommodate ReqM and RM, therefore a value manager who has those skills can be a study leader for the integrated study who can undertake it at all organisational levels.

9.7 Chapter Summary:

This chapter investigated and confirmed the assumptions used in building the conceptual approach to increase its validity. Then, it used the findings to conduct improvements to the conceptual approach argued in Chapter 6, leading to it being modified and developed as a research approach. This approach was developed for the regulated private sectors as it is evidently the most appropriate one to be targeted. The research approach has been developed through four parts {models} as follows.

Firstly, the organisation structure conceptualised in Figure 6.4 was critically reviewed. This review leads to an update as shown in Figure 9.1. Furthermore, the bottom-up approach of structuring portfolios and programmes presented in Figure 8.2 in the previous chapter was critiqued and updated as shown in Figure 9.2.

Secondly, the studies types and their information conceptualised in Table 6.1 was updated through two stages as discussed in section 9.4 which led to the update as shown in Table 9.2. The improvements included adding S0 study and its features; some modification to the features that already existed in Table 6.1; and adding other features. The new features are: importance degrees and benefits direction of the studies; accountabilities for each study; and typical techniques.

Thirdly, the updated information presented in Figure 9.1, Table 9.2 and other findings were used to critique the process diagram conceptualised in Figure 6.5. This review led to the update as shown in Figure 9.3.

Fourthly, the need for ReqM, VM and RM integration was demonstrated. Thus, the VM extended process conceptualised in Figure 6.6 in Chapter 6 was critically reviewed. This review led to the update of that as integrated pre-study {preparation}, integrated study {mainly workshop{s}} and integrated post-study {implementation} stages. These are shown in Figure 9.4, Boxes 1, 2 and 3 respectively. Also, the study leader skills conceptualised in Chapter 6 were updated and shown in the same figure, Box 4.

Thus, the integrated research approach for the appraisal was created in this chapter. The next chapter is devoted to drawing conclusions from the research and suggesting recommendations for further research.

10 CHAPTER TEN: CONCLUSIONS AND RECOMMENDATIONS:

10.1 Introduction:

This chapter addresses a number of issues to conclude the thesis. The Chapter highlights how each of the objectives set out in Chapter 1 was achieved and consequently the achievement of the research aim; it emphasises the original contribution made by this research; it discusses the limitations of the research; and then addresses recommendations for future research and areas which need more investigation.

10.2 The Objectives:

This section reviews the research objectives with their achievements which contribute to the achievement of the research aim as follows:

Objective 1: To review and investigate current construction projects and their appraisal stage including its upper organisational levels of policy, strategy, portfolio and programme to clarify their relationships, structuring, management, problems, and required skills for each level:

This objective has been achieved through Chapters 2, 6 and 8 as follows.

It was evident from both the literature and the fieldwork that most construction projects are undertaken in a multi-project context and the management of multi-projects is different from single ones and therefore programme and portfolio management are used to undertake multi-projects because traditional PM is unable to manage this type.

From the literature, it was concluded that the appraisal stage represents the early stages of projects, which extend from pre-brief to sanction with a relationship with programme, portfolio and business strategies. This is because it starts at corporate strategic level and then continues to be managed within other levels, particularly for large organisations. It was also evident from both literature and fieldwork that projects come out from organisational strategies through a series of investment decisions and strategic alignment processes. These are undertaken within their appraisal stages through different organisational levels to create strategic change in the organisation. Also, the literature concluded that the organisational value chain should be kept unbroken to align the projects with their higher levels through transmitting, transferring and maintaining value through different organisational levels to ensure achieving value for money as an outcome of the strategic management process for an organisation. The fieldwork indicated that regulated private organisations have structured investment processes for all that but people need to be trained on these processes to work effectively. Therefore, the appraisal stage was concluded as a very important stage which needs enough time and attention.

It was evident from both literature and fieldwork that the best way to clarify the relationship between organisational levels is to think in terms of a pyramid with organisation policy at the top,

then organisation strategy, then portfolio, then programme and then project. Organisation policy concerns vision, mission and values; organisation strategy focuses on long term strategies and objectives to reach the vision; portfolio is a collection of all programmes, projects and other work within an organisation; programme is a group of related projects; project is a temporary unique investment of resources for outputs under the constraints of time, cost, and quality.

The literature concluded that the creation of programmes and projects are not addressed within portfolio and programme key definitions respectively. The fieldwork indicated this by highlighting two approaches to structuring portfolios and programmes. One is top-down in which organisation forms its policy and then this policy should drive organisation strategy and objectives and these should drive investment portfolio which break resources across capabilities and drives programmes which drive projects. This approach provides a structured investment process but is not well understood in practice. The other one is bottom-up in which the Board set business planning and strategy which produce a capital investment process which generates projects and then projects are grouped into programmes and then programmes into portfolios to try to link projects to the organisational strategy. This approach creates a gap between strategy and project levels. This gap also lines up with the poor management of the front-end including portfolio, programme and the front of projects. This gap can be filled by a skilled sponsor with the effective processes {e.g. ReqM, VM and RM} or by consultants.

It was also evident from the literature and the fieldwork that the Board manages organisation policy and strategy. Portfolios, programmes and projects are managed by their managers. However, sponsors may manage programmes and projects at their early stages if their managers are not yet appointed. The literature identified some skills for portfolio, programme and project managers and programme and project sponsors. The fieldwork confirmed these skills and also highlighted those skills required by the Board members. The skills profile across organisational levels tended to focus more on leadership skills at high levels such as the Board and portfolio levels. Then while going down through programmes into projects, the focus tended to be more on managerial skills and day-to-day delivery. Moreover, each level required a good experience and knowledge in managing at lower levels.

Achieving the first research objective leads the research to contribute to the knowledge by providing an understanding of the appraisal stage of projects and upper organisational levels. Also, clarifying these levels' relationships, their structuring, problems and required roles and skills for each level particularly in the regulated private sector. This understanding and clarification provided the basis to conceptualise and develop the first research model which represents the research organisation structure as shown in Figure 9.1.

Objective 2: To review and investigate ReqM, VM and RM to understand their application, timing, processes, participants, required skills to manage them, tools and techniques in UK construction as discrete disciplines:

This objective has been achieved through Chapters 3 to 6 and 8 as follows.

Both the literature and the fieldwork generally consider ReqM as a method of capturing and managing requirements during the investment lifecycle {particularly at the project level} and it comes originally from IT; VM is a method to manage value through functions analysis and provide better options in one or several interventions; and RM is a method of understanding and managing risks {both opportunities and threats} in a continuous manner.

It was also evident from the literature and the fieldwork that ReqM, VM and RM can be undertaken formally or informally. Informal RM is characterised by a relative absence of documented RM policies and processes and is considered insufficient, particularly for complex situations. Informal VM may be called strategic studies which may be undertaken in workshops and challenged environment to a certain extent or generally without that. Informal ReqM is when requirements are identified and managed within other processes such as VM and stakeholder management. On the other hand, formal ReqM, VM and RM have a number of activities and techniques which go into three stages of pre-workshop, workshop and post-workshop for formal VM and RM processes. The formal ReqM process uses workshops and involves elicitation, gathering and capturing; analysis; organising, categorising and prioritising; formatting and documenting; validation and verification; and tracking and managing requirements changes. There are some tools to be used for formal RM and ReqM such as ARM and DOORS respectively but they are not common in construction and the latter's applications are mainly limited to programme and project levels.

The literature emphasised the importance of using formal ReqM, VM and RM at the appraisal stage. It also concluded that formal VM and RM should be used at all organisational levels while stakeholders and their requirements should be identified at each level. Nevertheless, the literature is dominated by project level applications of these methodologies. It was concluded that formal RM and ReqM should be applied as a continuous process over the PLC while formal VM has five key opportunities at project level as shown in Figure 3.4.

It was also found from the fieldwork that the application of ReqM, VM and RM and its tools and techniques increase and become more formalised, when going from organisational policy and strategy through portfolio and programme into projects and their phases. They are normally used in projects, sometimes in programmes, occasionally in portfolios and rarely in organisational policy and strategy. This means they are dominant at project level rather than at policy and strategy levels where organisations define where they are going as companies and what they are trying to do.

It was evident from the literature and the fieldwork that ReqM, VM and RM require similar skills and features to be managed such as: moral and ethical; necessary qualifications, training and

experience; required knowledge and understanding; independency from the scheme under review; flexibility; evaluation, leadership, management, facilitation and communication skills; and some technical and engineering background {mainly in the later stages of the PLC}. They involve similar participants at the appraisal stage such as scheme managers and sponsors and others as required.

Achieving the second research objective leads the research to contribute to the knowledge by providing an understanding of ReqM, VM and RM. Also, clarifying their application within the organisational levels particularly in the regulated private sector. This understanding and clarification provided the basis to conceptualise and develop the second and the third research models which represent the integrated studies series and their process diagram as sown in Table 9.2 and Figure 9.3 respectively.

Objective 3: To capture and understand the linkages existing and potential between ReqM, VM and RM especially in the appraisal stage and at different organisational levels:

This objective has been achieved through Chapters 6 and 8 as follows.

Additional to the similarities in study managers skills and key participants, it was concluded from the literature that there are several linkages between ReqM, VM and RM. These linkages were argued and examined in Chapter 6 through four possibilities of theoretical underpinnings, processes, tools and techniques and intervention viewpoints. It was concluded that, several links exist between these concepts as each one is linked to their basic principles of problem solving, decision-making and value concepts. To manage ReqM, VM and RM together, processes integration is the most common procedure and would provide advantages while there are a few disadvantages and barriers and most of these can be overcome as argued in Chapter 6. The tools and techniques can be integrated, but only to a certain degree, as not all of the tools and techniques can be used for all ReqM, VM and RM at the same time and there are also special tools and techniques that can only be used for one of these methodologies. Nevertheless, if an organisation will not/could not integrate their processes with some integrated techniques, then at least they should be undertaken sequentially and appreciate each other to maximise the benefits of their use.

The fieldwork supports the interventions integration as ReqM, VM and RM are mostly undertaken sequentially. Moreover, it identifies more reasons to integrate ReqM, VM and RM processes with some common techniques being noted.

Several models and approaches were found for VM and RM integration in the literature and ReqM, VM and RM integration in the fieldwork. Nevertheless, a number of VM and RM integration barriers and weaknesses were found in the literature such as the different mindset needed when evaluating value and risk; the change resistance; and the need for expert study managers. For ReqM, VM and RM integration, the fieldwork indicated to others barriers and weaknesses such as the patchy understanding of ReqM, VM and RM within regulated private organisations and their occasional use of formal ReqM; the possible complexity of the ReqM, VM and RM integrated

study; organisations do not recognise the benefits from this integration; and the need for technically knowledgeable {engineers} for formal ReqM particularly for technical issues. These barriers and weaknesses should be considered and overcome where possible within any integration approach for ReqM, VM and RM.

Objective 4: To develop an approach for integrating these three methodologies within the appraisal stage at different organisational levels based on the literature and fieldwork data:

This objective has been achieved in Chapter 9 as follows.

The fieldwork findings presented in Chapter 8 was discussed and combined with the literature presented in Chapters 2 to 6 in order to critique the conceptual approach and its four models and develop the research integrated approach from that. The assumptions used in conceptualising the approach have been investigated and confirmed. The approach has been developed for the regulated private sector as follows.

Firstly, the investment process and the linkages between organisational levels as well as the skills profile within these levels were discussed, clarified and used to critique the conceptual organisation structure and the studies timing {Figure 6.4}. This review resulted in some changes which have led to the update of that as shown in Figure 9.1 as the first model. These can be summarised as: adding a level of policy formation before organisation strategy with another integrated study {S0} and indicated for both levels to be managed by the Board; indicating the intricate process with regulators/funders at the top of the organisation structure to feed the policy level; specifying exactly what is in each link between levels, indicating top-down investment; positioning the three lanes of relationship shown in Table 9.1 next to the general one; positioning 360º skilled sponsors around programmes and projects; and adding a note about key roles for managing organisational levels, indicating further information about them.

Secondly, the studies types and their information conceptualised in Table 6.1 was discussed during the fieldwork with several interviewees, fed from the IVM Seminar (2010) which produced some changes as a first stage of updating it. After that, themes like: the most important level to use ReqM, VM and RM; and their key participants were discussed, clarified and used to produce other changes as a second stage of updating this table. These two stages led to the update of this table, leading to the development of the series of integrated studies as shown in Table 9.2 as the third model. The changes include adding S0 study and its features; some modification to the features that already existed in Table 6.1; and adding others features. The new features are: importance degrees and benefits direction of the studies; accountabilities for each study; and typical techniques.

Thirdly, the updated information presented in Figure 9.1, Table 9.2 and other findings were used to critique the conceptual process diagram of the integrated studies {Figure 6.5}. This review resulted in two main changes as: S0 and its ReqM, VM and RM activities and outputs should be added as it is evident to drive and feed S1. Moreover, seeking agreement with the regulators and funders to

develop policy and strategies should be indicated to process from S0 to S1 and from S1 to S2. These changes have led to the update of the conceptual process diagram as shown in Figure 9.3 as the third model.

Fourthly, the linkages between ReqM, VM and RM including their integration levels and their approaches were discussed. This discussion alongside the early VM process findings were discussed, clarified and used to critique the conceptual VM extended process {Figure 6.6}. This review resulted in some changes, mainly regarding the RM and ReqM issues within the process. These changes have led to an update of the conceptual VM extended process as: integrated pre-study {preparation}; integrated study {mainly workshop{s} plus its follow-up work}; and integrated post-study {implementation} stages. Also, the conceptual study leader skills were updated. These come together to form an updated version of the integrated study approach which is the fourth model indicated in Figure 9.4.

The significance of realising the final objectives and the contribution to knowledge is given in the following section.

10.3 Contribution to the Knowledge:

This research critically reviewed the literature and investigated the field to clarify the structured investment process across organisation levels in the appraisal stage of UK construction projects. Then, it identified the series of integrated studies, their process diagram and the integrated study approach within this stage and across these levels for the regulated sector. Therefore, the original contributions of the research are:

- Providing an understanding of the appraisal stage of construction projects which involves a top-down appraisal of investments through organisational levels of policy, strategy, portfolio, programme and project. Moreover, clarifying these levels relationships, their management, structuring, problems, required roles and skills for each level as well as the value flow through them.
- Providing an understanding of ReqM, VM and RM as discrete disciplines as well as clarifying the linkages between them particularly in the appraisal stage and within different organisational levels.
- Providing a comprehensive approach to integrate the concepts, methodologies, timing, tools and techniques that exist within the ReqM, VM and RM within the appraisal stage of projects at different organisational levels. This approach consists of four models of organisation structure and integrated studies timing; a series of integrated studies within organisation levels; a process diagram of the integrated studies throughout organisation levels; and a general integrated study approach.

- From a critical perspective, there is no such comprehensive approach to address all these themes {ReqM, VM and RM methodologies at policy, strategy, portfolio, programme and project levels} together. This research is the first to attempt to do that.

Overall, the research contributed to the knowledge by considering the importance of the linkages and interactions between different organisation levels to assess and appraise projects. Furthermore, it articulates that importance through the comprehensive integration of the three methodologies {ReqM, VM and RM} as a series of integrated studies to be applied at all levels which help decision-making and improve value for money.

10.4 Limitations of the Research:

The research and its main findings are limited to the following:

Firstly, this study is limited to UK applications for ReqM, VM and RM at different organisational levels and the practical data was collected with this in mind. On the other hand, practical aspects from other countries such as Australia and the USA were covered in the literature review only due to resource limitations {money and time availability}.

Secondly, the study focuses on the construction industry and the practical data was collected with this in mind. On the other hand, this study does not target other industries such as IT and manufacturing. This is mainly because it is evident that construction is a very important industry and compared to other industries it needs more performance and value for money improvement.

Thirdly, the stages which exist after the appraisal stage are beyond the research scope. This is because they are well known and later ones have a much lower uncertainty and potential for change as well as higher cost and resistance of change which reduces the opportunities and consequently the need for the integrated studies.

Fourthly, small-scale client organisations are beyond the scope of this research. This is because they usually do not have portfolio, programme and project structures in place as well as not being willing to use ReqM, VM and RM methodologies.

Fifthly, pure public and private sectors were not targeted. This is because it is very difficult to develop a general approach to include them together with the regulated private sector in a single research.

Sixthly, major projects are evidently beyond the capability of a single organisation and undertaken out of the regular activity; day-to-day operation; or ‘business as usual’ of the organisation. Therefore, no integrated study was developed for them.

Finally, the highlighted techniques for the integrated study stages and phases were not detailed within the general approach developed. This is mainly because it is evident that some techniques differ from one study to another depending on the situation and the study leaders’ choices.

10.5 Areas for Future Research:

Because of the limitations in the scope of this research, several issues emerged which are not adequately covered in the existing literature and could essentially benefit from additional investigation and research. These issues might include the following recommendations:

Firstly, this research developed the integrated approach for the regulated sector. Therefore, there is a need for further investigation about the regulators, their regulatory approaches and how they can benefit from methodologies like ReqM, VM and RM whether separated or integrated in developing their regulations and requirements.

Secondly, it was evident that major projects have a significant impact on their organisations but they are considered out of the research scope as they are special cases. Therefore, they need to be investigated in other research which should clarify their investments and develop how ReqM, VM and RM can be used for them, whether separated or integrated.

Thirdly, in order to produce a general approach to include public and private sectors, there is a need for three similar further pieces of research: one for the public sector; one for the private sector and another one combining the three sectors which generalises them in one approach to fit all sectors.

Fourthly, this research develops a general integrated approach for ReqM, VM and RM in the appraisal stage and produces them as one methodology that helps decision-making and increases value for money within organisations. However, it was found that some organisations preferred to use them separately {but sequentially} and from the intensive literature search, there are no comprehensive standards to address the timing, methodologies, tools and techniques of ReqM, VM and RM within different organisation levels as separate entities. Therefore, there is a need for three separate pieces of research and each should focus on one methodology.

Fifthly, the validity of this research and its developed approach has been proven in the research methodology chapter {section 7.3.7}. Nevertheless, more research/work can be undertaken to do another final test as an additional external validity for the approach. According to McNiff et al. (2003 pp135-137), the approach can be validated by exposing it to a validation group to criticise. As stated by them, the size of this group tends to be smaller than 10, usually about four to five participants who should be carefully selected to ensure that they criticise the work very well. Alalshikh (2010 p221) followed McNiff et al. and used interviews and questionnaires to do that. According to Male et al. (1998b pp12-13), this final validation can be also undertaken quantitatively, using a detailed questionnaire and statistical sampling. Moreover, they indicate focus groups {expert seminars} as another way to do this.

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11 Appendixes:

Appendix A: For Chapter 2:

Source																
A General																
(Hunter, 2006 p114)	Pre-project								project				Post-project			
	Project conception	Rationale establish	Strategic planning process	Key people identification	Select project alternative, appraisal	Pre-feasibility/ feasibility	Definition of project & proceed decision	Project formal planning	Design and contract	Implementation	Project monitoring	Handover	Operation	Evaluation	feedback	
Investment Three stages (Smith, 2002b p31)	Project Appraisal			Project implementation				Operation and maintenance of the asset								
	Initiation or Viability or Pre-feasibility	Feasibility	Sanction	design	Construction	commissioning	Completion									
(BSI, 2002 pp49-55)	Conception phase	Feasibility phase	Authorisation	Operation phase	Operation phase	Termination/ decommissioning phase										
B Construction																
(BSI, 2006 p41)	Initiation	Feasibility	Outline design	Scheme design	Detailed design	Mobilisation	Construction	Commissioning	Handover							
APM BoK	Pre-feasibility	Feasibility	Design	Contract/procurement	Implementation	Commissioning	Handover	Operation								

Mining house	Initial feasibility				Full feasibility		Development				Operation			
Oil company	conception				development		Basic design		Contract selection		Detailed eng.	Plant construction	Initial operation	Plant acceptance	Operation
RIBA updated by (Male et al., 1998a p12)	a	b	A	B	C	D	E	F	G	H	J	K	L	M
	Project awareness	Client Development	Inception	Feasibility	Outline proposal	Scheme design	Detail design	Production info.	Bill of quantity	Tender action	Project planning	Operations on site	completion	feedback
	Pre-brief		Briefing		Concept Design		Detailed design				Site operations			
(Aouad et al., 1999 p5)	Pre-project				Pre-construction						Construction		Post-construction	
	Phase 0: Establishment of need	Phase 1: Conception of need	Phase 2: Outline feasibility	Phase 3: Full feasibility	Phase 4: Outline conceptual design	Phase 5: Full conceptual design	Phase 6: Coordinated design	Phase 7: Production information			Phase 8: Construction		Phase 9: Operation and maintenance	
AIA (Male et al., 1998a p12)	Pre-design			Scheme design		Design development		Construction document		Contract administration		Post-design		
CIRA (Potter, 1995 p22)	Idea			feasibility	Briefing		Scheme design		Production information		Tendering		Construction on site	Occupation

<table>
<tr><td>Accelerating change stages (Dallas, 2006 p64)</td><td>Verification of need</td><td>Assessment of option</td><td>Develop procurement strategy</td><td>Implement procurement strategy</td><td colspan="6">Project delivery</td><td colspan="3">Post project review</td></tr>
<tr><td>OGC gateway stages (Dallas, 2006 p64)</td><td>Strategic assessment</td><td>Business justification</td><td>Procurement m strategy</td><td>Investment descision</td><td colspan="6">Readiness for service</td><td colspan="3">Benefit realisation</td></tr>
<tr><td>PFI stages (Dallas, 2006)</td><td>Strategic outline case</td><td>ISOP</td><td>ITN</td><td>ITN-PB; BAFO</td><td colspan="6">Post-contract capex</td><td colspan="3">Post-contract opex</td></tr>
<tr><td>(The Chartered Institute of Building, 1996 p11)</td><td>inception</td><td colspan="3">Feasibility and strategy</td><td colspan="3">Pre-construction</td><td>Construction</td><td colspan="2">commissioning</td><td>Completion and handover</td><td>Client commission</td><td>Post-completion review</td></tr>
<tr><td colspan="14">C IT orientated</td></tr>
<tr><td>Contractor</td><td colspan="2">definition</td><td colspan="2">Analysis</td><td colspan="2">Design</td><td colspan="3">Implementation</td><td colspan="2">installation</td><td colspan="2">operation</td></tr>
<tr><td>Client</td><td colspan="2">Outline and formal appraisal</td><td colspan="2">Functional analysis</td><td colspan="5">System development</td><td colspan="2">Commissioning</td><td colspan="2">Operation</td></tr>
<tr><td>PRINCE</td><td colspan="2">Initiation</td><td colspan="2">Specification</td><td>Logical design</td><td>Physical design</td><td colspan="3">development</td><td colspan="2">Installation</td><td colspan="2">Operation</td></tr>
</table>

Software development	Concept exploration	Requirement	Design	Implementation	Test	Installation	Maintenance
D Organisational change orientated							
Manager	Initiate/contract	Collect data and develop option	Develop concept	Detailed design	Plan and implement change	Continuous improvement	
Consultant	Scouting	Entry	Diagnosis	planning	Action	Stabilisation and evaluation	Termination
E Funding Orientated							
Management accountant	Identification	Preparation	Evaluation	Funding	Execution	Appraisal	

11.1: Figure A.1: Project phases {sources: (Smith et al., 2006 p16) adapted by the Author}

Appendix B: For Chapter 3:

B.1 The Activities/Techniques in The Pre-study {O&D} Stage:

B.1.1 Workshop Agenda and Place:

This is an important part of the O&D, which should be done by the value manager. It is an output of the process and is a sequence of operations usually illustrated as tools and techniques (Kelly et al., 2004 p126). According to Kelly et al. (2004 p126) even if the value manager produces an appropriate agenda, he will usually need to change and update it during the workshop because he cannot guarantee how the participants will act and behave during the workshop. Therefore, it is better to make a flexible agenda by keeping a little spare time, which may be required. Moreover, Kelly et al. (2004 p127) suggested to keep the agenda as simple as possible because if it has too many details the participants could become more worried about the agenda and the progress rather than their concern about the content of the study.

The location and environment of the workshop will have an important influence on its success (Norton and McElligott, 1995 p43). And thus, it is preferred to hold it in an isolated place which is usually a hotel so the study can be held without interruptions (Kelly and Male, 2002 p87).

B.1.2 Briefing Document Prior to the Workshop:

The value manager should prepare a report of not more than 10 pages and send it to the participants before the workshop. This should include the workshop agenda and information gathered, and should briefly describe the tools and techniques that will be used in the workshop. In practice if a lot of information is sent, it will not be read (Hammersley, 2002 p4; Kelly et al., 2004 p123). This stage is useful to ensure that the participants are aware of the workshop and its activities.

B.1.3 Checklist:

This technique reveals the information through interviews, interrogation from the team, and issues analysis (Kelly et al., 2004 p276). In addition, it is used to facilitate the extraction of essential data and interactions. Furthermore, the checklist highlights any hidden agendas to the value manager (Morris and Hough, 1987). According to Male et al. (1998a p49) this technique is done under the headings of the project environment, community, politics, finance, organisation, time, people, contractual issues, project concept, stakeholder analysis and project constraints.

B.1.4 Interviews and Questionnaires:

Interview is done by the value managers with the key stakeholders and also with the workshop participants. The interview and questionnaires serve the purpose of giving the value manager an overall view and understanding of the strategic and tactical issues of the project (Kelly et al., 2004 p289), though the questionnaire takes longer; however, questionnaires could be used if the interviews were not a practical option (Male et al., 1998a p50).

B.1.5 Document Analysis:

Document analysis, also known as document search, is a tool to inform the value manager about the background of the project and to find important information used in the workshop; any missing information can be found by the use of interviews (Kelly et al., 2004 p281). In addition, it is used to ensure gaining good quality information because the quality of the study performance is related to the quality and the comprehensiveness of the available information (Norton and McElligott, 1995 p44). Therefore, the interview and the document analysis are used to ensure and increase the validity and availability of the information that was gathered.

B.1.6 Change Management Procedures:

Any change in the project that is caused by a VM study should be acceptable to both the client and the contractor. Furthermore, in the interviews, the procedure necessary for the workshop to carry through change proposals should be explicit and clear (Male et al., 1998a p51).

B.2 The Tools and Techniques that are used in the Workshop Information Phase:

B.2.1 Presentation:

This is important because it is the initial stage of the information phase; it involves the senior manager giving a short introduction to state the organisational goals (Norton and McElligott, 1995 p57). Then, the value manager explains the VM principle, process and the workshop agenda (Hammersley, 2002 p6; Male et al., 1998a p52).

B.2.2 Issue Analysis:

This is a very useful technique because it is simple and allows the whole team to raise their ideas randomly and share their knowledge. Subsequently, ideas are grouped under headings by using sticky notes which are then prioritised by coloured dots (Kelly et al., 2004 pp55-56; Male et al., 1998a p52). Usually the topics under discussion are the community, education, health, politics, budget, project location, time, contractual and legal issues, staffing and maintenance (Kelly and Male, 2002 p95).

B.2.3 Strategic Time Line:

This is a graphical tool that illustrates what needs to occur and when, and identifies the critical points of the project such as design, tender, contracting, construction and so on, and usually comes after the brainstorming stage (Kelly et al., 2004 p308; Male et al., 1998a p52).

B.2.4 Stakeholder Analysis:

People whom have a real interest in the project should be addressed, and their interest in, and influence on the project reviewed. The goals of the project must reflect the entire principal needs and wants of the key stakeholders. In addition, it is important not to forget that each stakeholder might have different views of the project (Hammersley, 2002 p4; Male et al., 1998a p52). Stakeholder's analysis should be applied to highlight: all interested stakeholders; their concerns; their impact; and any legitimate requirement they might have for the project (BSI, 2006 p27). This

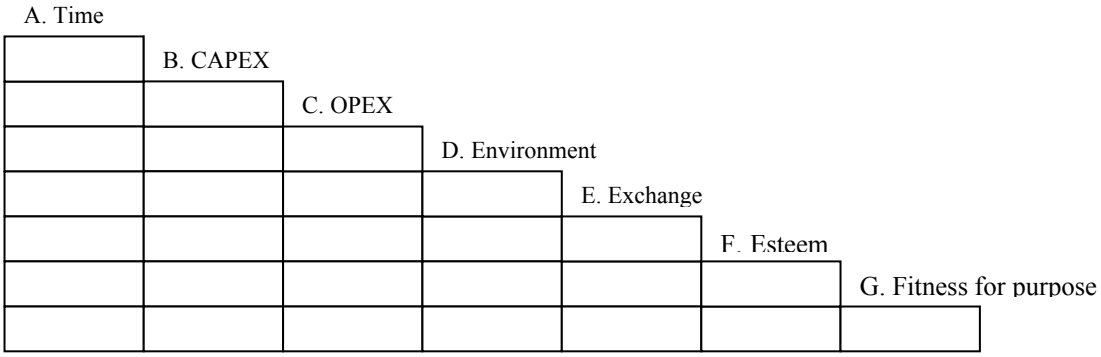
analysis can be done by several techniques such as the power/interest matrix (Olander and Landin, 2005 p322).

B.2.5 Project Driver Analysis:

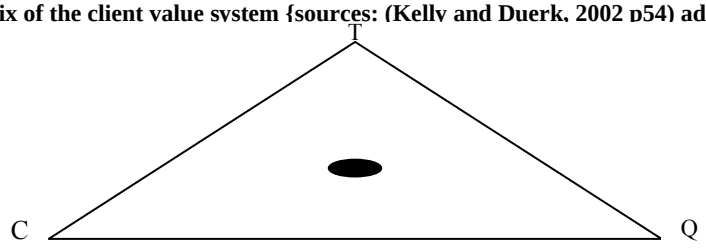
It is used to identify the factors and/or people that are actively promoting the project. In other words, it is used to analyse the key drivers that pull or push the project; this is done under headings such as time, cost, quality, design and space drivers. However, this technique is used if it is not addressed within the issue analysis (Kelly et al., 2004 pp281-282; Male et al., 1998a p52).

B.2.6 Client Value System Analysis:

This technique is used in order to know what the client's initial standpoints are, and what his aims and his priorities for the project objectives are. There are two methods available; the first method involves making explicit the variable of quality and value which consists of seven elements, namely, time, capital cost {CAPEX}, operating cost {OPEX}, environment, exchange, esteem and fit for purpose; also, the value manager has the right to add any other element that he knows is important. This is ranked using the pair's comparison technique by the client or it is represented to produce a matrix such as that shown in Figure B.1. The second method is practiced by using the time, cost and quality triangle which is widely used in VM workshops. In this method, the value manager asks the team for the position of the dot between the three variables. Figure B.2 illustrates the T/C/Q Triangle (Kelly and Duerk, 2002 p51; Kelly et al., 2004 pp207-215; Male et al., 1998a pp52-53)**.**



11.2 Figure B.1: Matrix of the client value system {sources: (Kelly and Duerk, 2002 p54) adapted by the Author}



11.3 Figure B.2: Illustrates the T/C/Q triangle {source: (Male et al., 1998a p53)}

B.2.7 Function Analysis:

This is one of the three fundamentals of the VM study and the most important stage, which takes a lot of time and effort. Kelly and Male (1993 p14) defined function as "*a characteristic activity or*

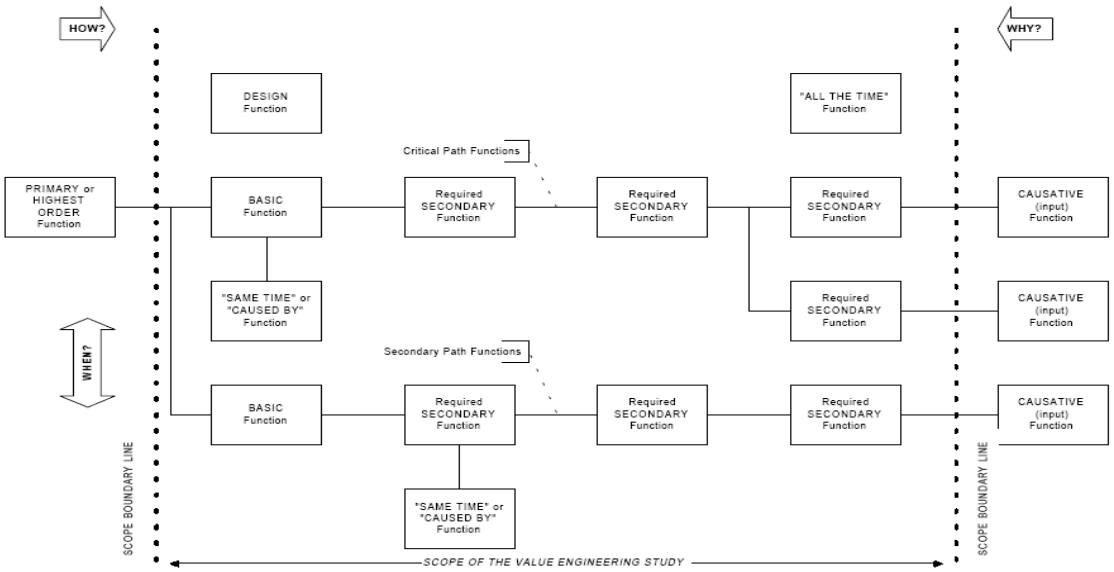
action for which a thing is specifically fitted, used or for which something exists", while Miles (1972 p27) described function as "*the basic purpose of each expenditure*". This technique is an aspect that creates a big difference between VM and cost cutting techniques and plays a significant role in the success of VM (Shen and Liu, 2003 p486). In addition, function analysis is considered as a very important element for quantifying value and is therefore at the heart of the VM process at any strategic or technical level (BSI, 2000b p27). There are four rules of FA: verb/noun definition, functional definition/technical solution, primary/secondary functions and cost/worth (Male et al., 1998a p53).

There are many benefits from FA such as: customer focus; function oriented; objectivity; versatility; creativity. Furthermore, FA is a feature that distinguishes VM from other similar methods (Hayles and Simister, 2000a p3). On the other hand, it sometimes tends to be misunderstood and resisted by newcomers to the method (Philips, 2002 p70).

FA could be done through different ways and there is no specific procedure to carry it out. The power of the method lies in the group doing it (Hammersley, 2002 p10).

The most common method in FA is the Functional Analysis Systems Technique {FAST} diagram, which is based on the analysis of essential functions for which items are designed. After that, FA concentrates on the design improvements of those functions (Stocks and Singh, 1999 p254). The steps of forming a FAST diagram are; function brainstorm, sorting of functions, and form function diagram (Kelly et al., 2004 pp61-63). Generally, there are two types of FAST diagram depending on the focus of the study being undertaken as firstly, the Strategic FAST diagram which is used at the strategic level to understand the whole project/scheme in the context of an organisation's strategy, programme and project. Secondly, is the Technical FAST diagram which is used at the project level to gain a technical appreciation of the problem leading to the exploration of technical solutions (Kelly et al., 2004 pp60-70).

Figure B.3 illustrates the FAST diagram rules, depicts the relationship between the different kinds of function. However, there are some variations on the FAST diagram such as function breakdown structure and objective hierarchies (Gronqvist et al., 2006 p11).



11.4 Figure B.3: Illustrates the FAST diagram rules {source: (OPFAM: Office of Project and Fixed Asset Management, 1997 p29)}

Additionally, Kelly et al. (2004 p133) suggested the function priority matrix {FPM} method for a large team. This method has three steps as follows (Gronqvist et al., 2006 p12):

- Functions brainstorming.
- Sorting the function on 2×2 matrix as shown in Figure B.4.
- Prioritises the functions.

	Strategic The Business Project	Tactical The Physical & Technical Project
Needs	Business Needs	Operational Needs
Wants	Added Business Benefits	Embellishments

11.5 Figure B.4: Sorting of function on 2×2 matrix {source: (Gronqvist et al., 2006 p12)}

However, all of the above methods are good and they should be adopted by the value manager, along with considering the strengths and weaknesses of each one.

B.2.8 REDReSS:

Reorganisation, expansion, disposal, refurbishment, safety and security is the final stage of the information validation exercise which is used to capture any missing data and to sensitise the VM participants for the FA exercise (Kelly et al., 2004 p58). Moreover, it helps the client and the participants to focus on relevant issues and their associated problems (Male et al., 1998a pp55-56).

B.2.9 SWOT Analysis:

This is a general management technique and can be used at various stages in the workshop to evaluate a service or design by analysing its strengths, weaknesses, opportunities, and threats (Kelly et al., 2004 p307; Male et al., 1998a p56).

B.2.10 Value vs. Cost:

This technique aims to rank the identified functions in relation to their perceived value and their estimated cost (Male et al., 1998a p56).

B.2.11 Histogram of Cost:

In this technique, the project areas are costed, the histogram is drawn up and after that the Pareto rule is used to identify where to concentrate attention during the subsequent creativity stage. Furthermore, it is used to identify any mismatches by comparing the project with past similar projects (Male et al., 1998a p56).

B.3 The Tools and Techniques that are used in the Workshop Creativity Phase:

B.3.1 Brainstorming:

This is a very useful technique for producing a large number of ideas through a number of people who have background information about the project or the problem. Therefore, Kelly and Male (1993 p13) mentioned this technique as the most commonly used in the creativity phase. This is supported by Male et al. as they consider it the preferred technique in this phase because it is simple, effective, and only takes up a short time {roughly an hour}. However, they argue that generating ideas might create some risks which should be brainstormed, identified and explored through: grouping into law, medium and high; creating potential impact as low, medium and high; exploring interaction effects; explore response strategies for medium and high risks.

B.4 The Tools and Techniques that are used in the Workshop Evaluation Phase:

B.4.1 Silence Means "No":

It is used to eliminate the less feasible ideas. The idea of this technique is for the value manager to read out all ideas and to cancel those for which no one voices any support (Male et al., 1998a p58).

B.4.3 Coloured Dots:

In this technique each member will be given a certain number of coloured dots to place them on those options that he thinks are best. After that, the ideas that have a big number of dots will be recorded for development (Kelly et al., 2004 p360; Male et al., 1998a p58).

B.4.4 Championing:

Persons volunteer or are selected because of their suitability to be the champion of one or more ideas. This means they take the responsibility for seeing the idea through to its application or for justifying why it could not be applied. Therefore, championing has been made to raise the rate of implementation as persons are made responsible and accountable for their actions with regard to the idea{s} (Male et al., 1998a pp58-59).

B.4.5 Big Issues:

It is also known as the Pareto principle. It means that a small number of causes normally lead to a large number of outcomes (De Leeuw, 2001 p10). The ideas that have the biggest influence are

selected for implementation. This technique might be used with championing depending on the client choice and the availability of time (Male et al., 1998a p59).

B.5 The Tools and Techniques that are used in the Workshop Development Phase:

B.5.1 Establishment of Project Mission and Outline Specification:

In the pre-brief point, the passed ideas are audited against the project mission as realised through the function diagram to confirm the mission and take these ideas forward into an outline or approach specification for the project (Male et al., 1998a p59).

B.5.2 Life Cycle Costing {LCC}:

LCC is defined by BSI (1997 p5) as "*the cost of acquisition and ownership of a product over a defined period of its life cycle. It may include the cost of development, acquisition, user training, operation, support, removal from use and disposal of the product*". Therefore, LCC is a tool to establish the whole cost of ownership. It is a structured method that addresses all the components of this cost and could be used to provide a spend profile of the product over its anticipated life-span. The LCC analysis outputs could help the manager in the decision-making process if there is a product choice (H M Treasury, 1992 p1).

There is a relationship between VM and LCC which has emerged in some points as: both VE and LCC aim to achieve "value for money" as a primary objective; both VE and LCC aim to achieve value improvement during the design process; both VE and LCC are subsets of the quality plan. However, VE focuses on the benefits of realisation by reviewing the current design solutions from the value perspective, whereas LLC focuses on overall cost of ownership, from initial purchase through to final disposal and replacement. Thus LCC can be considered as part of the VE process (DEO(W): Defense Estate Organization (Works), 1996a p5). According to these and for the other reasons: both LLC and VE share a common method of analysis as well as there being a direct relationship between maintenance and capital costs, LCC should be integrated with the VE process (DEO(W): Defense Estate Organization (Works), 1996b p15) . However, LLC is considered as a significant part of VM (Merna, 2008a p17; Merna, 2002a p19; OGC, 2003h p7, 2003i, 2007j p9, 2007l).

Pasquire and Swaffield (2002 pp132-136) identified some techniques for LCC as: simple payback method; discounting methods such as discounted payback method, present cost, net present value, internal rate of return, benefit-cost ratio method and annual equivalent value; ranking and weighting techniques such as weighted evaluation technique, simulated multi-attribute rating technique and quality function deployment technique.

The costs which should be taken into account in LCC determination are: investment cost including; energy costs; non-energy operation and maintenance costs; components replacement; residual or terminal credits (Kelly and Male, 1993 pp101-102).

However, it is fair to say that LCC could take a long time and a lot of effort. Therefore, it is not always undertaken within the workshop (Male et al., 1998a p60).

B.6 The Outcomes from each Value Opportunity Points (Kelly et al., 2004 pp107-116; Male et al., 1998a pp29-31):

1. Strategic briefing study: point 1: the statement of the project mission; a build decision; the context of the project; the client value systems; organisational structures for the project delivery; overall scope and budget of the project; schedule; and an execution plan for the whole project.
2. Project briefing study: point 2: a summary of the relevant part of the strategic briefing document; the design aims; a specification of the project performance; the function and the activity of the client; the site information; the facility size; important targets for quality cost and time; and the procurement process.
3. Concept design study: point 3: a statement of the design direction; the procurement strategy; significant milestones; important performance indicators; significant risk; cost plan and budget in detail; the schedule for the activities; the outline drawing and specification for all systems; and the site layout and access.
4. Final sketch design study: point 4: a scheme design statement; an updated execution plan of the project; important milestones and targets; the measures of performance; site details; spaces and element dimensions; the specification of the environment system; further risks; the cost plan; and proposals of the facility maintenance and management.
5. Operation study: point 5: a statement of the design extent consistent with procurement route; the execution plan of the project; important milestones and targets; important performance indicators; a supply chain diagram; the project developments gates; and RM plan.

Appendix C: For Chapter 6:

11.1: Table C.1: Integration literatures about VM, RM, UM and ReqM {source: The Author}

No.	Authors and Year	Title	Integration approach
1	(Poynter-Brown et al., 1995)	Value and Risk Management: Looking to the Future.	The authors argue the importance of using VM and RM by the chartered surveyors.
2	(Kirk, 1995)	The Integration of Value Management and Risk Management.	He suggests a generic pattern to VM that involves the traditional job plan with an RM process which involves qualitative risk assessment, quantitative risk assessment, and risk response implementation. He provides the 'probabilistic estimating' concept by combining 'range estimating' and 'Monte Carlo Simulation' instead of traditional 'Deterministic estimating'. According to Chang and Liou (2005 p2), this practice provides better confidence to the decision-taker when calculating the project contingency.
3	(Haynes, 1996)	Value for Money Manual.	He integrates VM, RM, estimates and benchmarks and provides three models, one for new construction and the other two for maintenance projects.
4	(The Highways Agency, 1999)	Value for Money Easy Manual.	It is a short explanation of the principles of the value for money techniques set out in the value for money manual.
5	(H M Treasury, 1997)	No 2: Value for Money in Construction.	It produces a value for money approach, incorporating a series of management techniques which produce a model structure approach that should be used to plan and manage a project from its inception. It notes that this approach can be modified to fit the needs of individual departments and different procurement routes.
6	(Mootanah et al., 1998b)	A Strategy for Managing Project Risks in Value Management Studies.	They make a concentrated investigation on the interactive strategy for a VM and RM approach and they propose a possible interface. They develop a VM and RM integrated process to be applied at inception, feasibility, design, procurement, construction, completion and post-completion.
7	(Jergeas and Revay, 1999)	An Integrated Value Management Approach.	Describe the concept of integrating four concepts, which are: strategic alliances {partnering}, value engineering, risk management and constructability.
8	(Hiley and Paliokostas, 2001)	Value Management and Risk Management: an Examination of the Potential for their Integration and Acceptance as a Combined Management Tool in the UK Construction Industry.	Examine the potential to integrate VM and RM and the benefit that could occur through the use of such a combined tool.
9	(Heberden, 2002)	Brand Value Management: The Achilles' Heel of Many Risk Management Systems.	About the argument of using VM and RM in Brand Finance plc.
10	(Philips, 2002)	A Value and Risk Management Approach to Project Development.	He tries to include RM in each phase of a VM workshop: risk identification and start of risk register in information phase; identification of the potential means of addressing important risk in creativity phase; use of agreed criteria to evaluate the practicality of these possibilities and provide risk response strategies in evaluation phase; risk register is completed in development phase with the involvement risk response or contingency plan for each high risk. In addition, he states that it is important to monitor and review the risk register over time. Furthermore, he recommends that a more thorough risk assessment needs to be applied separately. He applies his integrated process at four project stages, which are strategic direction, concept definition, project management {design and construction} and system optimisation.
11	(Walker and	Construction Companion: Risk and Value	It is about managing VM and RM in construction projects over its life cycle. It considers risk

	Greenwood, 2002)	Management.	and value in project procurement; in project design; and in project construction.
12	(Day et al., 2003)	The Integration of Risk Management and Value Management.	It is an argument about the integration of VM and RM and the use of RM as a part of an evaluation option in the evaluation phase of VM.
13	(OGC, 2003h, 2007j)	Procurement Guide 04: Risk and Value Management.	It provides six key stages when applying VM and RM in government projects which are done prior to their gateway's review.
14	(Griffin, 2004)	Integrated Value and Risk Management: A Critical Analysis.	It provides a critical review of VM and RM and how they can be integrated and the reasons and the barriers for that.
15	(Kelly et al., 2004)	Value Management of Construction Projects {In Appendix 1}.	Offers three simple steps to integrate RM within VM.
16	(Beardsall, 2005)	Value, Risk and Uncertainty.	It is about how uncertainty can be expressed, and sets out a very simple method for calculating the resulting probability distribution for value.
17	(Othman, 2005)	Value and Risk Management Protocol for Dynamic Brief Development in Construction.	He provides an RM and VM protocol for managing a dynamic brief.
18	(Weatherhead et al., 2005)	Integrating Value and Risk in Construction.	They take a wider view by providing a toolkit which can be used for all projects and it is applied over the PLC of concept, feasibility, concept design, detailed design, construction, and operation.
19	(Dallas, 2006)	Value & Risk Management: a Guide to Best Practice.	He provides a model to integrate VM and RM at inception, strategy, feasibility, pre-construction, construction, use, as well as considering programme and strategic levels.
20	(Smith et al., 2006 pp36-56)	Risk and Value Management {Chapter 4} in Managing Risk in Construction Projects.	They provide a model to integrate VM and RM in the appraisal stage of the project.
21	(Afila and Smith, 2007)	Risk Management and Value Management in Project Appraisal.	They examine current industrial practice in project appraisals about using VM and RM.
22	(Bloore, downloaded 28/3/2007)	Risk & Value Management on Project: The Barriers to Integration.	He discusses the barrier to VM and RM integration.
23	(Green, access on 29/5/2008)	Towards an Integrated Script for Risk and Value Management.	He suggests that a coherent VM and RM integration script can be produced through 'strategic choice methodology' which replaces the 'value' and 'risk' language with the 'uncertainty' concept.
24	(Stoughton, access on 20/4/2010b pp1-2)	Uncertainty and Value Management - Part 2.	Also under the uncertainty banner, he tries to address both value and risk through an integrated model based on traditional value management processes which include: framing {pre-event and information stage}; initial analysis of uncertainty; range of alternatives for realisation {speculation}; analysis; development; evaluation and preferred alternatives; and presentation and decision.
25	(Smith and Male, 2007)	Risk, Value, Uncertainty and Requirements Management in Projects.	They discuss the argument for integrating VM, RM, UM and ReqM in the appraisal stage and after that, and they indicate that there is no comprehensive model bringing together these four concepts. However, this paper is the basis of this research.

11.2 Table C.2: VM, RM and ReqM processes comparison {sources: The Author}

Methodology / Process Features	VM	RM	ReqM
The process is considered a significant part of PM.	√ (Hiley and Paliokostas, 2001 p5)	√ (Haynes, 1996 p68; Hiley and Paliokostas, 2001 p5; Smith, 2008a p43)	√ (Zwikael and Tilchin, 2007 p50)
Needs a clear implementation plan.	√ (Dallas, 2006 p57; Kelly et al., 2004 p103)	√ (Dallas, 2006 p57; Hillson, 2002 p237; PMI, 2008 p276)	√ (Jonasson, 2008 p20)
The first activity is to gather information from several sources whether documents or stakeholders.	√ (Male et al., 1998b p40)	√ (Haynes, 1996 p74; Wood and Ellis, 2003a p26, 2003b p257)	√ (APM, 2006 p52; OGC, access on 21/5/2008 p1)
Starts with understanding the investment.	√ (Dallas, 2006 p57; Male et al., 1998b p40)	√ (Dallas, 2006 p57; Hillson, 2002 p236)	√ (Hooks and Farry, 2001 p37; Jonasson, 2008 p20; OGC, access on 21/5/2008 p1)
Needs stakeholder identification, analysis & key stakeholder involvement.	√ (Dallas, 2006 p57; Fernie et al., 2003 p360; Male et al., 1998a p32, 1998b p40)	√ (Dallas, 2006 p57; Merna, 2003 p114; Smith et al., 2006 pp194-195; Wood and Ellis, 2003b p257)	√ (Fernie et al., 2003 p356; OGC, access on 21/5/2008 p2)
The common use of existing team with external specialists when required particularly in UK.	√ (Kelly and Male, 2002 p85; Male et al., 1998b p34; Norton and McElligott, 1995 pp39-42)	√ (IRM, 2002 p5)	√ (OGC, access on 21/5/2008 p2)
The participants are selected by the client with help from the study manager, based on:	√ Test like the ACID one (Kelly et al., 2004 pp89-90)	√ Pre-defined criteria like ones provided by Godfrey (1996 p27)	√ Key stakeholders are identified as they are the main requirements source (Alexander and Stevens, 2002 pp16-17; Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1)
The preference of using an independent study manager.	√ (De Leeuw, 2001 p7; Kelly et al., 2004 p92; Male, 2008b p36)	√ (Godfrey, 1996 p26; Smith et al., 2006 p232)	-
Should have a preparation stage.	√ (Dallas, 2006 p57; Kelly et al., 2004 p123)	√ (Dallas, 2006 p57)	√ (Hooks and Farry, 2001 p37; Jonasson, 2008 p20; OGC, access on 21/5/2008 p1)
Have pre-workshop, workshop and post-workshop stage.	√ (Hannan, 1994 p1; Hiley and Paliokostas, 2001 p3; Male et al., 2005 p12)	√ (Wood and Ellis, 2003a pp24-25)	-Nothing mentioned about that particularly but as it has a workshop (Alexander and Stevens, 2002 pp16-17; Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1), logically there should be pre and post workshops for preparation and change control respectively
The pre-workshop stage for the process consists of:	√ Similar activities (Mootanah et al., 1998b pp269-272)	√ Similar activities (Mootanah et al., 1998b pp269-272)	-Nothing mentioned about that particularly but there should be some similar activities like appointment of the study manager, selecting the participant and preparation (Hooks and Farry, 2001 p37; Jonasson, 2008 p20; OGC, access on 21/5/2008 p1)
Group activities depend on	√ (Hiley and Paliokostas, 2001 p5; SAVE	√ (Hiley and Paliokostas, 2001 p5)	√ Mainly for requirements identification

systematic procedures and utilise multidisciplinary teams in workshop.	International, 2006 p5)		(Alexander and Stevens, 2002 pp16-17; Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1)
Needs creative thinking.	√ VM requires creativity when generating value alternatives that meet required functions (Ellis et al., 2005 p487; Hiley and Paliokostas, 2001 p5)	√ RM needs creativity in order to identify appropriate responses to deal with potential risks (Hiley and Paliokostas, 2001 p5; Wideman, 1992 pI.2)	-
The use of workshop is mainly for:	√ Information gathering, ideas generation, evaluation and maybe some idea development (Kelly et al., 2004 p126; Male et al., 2005 p12)	√ Introduction, identification, qualitative assessment, and quantitative assessment (Haynes, 1996 p85)	√ Requirements identification (Alexander and Stevens, 2002 pp16-17; Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1)
Needs to report the outcomes.	√ (Dallas, 2006 p57; Hammersley, 2002 p5; Male et al., 1998a p61)	√ (Dallas, 2006 p57; IRM, 2002 p9)	√ (Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1)
Needs monitoring & change controlling.	√ (Dallas, 2006 p57; SAVE International, 1998 p3, 2006 p18)	√ (Chapman, downloaded on 24/2/2008 p217; Dallas, 2006 p57; Hillson, 2002 p239)	√ (APM, 2006 pp52-53; Fernie et al., 2003 p360)
The outcomes from each process:	√ Being intimately related and interdependent (Godfrey, 1996 p12)	√ Being intimately related and interdependent (Godfrey, 1996 p12)	√ Being intimately related and interdependent (Merna, 2003 p114; OGC, 2007j p8; Smith et al., 2006 pp194-195)

11.3 **Table C.3: VM, RM and ReqM tools and techniques comparison {sources: The Author}**

Methodology / T&T	VM	RM	ReqM
The use of information gathering techniques like interviews, questionnaires and documents.	√ Are similar (Kelly et al., 2004 pp281-289)	√ Are similar (Kwakye, 1997 p43; PMI, 2008 p274)	√ Are similar (Alexander and Stevens, 2002 pp16-54; Fernie et al., 2003 p357; Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1)
The use of ideas generation techniques like brainstorming.	√ Are similar (Hiley and Paliokostas, 2001 p5)	√ Are similar (Hiley and Paliokostas, 2001 p5)	√ Are similar (Alexander and Stevens, 2002 pp16-54; Hickey and Davis, 2004 p67; OGC, access on 21/5/2008 p1)
The use of prioritising techniques like coloured dots.	√ Are similar (Kelly et al., 2004 p360; Male et al., 1998a p58)	√ Are similar (PMI, 2008 p274)	√ Are similar (Jonasson, 2008 p173)
The use of SWOT analysis.	√ Are similar (Griffin, 2004 p93)	√ Are similar (Griffin, 2004 p93)	-
The use of function diagramming and matrices.	√ (Gronqvist et al., 2006 p11; Kelly et al., 2004 pp60-70)	-	√ (Fernie et al., 2003 p357; Jonasson, 2008 p173)
The use of specialist techniques.	In ideas developments, LCC (Male et al., 1998a p60)	In quantitative analysis, expected monetary value, expected net present value, sensitivity analysis and decision analysis (Baker et al., 1999a p94)	In requirements analysis, things like paper prototypes to operating prototypes which involve diagramming, software modelling, simulations and mockups (Hooks and Farry, 2001 p39)
The use of specialist software:	-	√ Commonly ARM (STG: Strategic Thought Group, 2010 pp3-4)	√ Commonly DOORS (Alexander, 2004 p1; IBM, access on 29/4/2010 p1; Volere, access on 3/2/2011)

11.4: Table C.4: VM, RM and ReqM interventions comparison {sources: The Author}

Methodology / Interventions	VM	RM	ReqM
Should be applied over the PLC but for different focuses.	√ (Dallas, 2006 p34)	√ (Dallas, 2006 p34; Merna, 2003 p110; Smith, 2003a p4)	√ (Zwikael and Tilchin, 2007 p51)
It is already used across PLC.	√ (Dallas and Clackworthy, 2010b p7)	√ (Wood and Ellis, 2003b p254)	√ (Dick, 2004 p4; Halbleib, 2004 p10)
Early application will provide better results and later ones will cost more.	√ (Dallas, 2006 p59; Hiley and Paliokostas, 2001 p3; Phillips, 2002 p72)	√ (Dallas, 2006 p59; Phillips, 2002 p72; Wood and Ellis, 2003b p257)	√ (Alexander and Stevens, 2002 p1; Hooks and Farry, 2001 p7)
Should be applied at different organisation levels {strategy, portfolio, programmes and projects} but for different focuses.	√ (BSI, 2000b p6; Dallas and Clackworthy, 2010a p8, 2010b p7)	√ (Merna, 2003 p115; OGC, 2007x pp65-82)	√ Nothing mentioned exactly but ReqM should be applied to properly identify and manage stakeholders and their requirements at each level and phase to feed other processes like RM (Merna, 2003 p114; Smith et al., 2006 pp194-195; Son et al., 2010 p279)
It is already used at different organisation levels.	√ (Afila and Smith, 2007 p63; Dallas and Clackworthy, 2010b p7)	-	-

11.5: Table C.5: Grouping of skills and features of the study managers for the integration approach {sources: the Author}

Skills	Grouping
Commanding respect (Dallas, 2006 pp103-105). Positive attitude (Dallas, 2006 pp103-105). Humility (Dallas, 2006 pp103-105). *Impartiality {Findings-all VM,RM, ReqM}.*	Moral and ethical
Challenge assumptions about needs and manners (Connaughton and Green, 1996 p54). Experienced (Male et al., 1998b p36). Having appropriate training in the VM process and its associated tools and techniques (Male et al., 1998b p36). Qualifications (Dallas, 2006 pp103-105). Experience (Dallas, 2006 pp103-105). Trained in VM and RM (Weatherhead et al., 2005 p17). Familiar with the process and techniques (Weatherhead et al., 2005 p17). *Inclusive {Findings-all VM, RM, ReqM}. Perseverance {Findings-all VM, RM, ReqM}. Can apply a structured approach {Findings-all VM,RM, ReqM}.*	Necessary qualifications, training and experience
Understand the project's relationship to the customer's organisational and strategic policy (BRE: Building Research Establishment, 2000 p3). Understand the project (BRE: Building Research Establishment, 2000 p3). Business knowledge (Jonasson, 2008 pp20-29). Industrial knowledge {e.g. IT, construction etc} (Jonasson, 2008 pp20-29). Questioning skills/systems thinking and logic (Jonasson, 2008 pp20-29). *Understanding people in terms of their reaction to risks {Findings-RM}.*	Required knowledge and understanding
Deal with organisational politics and hidden agendas (BRE: Building Research Establishment, 2000 p3). Independent, whether external to the organisation or in-house but not directly participating with the project (Male et al., 1998b p36). Independent (Godfrey, 1996 p26). Provide control of team members (Godfrey, 1996 p26). Prompting and guiding sessions (Godfrey, 1996 p26). Independency from the scheme (The Highways Agency, 1999 p14).	Independency from the scheme under review
Ability to adapt (Dallas, 2006 pp103-105). *Resilience {Findings-all VM, RM, ReqM}.*	Flexibility
Evaluate complex problems (BRE: Building Research Establishment, 2000 p3). Analytical skills (Jonasson, 2008 pp20-29).	Evaluation skills
Encourage innovation (BRE: Building Research Establishment, 2000 p3). Motivate project participants towards accomplishing the project goals (Connaughton and Green, 1996 p54). Produce authoritative leadership (Connaughton and Green, 1996 p54). Having a variety of management skills, particularly in human dynamics and team management (Male et al., 1998b p36). Having leadership quality (Male et al., 1998b p36). Decision-making (Jonasson, 2008 pp20-29). Negotiation (Jonasson, 2008 pp20-29). Escalation skills (Jonasson, 2008 pp20-29). Leadership skills (Jonasson, 2008 pp20-29). Leadership skills (Dallas, 2006 pp103-105). Objectivity (Dallas, 2006 pp103-105). *Courage {Findings-all VM, RM, ReqM}.*	Leadership and management skills
Manage the team (BRE: Building Research Establishment, 2000 p3). Secure the confidence of workshop attendees and senior managers (BRE: Building Research Establishment, 2000 p3). Organise and facilitate workshops and brainstorming sessions (Connaughton and Green, 1996 p54). Conflict resolution (Jonasson, 2008 pp20-29). Facilitation skills (Dallas, 2006 pp103-105). *Good at summarising {Findings-all VM, RM, ReqM}. Diplomat {Findings-all VM, RM, ReqM}.*	Facilitation skills
Communicate with both technical and lay project team members (Connaughton and Green, 1996 p54). Meeting and presentation skills (Jonasson, 2008 pp20-29).	Communication skills
Should be more creative, organisational and motivational than technical (Dell'Isola, 1997 p64). *Able to understand technical concepts {Findings-all VM, RM, ReqM}.*	Some technical and engineering background {mainly in the later stages of the PLC}

Appendix D: For Chapter 7:

D.1 The Case Study Protocol {adapted from (Woodhead, 1999 pp327-344; Yin, 2003 pp67-77)}:

❖ Overview of the Research Project:

The research aims, the research objectives, scope and limitations and the adopted research methodology have been highlighted in the introduction and the research methodology chapters.

❖ Field Procedures:

- The data collection stages:
  - Several stages have been planned as follows:
    - Gaining access: the following steps were used as necessary:
      - Identify subject by phone/email to the interviewee, his/her secretary or company's reception.
      - Ask for the interviewee's email or mail address.
      - Send out formal illustrative letter/email from the research supervisor with formal letter to the interviewee.
      - Contact to arrange a meeting.
      - Send out information pack before the meeting.
    - Conducting interview.
- Expected preparation prior to site visits → identifies specific documents to be reviewed and where they can be accessed, for example:
  - Review this protocol.
  - Review the conceptual models.
  - Review some important aspects regarding interview {see (Dawson, 2007 pp67-78; Denscombe, 2007 pp190-196; Swetnam, 2004 pp64-69; Valenzuela and Shrivastava, downloaded on 2/7/2007 pp10-15)}.
  - Be familiar with the interview schedule and questions.
- Eventualities preparation {providing for unanticipated events, including changes in the availability of interviewees as well as changes in the mood and motivation of the case study investigator}. The interviews are structured as follows to adapt to unexpected events:
  - If the interview is cancelled early:
    - Another one would be arranged if possible OR a questionnaire with a cover note would be handed or sent, followed by a telephone call to ensure everything is OK and a date for its return would be arranged.
  - If the interview is cancelled at the last moment:

- A questionnaire with a cover note would be left, followed by a telephone call to ensure everything is OK and a date for its return would be arranged.

  - If the interview duration is 15 minutes:
    - A questionnaire with cover note would be handed to the interviewee. A date for its return would be discussed. The remaining time would be used to identify other actors within the organisation. This conversation would be tape recorded after asking for permission, in addition to note recording.
  - If the interview duration is 30 minutes:
    - Firstly, as many questions as possible should be asked and then a questionnaire of the remaining questions with cover note would be handed to the interviewee and a date for its return would be discussed. This conversation would be tape recorded after asking for permission, in addition to note recording.
  - If the interview duration is 1 hour:
    - Firstly, as many questions as possible should be asked and if necessary, a questionnaire of the remaining questions with cover note would be handed to the interviewee and a date for its return would be discussed. This conversation would be tape recorded after asking for permission, in addition to note recording.
  - If the interview duration is 1:30-2 hours:
    - Ask all questions. This conversation would be tape recorded after asking for permission, in addition to note recording.

- Typical sources of evidence that were asked for are as follows:
  - Letters, memoranda and other communiqués.
  - Agendas, announcement and minutes of meetings, and other written reports of events such VM and RM reports.
  - Administrative documents - proposals, calculations, progress reports and other internal documents.
- Having sufficient resources while in the field as follows:
  - Enough money for transport, coping, etc.
  - Mobile.
  - Laptop with backup storage device.
  - Empty flash memory with enough space.
  - Audio recorder with enough batteries.
  - Writing instruments such as pens, pencils and erasers.
  - Field notes, papers, papers clips and several pre-labelled {addressed} A4 envelopes.
  - The researcher's business cards.

- The {interview schedule and questions}.

➢ Developing a procedure for calling for assistance and guidance, if needed, from supervisors or colleagues as shown in Table D.1:

11.6 Table D.1: Some contacts for assistance and guidance

	Name	Work tell	Email	Mobile
Supervisors	Supervisor 1	0113XXXXXXX	supervisor 1@leeds.ac.uk	07XXXXXXXXX
	Supervisor 2	0113XXXXXXX	supervisor 1@leeds.ac.uk	07XXXXXXXXX
Colleagues	Colleague 1	0113XXXXXXX	Colleague 1@leeds.ac.uk	07XXXXXXXXX
	Colleague 2	0113XXXXXXX	Colleague 2@leeds.ac.uk	07XXXXXXXXX

➢ Name of sites to be visited, including persons' contacts.

➢ Data Collection plan {covers the calendar period for the site visits, the amount of time to be used for each visit, and the level of effort to do each case study}. Making a clear schedule of data collection activities that were expected to be completed within specified periods of time.

➢ Field data verification:

- After the answers have been gained from the interviewee, the data was transcribed and written. Then, were verified by the respondent as a 'true and fair account' or by review and comments whichever he/she preferred.
- The investigator was building verification as a series of iterative stages where bias is aired and the respondents are asked to either confirm or deny the validity of the certain vision of reality being presented.

❖ Case Study Questions:

➢ Level 1: questions to be asked to interviewees: all interviewees were asked similar questions depending on the meeting time and discussion which are as follows:

General Information:

From the literature it is found that there are some questions which should be asked in order to know the right background information about the respondents and their organisations. These questions are as follows:

- **{From piloting}** Can you briefly describe your role within the organisation as well as other experiences?
  - As indicated in the literatures, within a qualitative approach, small purposive samples are required and should be seen to provide the most valuable data. Therefore:

- The expected outcome from this question is an overview about the interviewee's role and experiences. This is to know his knowledge, how he/she works within the organisation and how he/she should be asked questions.

- How long have you been involved with the construction industry?
  - According to Denscombe (2007 p17), in the purposive sampling {which is the case of this research}, the targeted organisations and their practitioners should be chosen mainly because they can provide the most valuable data and therefore they should have experience in construction. Therefore:
  - The expected outcome from this question is the duration of being involved with construction. This is to know the real experience within the construction industry.
- How long has your organisation been involved with the construction industry?
  - Same as the previous one but for the organisations.

Organisation Levels and the Investment Processes:

From the literature about project management, there are four levels in the appraisal stage which are strategic, portfolio; programme and project which should be investigated to know where essentially to integrate VM, RM and ReqM.

- What is your organisation investment process?
  - The literatures indicate the importance of the investment process in the appraisal stage. Therefore:
  - The expected outcome from this question is to know about the investment process of the organisation.
- What are your definitions of portfolio and programme?
  - Different literatures provide different definitions for portfolio and programme, some of them consider both to be the same while the majority do not. So this question is to investigate these in practice. Therefore:
  - The expected outcome from this question is to know how the organisation defines portfolio and programme.
- Do you use portfolio and programme management and if so how do you use them?
  - To investigate the appraisal stage we need to know the application of portfolio and programme in practice as from the literatures it is found that a different company might use them in different way. Therefore:
  - The expected outcome from this question is to know how the organisation uses portfolio and programme.
- **{Prop Q-From piloting}** If they are not used – do you think they should be used? Why? And how do you think they can be used?

- This is a prop question to know the interviewee's opinion if the organisation does not use portfolio and programme.
- The expected outcome from this question is to know how portfolio and programme should be used and why?

- **{From RESP06}** How do you structure your portfolio and programme {top-down or bottom-up}{show the figures}?
  - There are two approaches to structure portfolio and programme: top-down {programme coming from portfolio and then project coming from programme} or bottom-up {projects coming from strategy and then group to programmes and then programmes group to portfolio}.
  - The expected outcome from this question is to know which approach is being used by the organisation.
- How do you link between the four levels {strategy, portfolio, programme and project} {show the figures}?
  - The organisational levels diagram {Figure 6.4} indicates how the main literatures link between these four levels and this question is to know whether or not they are linked in the same way in practice. Therefore:
  - The expected outcome from this question is to know the relationships between strategy, portfolio, programme and project in the organisation.
- What is the skills profile which is needed to manage at each level?
  - The literature indicates some key roles to manage organisation levels and this question is used to investigate their skills profile.
  - The expected outcome from this question is to know the required skills for the Board, portfolio manager, programme manager, and sponsor.

Applications of VM, RM, and ReqM:

The following group of questions is used to explore the organisation approaches for value management, risk management, and requirements management within the different organisation levels.

- What do you understand by value management, risk management, and requirements management studies?
  - The literature indicated that there are different views on the VM, RM, and ReqM studies and therefore:
  - The expected outcome from this question is to know how the organisation understands them.

- Do you use value management, risk management, and requirements management studies and if so for how long?
  - In this research, the researcher is investigating the above methodologies and therefore he should know whether they are used or not by the targeted organisation. Therefore:
  - The expected outcome from this question is to know whether the organisation uses VM, RM, and ReqM studies or not and if they use them, the researcher needs to know for how long. This will give an indication of which ones are used and for what period.
- In which level do you usually apply value management, risk management, and requirements management studies? Why? How? Which is first and why? Are they integrated and why and how?
  - There may be a chance that an organisation does not apply these methodologies for the most important level and this question is to investigate that. Therefore:
  - The expected outcome from this question is to know in which level does the organisation apply VM, RM, and ReqM studies and for what reasons.
- Which levels do you think are similar, in which value management, risk management, and requirements management studies can be used similarly for them? And why?
  - The literatures are unclear about the similarities among the organisation levels and according to the time limitation of this research it is impossible to produce a model for each level and therefore, one model should be produced for the similar levels and this question is to investigate if there are similarities among the levels. Therefore:
  - The expected outcome from this question is to know the similar level {if any} in which VM, RM, and ReqM studies can be used in a general way for all of them as well as the reasons for these similarities.
- Which level do you think is the most important level for using value management, risk management, and requirements management studies? And why?
  - The most important one should be investigated as if there are no similarities between the different organisation levels, the model should be developed to the most important one.
  - The expected outcome from this question is to know the most important level to use VM, RM, and ReqM studies as well as the reasons for this importance.

VM, RM and ReqM study managers and participants:

The literatures indicate that study managers skills and participants should be considered for the studies and they should be investigated as follows:

- What are the skills and features that are needed for the study leader for value management, risk management, and requirements management OR integrated studies? And is he internal or external?
  - Several literatures indicate the skills and features that are needed for the study leader for the above methodologies and the conceptual approach considered the need of them but they should be investigated in practice through this question. Therefore:
  - The expected outcomes from this question are some important skills that are needed to lead the VM, RM, and ReqM OR integrated studies such as presentation and leading skills. Furthermore, to know if he is internal or external.
- Who are the key people that should participate in value management, risk management, and requirements management OR integrated studies and is it an internal or external team?
  - The conceptual approach has considered that the presence of some people is essential but this should be investigated in practice through this question. Therefore:
  - The expected outcomes from this question are to identify the key people that should participate in the study and whether to use the internal or external team.

VM, RM and ReqM integration:

The following group of questions is used to explore the organisation approaches for integrating value management, risk management, and requirements management as well as the reason for integrating or not integrating these methodologies.

- Do you integrate value management, risk management, and requirements management OR use them separately? Why? How? Which one first and why?
  - In this research the way of managing the above methodologies are investigated. However, the literature covered the theoretical approaches of managing them and this question is to know in practice whether they are integrated or not and how. Therefore:
  - The expected outcome from this question is to know the practical approach of integrating VM, RM, and ReqM in the organisation or the approach of using them separately if they are not integrated.

- **{Prop Q-From piloting}** If they are not integrated – do you think they should be integrated? Why? And how do you think they can be integrated?
  - This is a prop question to know the interviewee's opinion if the organisation does not integrate VM, RM, and ReqM.
  - The expected outcome from this question is to know if VM, RM, and ReqM should be integrated and how.

<u>If there is time → Continue</u>

- Can we discuss your views on the ideas behind the research using the diagrams and the studies table and how these can be implemented in your organisation or other organisations?
  - As indicated earlier, the conceptual approach was build from the literature. Therefore:
  - The expected outcome from this question is to gain a deep understanding of the interviewee's viewpoint on the ideas behind the research and how these can be implemented in his organisation or other organisations.

<u>If there is time → Continue</u>

<u>Early VM Process:</u>

The VM stages will be investigated. This is mainly because from the literature review of VM, RM and ReqM as well as according to Smith and Male (2007 pp5-6) VM can accommodate other techniques like RM and ReqM. However, the investigation consists of the three stages of VM as follows:

Pre-study {pre-workshop/orientation and diagnostic} Stage:

- At this stage, do you mainly collect information; identify key stakeholders, scheme objectives and constraints; hold pre-workshop meetings; and set the workshop scope and agenda?
  - The literature emphasis on the importance of these five activities for preparation and this question is used to investigate and confirm that.
  - The expected outcomes from this question are to know if these activities are being used or not in practice in the VM
- Do you gather information at this stage about requirements, risks and uncertainty? Why?
  - The literature of VM indicates that a lot of information should be gathered in this stage and this question is used to investigate that as well as its reasons. Therefore:
  - The expected outcomes from this question are to know what information should be gathered at this stage; and for what purposes?

- Do you identify the change procedures and control of VM, RM and ReqM changes at this stage? How?
  - The literature of VM indicates that the change procedures might be indentified in this stage and this question is used to investigate that as well as its reasons and approaches. Therefore:
  - The expected outcomes from this question are to know the approach for identifying the change procedures and control of VM, RM and ReqM changes.
- What other main activities or techniques do you use in the pre-workshop?
  - The literature of VM indicates that there are other activities and techniques that might be used in this stage and this question is used to investigate that. Therefore:
  - The expected outcomes from this question are to know any other activities than those mentioned in the previous questions.

Study Stage {usually workshop}:

- Do you use workshop{s} for value management, risk management, and requirements management OR integrated studies? How long these workshops last for?
  - According to the literature there are several trends to avoid using the workshop as indicated in Kelly and Male (2002 p80) and this question is used to investigate this in practice. Moreover, VM and RM workshops' durations are indicated in the literature for project levels but needs to be confirmed for all levels. Also, nothing mentioned in the literature about the duration of ReqM workshop and this should be also investigated.
  - The expected outcome from this question is to know if the organisation uses workshop{s} for VM, RM, and ReqM OR integrated studies and for what durations.
- Do you identify requirements in the information phase of the value management study? And how?
  - According to VM literature, requirements and functions should be identified in this phase and this question is used to investigate that in practice. Therefore:
  - The expected outcome from this question is to know if the organisation identifies requirements in the information phase of the VM study.
- Do you identify risks associated with each option in the creativity phase of the value management study?
  - According to Male et al. (1998a p58) as well as Smith and Male (2007 pp5-6) risk associated with each option should be identified and this question is used to investigate that in practice. Therefore:

- The expected outcome from this question is to know if the organisation identifies risks associated with each option in the creativity phase of the VM study.

- Do you assess qualitatively the risks associated with options in the evaluation phase of the value management study?
  - According to Smith and Male (2007 pp5-6) risk associated with options might be assessed qualitatively in the evaluation phase of the VM study and this question is used to investigate that in practice. Therefore:
  - The expected outcome from this question is to know if the organisation assesses qualitatively the risk associated with options in the evaluation phase of the VM study.
- Do you assess risks quantitatively and/or mitigating them in the development phase of the value management study?
  - According to Smith and Male (2007 pp5-6) risk associated with options might be quantitative analysis and/or mitigated in the development phase which may be some inside and some outside the workshop and this question is used to investigate that in practice. Therefore:
  - The expected outcome from this question is to know if the organisation assesses risks quantitatively in the development phase of the VM study.
- Do you conduct the development phase of the value management study during OR after/outside the workshop and why if it is after/outside?
  - According to Kelly and Male (2002 p81), in the UK this phase is often conducted outside the workshop and this question is used to investigate this in practice. Therefore:
  - The expected outcome from this question is to know when and why the organisation conducts the development phase of the VM study.
- What things do you include in the value management report?
  - The VM literature indicates several things to be included in the VM report and this question is used to investigate them and their purpose in practice. Therefore:
  - The expected outcome from this question is to know which things that the organisation normally includes in the VM report.

Post-study Stage {Implementation}:

- What are the main activities in this stage? And how long it takes?
  - The VM literature indicates some activities in this stage and this question is used to investigate them in practice. Therefore:

- The expected outcomes from this question are to know which activities that the organisation normally uses in the implementation stage of the VM study and the duration of this stage.

  - Are there any documents or data sources that could be useful for this research? And how can I get them?
  - Are there any other persons that could be useful to interview?
    - The expected outcomes from these questions are an indication to some persons and documents if any can produce useful information or data for the research.
  - Would you like to add any other things?
    - The expected outcome from this question is to give any additional things from the respondent that he thinks are useful.

- Level 2: questions to be asked through the individual case: These questions are as follows:
  - What is the organisation history?
    - As indicated earlier it is important to know about the targeted organisations that are used as case studies and this question is used to remember that while collecting and analysing the data of each case. Therefore:
    - The expected outcome from this question is background information about each organisation.
  - What are the organisation levels and how are they related together?
    - As indicated earlier it is important to investigate the organisation levels of the targeted organisations that are used as case studies and this question is used to remember that while collecting and analysing the data of each case. Therefore:
    - The expected outcome from this question is to understand the organisation structure of each organisation.
  - How and when does the organisation apply VM, RM and ReqM OR the integrated studies?
    - The literature indicate the timings and approaches of using the above methodologies but does not indicate a specific time and a general approach to them as well as to the integration between them, and this question is used to remember that while collecting and analysing the data of each case. Therefore:
    - The expected outcome from this question is to know the timing and the process of using VM, RM, and ReqM in each organisation.
  - What are the study's inputs?
    - The literature indicates these issues in a general way and this question is used to remember that while collecting and analysing the data of each case. Therefore:

- The expected outcome from this question is to know the inputs that are required for the study.

▪ What are the different VM stages and their activities?

- The literature indicates the above issues but they need more investigation to know if VM accommodates RM and ReqM issues in practice.
- The expected outcome from this question is to understand the application of VM and if it accommodates RM and ReqM.

➢ Level 3: questions to be asked through the combination of the cases.

▪ How and when can VM, RM and ReqM be managed?

- The literature indicates these issues in a general way and this question is used to investigate exactly the best way and time of managing the above methodologies when conducting the cross case comparison.
- The expected outcome from this question is to understand and know the timing and the process of managing VM, RM and ReqM in practice.

❖ Outline of Case Study Report:

➢ The research audience:

▪ Thesis committee

- Examine previous case study reports {theses} that have been successfully communicated with this audience {thesis committee}.
- For a thesis committee, mastery of the research methodology and theoretical issues with an indication of the care with which the study was carried out is significant.

➢ Formats for written case study reports:

▪ Issues as cross-case analysis {multiple cases only}:

- Issues.
- All response to these issues.
- Discussion from the researcher if needed.

➢ Illustrative structures for case study compositions:

▪ Linear-analytic structure.

- Introduction to issue or problem being studied.
- Review of relevant prior literature.
- Conceptual approach.
- The adopted research methodology.
- The findings from data collection and analysis.
- The discussion of findings with literature and the research approach.
- The conclusion and recommendations.

Illustrative Letter/email:

Dear Mr. X

We are undertaking a research study at the University of Leeds that is focused on Managing Value, Risk and Requirements in the Appraisal Stage of UK Projects and Programmes. This is part of an ongoing series of studies in this area, including recent work completed by myself for the Office of Government Commerce and Commission for Architecture and the Built Environment. The current research study is being conducted by Ehab Mlybari and is supervised by myself. Please find attached a letter providing additional information.

I would be grateful if he could discuss with you in confidence how your company approaches projects and programmes. The discussion would take about an hour. If you are in agreement, Ehab will contact you directly to arrange an interview at your offices at a time convenient to yourself. His email address is {the researcher@leeds.ac.uk}

Please do not hesitate to contact me on my mobile {07XXXXXXXXX} if you would like to discuss the research in more detail. I can also be contacted on my email {supervisor@leeds.ac.uk}.

Kind regards,

Steven Male

Formal Letter:

School of Civil Engineering
The University of Leeds
Leeds LS2 9JT

Tel: + 44 113 Direct Line
Tel: + 44 113 Secretary
Fax: + 44 113 Direct
Fax: + 44 113 General Office

Mobile:

Mr. X
Head of Project Management
X Street
London

DD/MM/YYYY
Dear Mr X
Subject: ***Managing Value, Requirements and Risk in the Appraisal Stage of UK Construction Projects.***

We are undertaking a research study at the University of Leeds that is focused on Managing Value, Risk and Requirements in the Appraisal Stage of UK Projects and Programmes. This is part of an ongoing series of studies in this area, including recent work completed by myself for the Office of Government Commerce and Commission for Architecture and the Built Environment. The current research study is being conducted by Ehab Mlybari and is supervised by myself.

Ultimately, by means of interviews and a case study approach, we are hoping to identify and document answers as to how value management {VM}, risk management {RM} and requirements management {ReqM} can be managed in the appraisal stage of projects, whether they stand alone, or, are also undertaken within programmes and portfolios of projects. We are hoping to establish a

methodology and a series of models that would increase confidence in decision-making under uncertain conditions as well as increase value for money.

I would be grateful if he could discuss with you in confidence how your company approaches projects and programmes. The discussion would take about an hour.

If you are in agreement, Ehab will contact you directly to arrange an interview at your offices at a time convenient to yourself. His email address is {the researcher@leeds.ac.uk}.

The outcomes of the research will be presented in a generic format and would not be attributable to any individual or organisation. To ensure any concerns over confidentiality are taken account of as part of the interview fieldwork process, the University of Leeds has a confidentiality agreement available if required.

We would also be pleased to discuss the generic outcomes of the research with you once the study is completed, and, intend to hold a workshop and also seminar on the outcome of the research when the fieldwork is complete. We would be very pleased if you could attend. Information will be forwarded in due course.

Please do not hesitate to contact me on my mobile {07XXXXXXXXX} if you would like to discuss the research in more detail. I can also be contacted on my email {supervisor@leeds.ac.uk}

Yours Sincerely,

Professor Steven Male

Professor of Property & Infrastructure Asset Management
Institute for Resilient Infrastructure

Reminder letter/email:

Date: DD/MM/YYYY

Ref: Letter/email Type

Mr. X.
Estates Manager,
Major Client Plc.,
20 X Street,
London W1.

Re: Managing Value, Requirements and Risk in the Appraisal Stage of UK Construction Projects.

Dear Mr. X,

My supervisor's letter/email of ***DATE*** requested permission to conduct a case study exploration within your organisation as part of a research project.

I am writing to enquire if you have made a decision as to whether your organisation will be able to support this research initiative.

I look forward to hearing from you.

Yours sincerely,

Ehab Mlybari.
07XXXXXXXXX
the researcher@leeds.ac.uk

Polite acknowledgment letter/email:

Date: 01/01/2009

Ref: Letter Type

Mr. X
Estates Manager,
Major Client Plc.,
20 Big Street,
London W1.

Re: Managing Value, Requirements and Risk in the Appraisal Stage of UK Construction Projects.

Dear Mr. X,

Thank you for your letter/email of ***DATE***. I am sorry you will be unable to take part in this research project as your organisation would have made a valuable contribution.

May I take this opportunity of wishing you and your organisation further success in the future.

Yours sincerely,

Ehab Mlybari.
07XXXXXXXXX
cn06eam@leeds.ac.uk

Interview meeting arrangement:

This will be by telephone/email.

I will arrive at least 30 minutes before the meeting.

Time of the meeting:…….

Date of the meeting:……..

Location of the meeting:……...

Meeting length:…….

{If the opportunity presents itself, the researcher asked for either the first meeting of the morning or the afternoon. This lessened the chances of other meetings eroding his time available}.

Case Study Information Pack:

Study Title: Managing Value, Requirements and Risk in the Appraisal Stage of UK Construction Projects.

Dear,

The School of Civil Engineering at The University of Leeds is conducting an ongoing series of studies about how we can manage value, risk, uncertainty, requirements in the appraisal stage of UK construction projects.

The literature review as well as the recently published paper by Smith and Male (2007) about "Risk, Value, Uncertainty and Requirements Management in Projects" highlighted that there is no attempt to provide a comprehensive approach to integrate the concepts, methodology, timing, tools and techniques which exist within value management {VM}, risk management {RM} and requirements management {ReqM} and this needs further investigation.

The team, headed by Professor Steven Male, has conducted numerous funded research projects in the area of Value Management and Value Engineering, Programme and Project Management, and Asset Management, for the Royal Institution of Chartered Surveyors, the Office of Government Commerce, the Commission for Architecture in the Built Environment and also the Environment Agency. This also includes studies for many large Industrial and Commercial clients by applying the principles of Value Management at various stages of the project life cycle, and writing commissioned reports.

The objective of the current study is to contact a number of targeted organisations from similar markets who are regular procurers of construction work. The aim is to determine how each organisation manages those four concepts in the appraisal stage in order to develop a better understanding of this process and to generate a approach that can help decision-making and increase value for money. The following is brief information about the research and the interview's questions:

Introduction:

Nowadays, the UK construction industry is one of the most important sectors due to its size; outputs; and contribution in the achievement of government's social and environmental goals. However, there are several problems with it especially in decision-making under uncertainty which is significant in the appraisal stage {inception or pre-brief to sanction}. Therefore, this research may enhance decision-making under uncertain conditions as well as increase value for money through its aim and objectives.

Aim:

This research aims to investigate the application of VM, ReqM and RM and their integration within the appraisal stage of UK construction projects at different organisational levels to enhance

decision-making under uncertainty and manage the organisational value chain which improves performance and organisational value.

Scope of the research:

This study will be based on literature as well as fieldwork. Fieldwork is limited to UK projects; the construction industry; and appraisal stage.

Methodology:

Briefly, the researcher will make a pilot study with one to two organisations to scope the work and validate the questions through semi-structured interviews. Then, he will conduct the main study with three to four other organisations to develop his approach through the understanding of their approaches of VM, RM, ReqM within project, programme and portfolio. Regarding the recording approach, it is planned to use field notes as well as audio recording. However, all recordings will be destroyed at the end of the research.

Verification Process:

On completion of each interview, a transcription of the interview will be forwarded to the interviewee for further comment.

Confidentiality:

Information gathered for the study will be treated in the strictest confidence, will be presented in the form of a generic model and will be anonymous. We will be pleased to provide collaborating organisations with details of the study's findings.

Key definitions through the research context:

List the key definitions about appraisal stage, strategy, portfolio, programme, project, VM, RM, UM and ReqM.

Questions to be discussed during the interview:

List the interview questions indicated above.

Diagrams to be discussed during the interview:

Attach Figure 6.4 and Table 6.1.

Your input into the study would be extremely valuable and we are writing to ask if you would assist the research through an interview of approximately 60-90 minutes to discuss how your organisation manages those four concepts in the appraisal stage.

Thank you again for your kind assistance and if you have any questions concerning the research, please do not hesitate to contact myself on 07XXXXXXXXX or by email {the researcher@leeds.ac.uk}

Yours Sincerely,

Engineer/ Ehab Mlybari

School of Civil Engineering, University of Leeds, Leeds, LS2 9JT

Appendix E: For Chapter 8:

11.7: Table E.1: VM, RM, ReqM applications within organisation levels {source: The Author}

Study / Issue in:		VM	RM	ReqM
Use:	**Organisation Policy Level**	Some consultants {R7; R10; R11} and Client Y indicated that regulated organisations do not use VM here. However, within Client N, the interviewees do not know as they do not really get involved in VM at this level. Whereas, within Client S the interviewee is not sure but would think that some form of value assessment is part of the policy formulation exercises.	Two consultants {R7; R11}, client case studies and IVM Seminar {2010} indicated that regulated organisations use RM here. Whereas, one consultant {R10} indicated that regulated organisations do not use RM here.	Some consultants {R7; R10; R11} and Client Y indicated that regulated organisations do not use ReqM here. However, within Client N, the interviewees are not sure what the company is doing in terms of formal ReqM at this level. Whereas, Client S uses ReqM here.
Why:		Two consultants {R7; R10} indicated that regulated organisations do not use VM here because: it takes place at the next level down which is about how they achieve that and what that looks like; or the Boards have ideas and then find people to go and flesh those ideas out and these people do things like VM, RM and ReqM and then report to the Boards about their ideas cost, risk etc… and whether there are better alternatives. So this is done at lower level like portfolio level as the consultant is not sure if the Board is doing it themselves. Whereas, Client S could use VM to compare the policy options.	Two consultants {R7; R11} and client case studies indicated that regulated organisations use RM here because it is a fundamental requirement for strategic management; to understand what their exposures are as companies; to look at big global risks which is more to do with sensitivity analysis; and because the regulated industry is very much measured on risk, so at strategic level the directors want to know where risks are and are really driven by the regulators. Whereas, one consultant {R10} indicated that they do not, for the same second reason of not using VM at policy level.	Two consultants {R7; R10} indicated that regulated organisations do not use ReqM here because: at this level, they look at satisfying a strategic intent, not how you get there; and for the same second reason of not using VM at policy level. Whereas, Client S uses ReqM here to understand regulators/funders' requirements as it is a fundamental requirement for strategic management.
How:		Client S might use VM here informally. It may be called strategic studies rather than VM studies. It may be undertaken in formal workshops and challenges environment to a certain extent or generally on a more informal basis and they tend to facilitate themselves {IVM Seminar, 2010}. The IVM Seminar {2010} indicated that it probably comes down to structure and where a manager is sitting in an organisation. If a Board is looking at policy or strategy, they are not likely to look to their value managers who are at a different level working at perhaps programme or project. So the Board might bring in a strategy consultant to do that sort of work rather than look to their value manager to help them with it. So, that is probably why the formal VM are not being used unless a strategy consultant is also a value manager.	Two consultants {R7; R11}, client case studies and the IVM Seminar {2010} indicated that regulated organisations do RM here formally and informally. However, one of the consultants {R7} and Client N indicated that the Board members are doing it individually or they might be doing it in a small meeting but they are not doing as much in a facilitated workshop and modelling. Whereas, another consultant {R10} and Client N indicated that formal RM tends to not be done by the Board particularly at this level. It is more fed upwards from lower levels {IVM Seminar, 2010}.	Client S does ReqM here informally.
Linkage:		Client N does not integrate them while Client S will integrate them.		
Priority:		Within Client N and S ReqM is used first because these drive why things have to be done.		

Use:	**Organisation Strategy Level**	Half of the consultants {R1; R2; R7; R11}, client case studies and IVM Seminar {2010} indicated that regulated organisations use VM here. Whereas, one consultant {R10} indicated that regulated organisations do not use VM here.	Half of the consultants {R1; R2; R7; R11}, client case studies and IVM Seminar {2010} indicated that regulated organisations use RM here. Whereas, two consultants {R6; R10} indicated that regulated organisations do not use RM here.	Half of the consultants {R1; R2; R7; R11}, Client S and Y indicated that regulated organisations use ReqM here. However, within Client N, the interviewees are not sure what the company is doing in terms of formal ReqM at this level. Whereas, one consultant {R10} indicated that regulated organisations do not use ReqM here.
Why:		Some consultants {R1; R7; R11}, client case studies and IVM Seminar {2010} indicated that regulated organisations use VM here to: identify strategic needs, compare strategic options and set their long term strategies and plans because of the regulator regime as regulated organisations are forced into doing things in a structured way. Whereas, one consultant {R10} indicated that they do not for the same second reason of not using VM at policy level.	Some consultants {R1; R7; R11} indicated that regulated organisations use RM here: to understand what their exposures are as companies; to make sure risks at this level are managed; to generate the high level risk associated with whatever organisational strategies they might be thinking about; to be aware of risks to build their long term plan around that; to remove a lot of uncertainties as they can affect negatively the cost and the outcomes and it is difficult to do anything later; and because they are all in a proper structured regulated process. Whereas, one consultant {R10} indicated that they do not for the same second reason of not using VM at policy level.	Two consultants {R2; R7}, Client S and Y indicated that regulated organisations use ReqM here: to understand their main stakeholders {like regulators and funders} and meet their requirements within their companies' strategies and objectives; and to identify some aspirational targets from strategic objectives. Whereas, one consultant {R10} indicated that they do not for the same second reason of not using VM at policy level.
How:		Two consultants {R7; R11} indicated that regulated organisations do VM here formally. However, one consultant {R1} indicated that VM style at the Board level differs from the one at the design of the project. Whereas, client case studies do VM here informally as indicated in policy.	Some consultants {R1; R7; R11}, client case studies and the IVM Seminar {2010} indicated that regulated organisations do RM here formally which includes workshops and sensitivity analysis around numerical modelling. Nevertheless, Client N does it sometimes informally, as indicated in the policy.	Some consultants {R1; R7; R11}, Client S and Y indicated that regulated organisations do ReqM here informally. However, two of them {R1; R11} and Client Y indicated that it is done within VM. Whereas, one of them {R7} and Client S indicated that it is done with stakeholder management.
Linkage:		Client N does not integrate them. Client Y, does ReqM within VM while RM is separate from them. One consultant {R7} indicated that within regulated organisations, VM, RM and ReqM are only linked at the optioneering process. Another one {R11} indicated that some water companies integrate all of them.		
Priority:		Within Client N and Y, ReqM is done first but as a part of VM within client Y because they are driven by their stakeholders and understanding their needs is really paramount. Whereas, two consultants {R7; R11} indicated that within regulated organisations, VM is done before RM to inform the requirements and the risks that pertain to each; and to identify the need and then start to manage the risk of that.		
Use:	**Portfolio Level**	Most consultants {R1; R2; R7; R10; R11}, IVM Seminar {2010}, Client N and S indicated that regulated organisations use VM here. Whereas, Client Y will use it here.	Most consultants {R1; R2; R7; R10; R11}, Client N and S indicated that regulated organisations use RM here. Whereas, Client Y will use it here.	Most consultants {R1; R2; R7; R10; R11}, Client N and S indicated that regulated organisations use ReqM here. Whereas, Client Y will use it here.
Why:		Half of the consultants {R1; R2; R7; R11} and client case studies indicated that regulated organisations use or will use VM here to: produce portfolio briefing; get strategic alignment; look across programmes within portfolio; put rationale in decision making about options and projects prioritising; get the best value as they recognised the VM benefits; understand the whole portfolio; get the most value	Half of the consultants {R1; R7; R10; R11} and client case studies indicated that regulated organisations use or will use RM here: as it is important to remove a lot of uncertainties as they can affect negatively the cost and the outcomes and it is difficult to do anything later; to understand and manage risk at portfolio level that affect all projects in the same direction like change of	Two consultants {R2; R7} and client case studies indicated that regulated organisations use or will use ReqM here to: look at requirements in a very broad sense which depends on how linked those programme groups are; assemble the aspirational targets; and understand and manage portfolio requirements and consider the stakeholders' needs and wants within

		for companies as a whole and look at the customer needs and do the trade-offs between different strategic options at this level.	standards, construction price, inflation, or change of law; and because it is part of their structured processes and the processes require the information to go back up.	portfolio objectives.
How:		Half of the consultants {R1; R2; R7; R11} and client case studies indicated that regulated organisations do or will do VM here formally. However, one of these consultants {R2} indicated that it would be a series of workshops {followed by RM workshops} from establishing the portfolio through programme and going to front of project. Nevertheless, Client N does it occasionally informally. Whereas, Client Y will do it with RM.	Half of the consultants {R1; R2; R7; R11} and client case studies indicated that regulated organisations do or will do RM here formally. However, one of the consultants {R2} indicated that it would be a series of workshops {following VM workshops} from establishing the portfolio through programme and going to front of project. Nevertheless, Client N does it occasionally informally. Whereas, Client Y will do it with VM.	Some consultants {R1; R7; R11} and client case studies indicated that regulated organisations do or will do ReqM here informally but Client N's interviewees are not sure if it is done formally like IT out of their sections. However, two of them {R1; R11}, Client N and Y indicated that it is done within VM. Whereas, one of them {R7} and Client S indicated that it is done with stakeholder management.
Linkage:		Client N does some integration between them. Whereas one consultant {R11} and Client Y indicated that some water companies integrate all of them.		
Priority:		One consultant {R11} and Client N indicated that some regulated organisations like most water companies do RM first as most of them see requirements and value as being defined before this level {so ReqM and VM 1st}, so they go into detail of risk minimising. Whereas, within Client Y ReqM as a part of VM comes first because they are driven by their stakeholders and understanding their needs is really paramount. Another consultant {R7} indicated that within regulated organisations, VM is done first to inform the requirements and the risks that pertain to each.		
Use:	**Programme Level**	Most consultants {R1; R2; R6; R7; R10; R11}, IVM Seminar {2010}, Client N, and S indicated that regulated organisations use VM here. Whereas, Client Y will use it here.	Most consultants {R1; R2; R6; R7; R10; R11}, Client N and S indicated that regulated organisations use RM here. Whereas, Client Y will use it here.	Most consultants {R1; R2; R6; R7; R10; R11}, Client N and S indicated that regulated organisations use ReqM here. Whereas, Client Y will use it here.
Why:		Most consultants {R1; R2; R7; R10; R11} and client case studies indicated that regulated organisations use or will use VM here to: get strategic alignment; look for competing projects within programme; look at packaging strategy; put a bit of rationale in decision making about options and project prioritising; get the best value as they recognise the VM benefits; understand and review the programme ensuring it is deliverable and the optimum functionality is being achieved and save money as well; get more value for companies; and generate the optimum programmes, ensuring that they have got the right mix of resources and use them efficiently by understanding and integrating relationships of the projects and prioritising them.	Half of the consultants {R1; R7; R10; R11} and client case studies indicated that regulated organisations use or will use RM here: as it is important to remove a lot of uncertainties as they can affect negatively the cost and the outcomes and it is difficult to do anything later; to understand and manage risks at programme level that may come from its projects; and because it is part of their structured processes and the processes require the information to go back up.	Some consultants {R2; R7; R10} and client case studies indicated that regulated organisations use or will use ReqM here to: assemble the aspirational targets; understand and manage {capture and track} programme requirements and consider the stakeholders' needs and wants within programme objectives.
How:		Most consultants {R1; R2; R7; R10; R11} and client case studies indicated that regulated organisations do or will do VM here formally. Nevertheless, Client N do it occasionally informally. Whereas, Client Y will do it with RM.	Most consultants {R1; R2; R7; R10; R11} and client case studies indicated that regulated organisations do or will do RM here formally. Whereas, Client Y will do it with VM.	Two consultants {R1; R11} and client case studies indicated that most regulated organisations do ReqM informally within VM and within stakeholder management for Client S. Whereas, another two consultants {R7; R10} and Client N indicated that some regulated organisations such as in the rail sector {e.g. some programmes within Client N} do ReqM formally which may use DOORS and other structured tools.

Linkage:		Client N does some integration between them. Whereas one consultant {R11} and Client Y indicated that, some water companies integrate all of them.		
Priority:		Within Client N and Y, ReqM as a part of VM comes first to understand objectives and stakeholder relationships. Whereas, one consultant {R11} indicated that most water companies do RM first as most of them see requirements and value as being defined before this level {so ReqM and VM 1st}, so they go into the detail of risk minimising.		
Use:	**Project Level**	Most consultants {R1; R2; R6; R7; R9; R10; R11}, IVM Seminar {2010} and client case studies indicated that generally client organisations {mainly regulated ones} use VM here usually for all project phases but its greatest impact is at an early stage.	All consultants and client case studies indicated that generally client organisations {mainly regulated ones} use RM here and over the PLC.	Most consultants {R1; R2; R6; R7; R8; R10; R11} and client case studies indicated that public and mainly regulated organisations use ReqM here and over the PLC.
Why:		Most consultants {R1; R2; R7; R9; R10; R11} and client case studies indicated that generally client organisations {mainly regulated ones} use VM here to: get strategic alignment; improve value; put a boundary round the project and what it looks like, but still look at the options; increase functionality and save money as well; define the needs of the project; understand some of the interfaces and stakeholders; understand the problems that they are trying to address.	Most consultants {R1; R7; R8; R9; R10; R11} and client case studies indicated that generally client organisations {mainly regulated ones} use RM here: as it is important to remove a lot of uncertainties as they can affect negatively the cost and the outcomes and it is difficult to do anything later; to understand and manage risks at project level; because companies strategically have seen the RM benefits and then they focus on managing their risks.	Some consultants {R2; R7; R10} and client case studies indicated that public and mainly regulated organisations use ReqM here to: understand and manage {capture and track} project requirements and consider the stakeholders' needs and wants within project scope and objectives; and look at the next level of detail.
How:		Most consultants {R1; R2; R7; R9; R10; R11} and client case studies indicated that generally client organisations {mainly regulated ones} do VM here formally. Also, another one indicated that it is usually used once but for big project it is about ongoing interventions and RM studies are done sequentially {R1}. Whereas, Client Y do it with RM.	Most consultants {R1; R2; R7; R8; R9; R10; R11} and client case studies indicated that generally client organisations {mainly regulated ones} do RM here formally. Whereas, Client Y do it with VM.	Half of the consultants {R2; R7; R8; R10} and Client N indicated that some public and mainly regulated organisations such as in nuclear and rail sectors do ReqM formally which may use DOORS and other structured tools. Whereas, also half of them {R1; R2; R8; R11} and client case studies indicated that most public and regulated organisations such as in the building and water sectors do ReqM informally. However, two of them {R1; R11}, Client N and Y indicated that it is done within VM. Whereas, one of them {R8} and Client S indicated that it is done within stakeholder management.
Linkage:		Client N does more integration between them here. Whereas one consultant {R11} and Client Y indicated that some water companies integrate all of them.		
Priority:		Within Client N and Y, ReqM as a part of VM comes first to understand objectives and stakeholder relationships.		

Appendix F: Ethical Considerations: PhD Candidates:

General Statement Prepared by Professor Steven Male, School of Civil Engineering, acting as supervisor

Focus of Doctoral Research: Management Research:

This is a generic statement about the approach that I adopt for doctoral research candidates in connection with ethical issues. It may be tailored in certain instances to suite a particular situation. However, typical doctoral investigations under my supervision involve companies and their business and commercial strategies, including their structure and process, and, Programme and Project strategies for construction. In the latter instance these will typically address process & procedures, contractual and procurement strategies of projects, value and risk management. Research involving interactions of the foregoing are also typical, and involve large corporate firms in the UK, in particular, or internationally, although less so. The investigations are often cross-sectoral and could include Government at all levels, and, Industry.

Candidates:

Doctoral candidates are typically Full-time {FT} UK, or predominantly FT International. The approach to ethical issues by the supervisor, where this might arise in the research, is that they are treated in a similar manner across all candidates and assumes that they are new to advanced research and the issues surrounding personal and commercially confidentiality. However, Part-time {PT} candidates are typically middle / senior management candidates, are very experienced and are used to dealing with personal and commercially confidential issues; these candidates will often be at the same {typical} or higher {unusual} managerial level to fieldwork respondents.

Typical Research Methodologies:

These will involve the use of:

- Secondary sources of information, such as; published Government reports, publicly available documents, academic journals and books.
- Primary Sources include: project documentation, interviews with individuals in projects and / or companies, which may be Structured or Semi Structured; Questionnaire Surveys conducted as postal / on-line surveys, and case studies of firms or projects. These will normally be conducted with guarantees of anonymity.
- Sampling frames could be Purposive, Opportunistic, or Random depending on the study and the associated requirements.

Process for involvement of Firms and Individuals for Fieldwork:

Initial contacts for fieldwork are typically: individuals that are known to the supervisor, individuals that are not known but may be recommended by other personal contacts, contacts made at conferences by the candidate or via other networking events, via contacting an individual through

an employing organisation, and, finally, contacts that the candidate might already have if they are PT.

Subsequently approaches to individuals within firms or projects are made on the basis of:

- An email explaining the research briefly but also containing a formal letter as an attachment.
- A phone call explaining the research, followed up by an email and formal letter as an attachment.
- Formal letter via postal contact.

Typically, the formal letter, which highlights the requests for involvement of a firm or individual, will set out how confidentiality and confidential issues will be handled, including the fact that a confidentiality agreement could be signed if required. This usually includes noting that the University has an agreement and also we would be willing to use a firm's own version. The letter will also note that:

- Anonymity is guaranteed.
- Results will be generic and non attributable to an individual or company.
- The contact details of the supervisor are provided, including an extended opportunity to discuss the research and the process to be adopted.

The fieldwork stage of research:

Prior to conducting the main fieldwork the following will normally take place between the supervisor and candidate:

- For Interviews, questions to be asked are vetted prior to interviews, candidates are briefed on tape recording interviews, and also that they should be sensitive to the fact that they may asked by the interviewee not to tape record interviews. PhD candidates will also be fully briefed prior to interviews on any potential difficulties, especially around commercial confidentiality and being sensitive to the needs of the interviewee.
- The use of Questionnaire Surveys will normally involve numerous pre pilot reviews by the supervisor to ensure questions are clear, concise and may not contain inappropriate material. Pilot reviews of questions will also be conducted internally within the School with lecturers familiar with the subject, and, subsequently externally with contacts known to the supervisor. Typically, surveys will be used in statistical analysis, or for qualitative generic results and this will be noted to respondents.

During fieldwork, the following will typically occur:

- At interviews, candidates will be expected to brief the interviewee on the purpose of the interview, that it is confidential, that anonymity is guaranteed and that results will be non attributable.

- In the case of sensitive interviews, which might involve known commercial confidentiality issues in advance or relate to very senior individuals involved as interviewees, the supervisor will attend with the candidate wherever possible.
- During the main study it will also be re-emphasised to respondents that anonymity is guaranteed, findings will be generic and non attributable, and, that the survey respondent or interviewee is able to contact supervisor at any stage.
- During the post-fieldwork stage for interviews interim results are typically fed back to respondents for confirmation of accuracy of material, and interviewees are also requested to confirm if there is any material they would not wish to be included in the generic presentation of results for confidentiality reasons, or, should there be any doubt that this may result in a breach of anonymity or confidentiality. Where such concerns exist, the respondent will be asked to note this in any response to feedback on interim and final results. In this latter instance, this type of comment from an interviewee may also arise during the interview process itself and is dealt with in the same manner.

Key issues that have arisen in PhD research:

Commercial confidentiality is normally the main issue. In this instance where a firm or individual has raised concerns over this, assurances are provided over anonymity, the presentation of generic findings, that results are non attributable, that key documents are held by the candidate in secure files, and that companies are able to request that the thesis has restricted access in accordance with Leeds University rules. Assurance is also given over the use of personal data for surveys, and this typically involves information on job roles; periods of employment in a company, on a project or in a role; and may cover age ranges. The assurance again will typically note that surveys are anonymised for statistical / results purposes.

A further issue that can sometimes arise is that companies and / or individuals are very reluctant to sign any form of formal collaborative agreement for doctoral research fieldwork when the candidate is seeking access to documents or individuals. This request may have been stated as part of a research protocol in the formal approach letter; experience indicates this may result in a refusal by the respondent to provide information or conduct interviews. Again, experience indicates that the normal preferred approach by individuals and firms is that they maintain contact with the candidate and supervisor and adopt an approach based on mutual trust, the personal reputations of their company, the supervisor and that of Leeds as a very reputable university. Experience also suggests that in a situation where a refusal to participate might occur due to an initial approach statement about a formal collaborative agreement, the supervisor's response is to propose subsequently a signed confidentiality agreement; this is sufficient but is usually not taken up by the respondent and participation is forthcoming. Equally, the request for a collaborative agreement may result in a request from the respondent that the only constraint might be the need to sign a commercial

confidentiality agreement. Again, this request from the respondent is, however, rare, and a relationship based on mutual trust and reputations is the approach adopted subsequently once this issue has been resolved within the firm.

Professor Steven Male
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