

The Application of Transaction Cost Economics to UK Defence Acquisition

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Abstract

Major defence projects have a reputation of cost increases, time delays and in some cases not meeting user requirements. The aim of this study was to discover the factors which create the difficulties in UK defence acquisition projects. The dataset used in this research are seventeen, National Audit Office: Value for Money reports of major defence projects. Qualitative Software NVivo 8 was used to organise passages from the reports into categories of factors representing the defence acquisition process. A content analysis method was applied to the categories in order to highlight their quantitative and qualitative significance. A Transaction Cost Economics approach was taken to formulate the research propositions, which were tested using the qualitative content analysis.

The fundamental transformation in defence procurement leads to post-contract asset specificity. There is a lack of substitute suppliers in defence procurement due to the high switching costs. There are three reasons given for this development in defence: (1) a legacy of the privatisation policy in the defence industry; (2) ownership transfers of specialised assets under the prime contracting approach and; (3) the transaction-specific investments by the MoD. The prime is able to take advantage of transaction-specific and relation-specific investments in the transaction for future contract tenders, due to the pre-contract asset specificity which results. This sequence of events is identified as the cause of the bilateral dependency condition in defence acquisition.

Uncertainty and asset specificity, to a lesser extent, were identified as the major causes of transaction-costs in defence acquisition. These transaction-costs were given as the causes of failures in meeting the value for money criteria of defence projects. The MoD has responded, in recent time, to project failure through a governance trade-off from a traditional market-based transaction towards a bilateral governance approach. A focus of this bilateral governance approach is the application of Smart Acquisition principles and the IPT mechanism (joint MoD-Industry teams). In order to strengthen and support the IPT mechanism it is argued that a relational contracting approach should be taken. Traditional contracting approaches weaken the joint team working, whereas relational contracting applies partnership principles of better communication, cooperation and collaboration.

Declaration

I hereby swear that no portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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Dedication

I dedicate this work to my maternal Grandfather, Yacob Wolde-Mariam, for the inspiration he has been to me. To my paternal Grandmother, Worknesh Mamo, for being an example of what great determination can achieve. To my Father, Kebede Getahun, and my late Mother, Guenet Yacob, for everything they have done for me.

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1 Introduction

1.1 Chapter Overview

This chapter will introduce two of the most important areas of this research, the research outline and research focus. The research outline will discuss the background to the research, the purpose of the research and the objectives to be met. The research focus will highlight two critical parts of the research. The first being the research questions and propositions, which will drive the analysis of the research findings, and the second is the contribution being made to practice and knowledge.

The research background will address the original purpose of this study, which later had to be changed due to organisational changes. The research was to be focused on primary investigation; this however had to be changed when access to primary data became limited. Therefore a change in the agenda of the research developed, which will be presented in the following sections.

In the research purpose I will discuss the need to understand UK defence acquisition as one of the most important areas of the State. In the last decade UK defence acquisition has gone through a number of transformations and with the election of a new coalition government it is one of the priority departments set for changes. These transformations and changes have put a spotlight on the UK defence acquisition process, which has been intensified by the economic difficulties the UK has recently entered.

The objective of this research is to highlight the challenges the Ministry of Defence (MoD) is faced with when undertaking defence projects. To meet this objective the research will review three areas: UK Defence Acquisition, Defence Economics and National Audit Office (NAO) publications. I will explain further how these three areas allow me to meet the research objective.

Research questions and propositions will be outlined in this chapter. The research questions look at the Transaction Cost Economics (TCE) perspective of defence acquisition; they attempt to understand defence by applying a TCE lens. The propositions follow-on from the research questions, they are the proposed outcomes in defence when assessing the effects of transaction costs in defence. The research questions and propositions are to be addressed in greater detail in the analysis of the data. However, they are presented and explained in this chapter to provide the focus for the thesis.

The contribution to knowledge in this research is two fold. Firstly, this research provides a structured systematic analysis of NAO reports. Secondly, the research provides new insight by applying a TCE lens to defence acquisition using the dataset. These two contributions provide a practical and theoretical application to knowledge in the field of defence economics.

1.2 Research Outline

1.2.1 Background

This doctoral research finds its origins within a major collaborative programme involving ten leading universities in the UK funded through a joint venture by EPSRC and BAE Systems. The programme was entitled Network Enabled Capabilities through Innovative Systems Engineering (NECTISE). This doctoral research was initiated in the second year of the NECTISE programme.

The purpose of NECTISE was to research the implementation of a new defence capability *Network Enabled Capability* (NEC), to be briefly explained in section 2.4.1. The introduction of NEC by MoD created a number of research questions in through-life management, decision support, architecture for networks and, control and monitoring for systems of systems.

It was a joint academic-industry research programme in which regular meetings took place to discuss ideas. Academics at all levels were involved, from Academic Leads at the professorial level, Research Assistants and a handful of doctoral student, and were joined by engineers and management from industrial collaborators.

The original research programme of this thesis was based in the through-life management strand. The focus was on the acquisition challenges faced by industry in the NEC

environment. The objective of the research was to develop new modes of collaborative working between the MoD as client and BAE Systems as a prime contractor, which support the evolutionary nature of NEC.

The research method was based on investigating a conceptual framework for long-term collaborative working by applying TCE theory. This would be achieved by conducting interviews with key members of an Integrated Project Team (IPT), a concept to be discussed in section 2.3. These interviews were to be supported by the inspection of documentary data. Further to this an organisational scenario model was to be developed of the acquisition environment for NEC with IPT team members from MoD and BAE Systems.

This ambitious research programme was supported by the NECTISE organisation. Access was to be readily available due to the sponsorship of BAE Systems. The early stages provided promising access to engineers and management of BAE Systems in workshops, seminars and conferences. The research plan was first to familiarise with the concepts of TCE, Defence Acquisition and NEC. The latter proved to be the most challenging since it seemed there were confusions within the academic, industry and MoD communities as to what NEC actually stood for.

The difficulties in the research programme arrived in the second year of the doctoral research and the third year of the NECTISE programme. The third year of NECTISE

heralded the mid-term review, in January 2009, which took place at the lead university campus, Loughborough University. The NECTISE researchers, specifically the research assistants and doctoral students, were tasked with providing posters of their research. I presented a poster of the early stages of my doctoral research (Appendix 2).

A panel made up of the sponsors toured the large hall quizzing researchers on the value of their research in order to decide whether to continue the programme into the major demonstration phase. The decision was announced by the Technical Director of the NECTISE programme, Prof. Michael Henshaw in April 2009. The decision was taken to stop the NECTISE programme. While a reason was not given for this decision, it is thought that this was due to a lack of value added to BAE Systems from the system engineers in academia.

The doctoral research suffered significantly from this development in NECTISE due to the issue of access becoming less forthcoming. The impetus given to collaborate with academia from NECTISE had suddenly broken down and the question of access became a major difficulty to the doctoral research. The ambitious doctoral programme became less realistic without the backing of BAE Systems.

Attempts were made to open up new avenues for the doctoral research. My supervisor attempted to gain access to a subsidiary of BAE System, Insyte, in which a meeting was set

up in order to discuss a possible area of research. This meeting while at first proving to be promising, faltered for reasons unknown when contact became difficult.

It was clear that the original research was going to be difficult to reinstate without support. Therefore a revised doctoral research which required less access and relied on secondary data was designed. The idea for the new doctoral research was based on work done by Dalton (2007). The revised doctoral research is discussed further below.

However, the original research was not completely lost. The NECTISE research team at Manchester Business School, Academic Lead Prof. Graham Winch, Research Assistant Dr. Eunice Maytorena, my co-supervisor Dr. David Lowe and I, collaborated in a paper, which I presented at the Sixth Annual Research Symposium at the Naval Postgraduate School in Monterey, California. The paper discusses the defence acquisition process for NEC using a transaction cost approach. The paper provides a conceptual framework which develops the structures and actions of an Advanced Military Vehicle IPT.

1.2.2 Purpose

The revised doctoral research aims to provide an analysis of the defence acquisition process using secondary sources in the form of Value for Money (VfM) reports on defence projects. The idea for this methodology comes from Dalton (2007) doctoral thesis, in which she applies a textual analysis of VfM reports in transport infrastructure, public

service buildings and government accommodation projects. While the same methodology is applied to Dalton (2007), the analysis in this doctoral research looks to apply a TCE lens to the textual and content analysis of defence VfM reports.

The purpose of this research is to understand the defence acquisition process within the UK context. The focus is on the transactions involved in the acquisition of the defence equipment or service, which is undertaken on a project basis. A defence project can vary in physical, monetary and temporal size. The interest is in looking at the transaction involved in major projects which are in excess of tens of millions of pounds and can take several decades reach their in-service phase.

In understanding the acquisition of these major defence projects the focus shall be on the transactions involved between the MoD and the prime contractor. The difficulties in defence transactions have been generally documented. However, the more intrinsic nature of the problems in defence acquisition has not been discussed at length.

This may be due to the fact that the focus has not been on the transaction costs involved in defence acquisition. This research is to highlight the major factors contributing to the high cost, lengthy and poor performance projects which have come to characterise defence projects and apply a transaction cost approach to the findings.

The reason for using TCE as the theoretical basis for defence acquisition is based on the focus of the theory on the exchange relationship between the buyer and the seller. This focus is congruent to the research purpose and provides the best basis for the research, as will be explained further in Chapter 3.

The MoD has attempted to make a number of changes to the way it acquires its defence projects over the years. It has changed the institutional, governance and process of defence acquisition in order to mitigate the problems mentioned. It has had mixed results in its endeavours. It is hoped that in highlighting these problems a new perspective on how to combat the difficulties in UK defence acquisition can be presented.

1.2.3 Objectives

The main research objective is to understand the nature of the transactions occurring in UK defence acquisition. The nature of the transaction is dependent on the way the MoD engages its prime contractors, the environment in which the transaction takes place and the resulting governance mode.

There are three areas of interest in this research, which provide the background to the research objectives. The first area will be a review of UK Defence Acquisition (Chapter 2). This chapter will look at the historical developments in the institutional and policy context of successive governments and the impact on the MoD and Industry.

The second area will be an economic discussion of defence acquisition. Chapter 3 will present the various economic disciplines used to provide insight into defence procurement policy. This chapter will assess the merit of these economic disciplines in delivering the desired research outcomes, specifically to understand the difficulties of the defence procurement and the solutions to mitigate them. The aim of this chapter will be to outline the reason for choosing TCE as the theoretical basis of this research.

Chapter 4 will follow-on from the economic review by exploring TCE in greater depth, and analysing the theoretical purpose of TCE. This chapter will provide a discussion of the origins, development and critique of TCE. The application of TCE theory will be assessed, with a view to develop the way in which this research will apply TCE to defence acquisition.

The third area will be an analysis of NAO publications of defence project management. The NAO are tasked by Parliament, as an independent quasi-governmental body, to scrutinise and audit the spending of government departments, including the MoD. They supply parliamentary committees with reports describing the performance of the departments on public spending projects. The focus of this research is in two types of reports by the NAO: Major Project Report (MPR) and Value for Money (VfM) Reports.

While MPR is based on the highest expenditure projects per year (as per the criteria) the VfM reports look at individual projects at the evaluation phase. The purpose of the MPR is

to look at the overall annual performance of the department and recommend any changes to MoD project management practice.

MPRs are used to provide evidence of the problems involved in defence acquisition, which are cost increases, time delays and failure to meet key user requirements. These reports will be discussed in length, in Chapter 5, and provide the basis of a preliminary study of defence acquisition practice. The analysis in this chapter will be a general discussion on how the MoD performed in developing major defence projects in the reporting period 1993 to 2010. The systematic structured analysis of the MPR is the preliminary study to be applied to the analysis of the dataset.

The VfM reports provide a more in-depth insight into individual projects. The reports look specifically at the acquisition process – the reasons for the acquisition, the bidders for the project, the negotiations, the contracting process, and the risks involved, and so on. The VfM reports are the dataset for this research and are analysed using qualitative software NVivo. The consequence of choosing to use the VfM reports are that this will make the focus of the transaction-cost analysis from the buyer's perspective.

A major part of the textual analysis is the dissemination, collation and categorisation of the text. The principal category, defence acquisition process, is separated into three subcategories: Selection Process, Contracting Process and Risk, Uncertainty and Complexity. The causal links of these factors are then investigated.

A content analysis of the categories provides the quantitative (frequency count) and qualitative significance of the factors and the factorial relationships. Greater emphasis is put on the qualitative findings as this research is anchored on a qualitative approach using content analysis. The finding of this analysis is applied to the research questions and proposition outlined in this chapter.

The objectives of the research are:

- To understand the common factors of why defence projects fail to satisfy value for money criteria such as time, cost and user requirements;
- To highlight common characteristics of defence projects in order to understand how defence acquisition can be improved;
- To apply a transaction cost economics lens to the content analysis findings in order to gain insight into defence acquisition.

1.3 Research Focus

1.3.1 Research Questions and Propositions

The research questions will set the agenda for the research into UK defence acquisition. The research questions follow-on from the research purpose and objectives, and will inform the research propositions in conjunction with the literature review. The three research questions will be furthered by undertaking a literature review into Transaction Cost Economics and the Major Projects Reports, Chapter 4 and 5 respectively. The

research questions will be tested against the dataset (Value for Money reports) using the propositions formulated.

The research questions focus on three key areas of the defence acquisition: First on the MoD-Industry relationship; second the Value for Money criteria for defence projects; and third on organisational changes in defence procurement.

Thus, the research questions are as follows:

- 1 How is the relationship between the MoD, as buyer, and Industry, as supplier, affected by the fundamental transformation in the acquisition process?
- 2 Is the presence of the environmental dimensions (uncertainty, asset specificity, and frequency) in the contract responsible for the cost and time variations and poor performance in customer requirements?
- 3 What is the response, by the buyer (MoD), where project failures exist, in terms of the transaction governance?

The first research question looks to investigate the transformation of a competitive tendering process in the contract award of the acquisition process to a bilateral dependent relationship, due to the fundamental transformation, thereafter. This has many consequences for the way the relationship will continue for the transacting parties and how the project will be managed and delivered.

The research findings will be analysed to see whether elements of the fundamental transformation are present in the acquisition process. This is a search for descriptions of

transaction-specific investment made in the acquisition process, which results in a bilateral dependent relationship between the MoD and the Prime in the project, within the VfM reports. Hence, the proposition is as follows:

Proposition 1: If the Prime makes transaction-specific investments then the fundamental transformation results in a bilateral dependency, between the MoD and the Prime, in defence acquisition.

In the second research question, the analysis looks at the difficulties occurring in a defence acquisition project and attempts to see if the difficulties are due to inappropriate considerations in the contract design to environmental factors (outlined by Williamson (1975)) resulting in transaction costs. In this aim the focus will be on the presence of the environmental dimensions in defence procurement. In order to identify the presence of these environmental factors there is a reliance on interpreting Williamson's definitions through inferences from the dataset.

The effect of the presence of environmental factors in the contract is to create a situation where the project will be hindered due to the resulting transaction costs. It is proposed that it is due to the manifestation of the transaction costs in the project that failure to meet the value for money criteria of the MoD results. The following proposition thus provides a link between the TCE consideration and project management by stating the result of transaction costs is to make project failure more likely:

Proposition 2: The presence of transaction costs in the contract contributes to the failure to meet value for money criteria.

The final research question looks at how the MoD attempts to deal with failures of organisation. Specifically, if there are any changes implemented to the transaction governance in order to remedy the difficulties within the project. This research question relies upon evidence of a change in the selection process used by the MoD to change the way it procures its defence equipment or/and services from Industry. This evidence looks at the way the MoD has changed its defence acquisition practice at the institutional, governance and process level.

The evidence which is being sought in the data is the transitions in procurement route and how the procurement routes differ in terms of transaction governance; references to failures in transactions in terms of organisation and whether any remediable action was taken or not; and the relationship between project failure and transaction governance (in the form of the selection process). TCE theory suggests that where there is a failure in the organisational mode then a transaction governance trade-off is expected, and as such a new governance mode is expected.

Proposition 3: If defence projects fail due to transaction-cost considerations in organisation then a governance trade-off is expected in defence acquisition.

The purpose of the research questions and propositions is to apply a transaction-cost perspective to defence in order to provide greater understanding and analysis of the reason for project failure, as stated as the first objective of this study. The categorisation and manipulation of the VfM reports will provide the basis for presenting the data for a content analysis process. This will be aided by providing a TCE lens to the data in order to focus on the transactional issues of the acquisition process.

1.3.2 Contributions

The first contribution to knowledge in this research is a unique contribution to practice; the systematic structured analysis of NAO defence reports. In a meeting with the Head of Defence in the NAO, Tim Banfield, commented that a cross-analysis of defence reports had never been performed. It is due to this uniqueness in the research that the NAO were interested in the research and provided a great deal of support and time in providing documentation and discussions on the focus of the research.

The analysis of MPR provided a common thread in what was occurring in the cost, time and user requirements performance since the first publication of the reports in 1993. The contribution made in analysing the MPR is further enhanced by focusing the analysis from the general to the specific level when looking at VfM reports.

Whereas the MPR is an audit of the annual performance of major projects; VfM reports are a documentary of the progression of individual defence project from concept to the point of its development at the time of the report. The analysis of the VfM report is based on finding the common factors and structuring their role on the defence acquisition process.

In combining the systematic structured analysis of the MPR and VfM reports the contribution in practical knowledge is the wealth of knowledge provided on the constituents of defence projects. The evidence gathered on the transactions in defence project is of great volume with the quality coming from an independent and powerful source in the form of the NAO.

The contribution made to theoretical knowledge is provided in the application of TCE to defence acquisition. In using a TCE lens to defence acquisition the findings of the systematic structured analysis of VfM reports can be magnified. This study of defence economics looks at the way in which the transaction costs involved in defence acquisition can be explained.

There has been great difficulty in explaining the problems involved in the acquisition process. TCE provides the analytical tools in which the main factors can be explained by applying it to observable actions. The structure of the transaction is broken down in detailed to explain the defence acquisition decision facing the MoD. In applying TCE in this

way to the defence case there is scope in replicating this method to other industries or national defence systems.

A key research contribution to TCE theory and defence economics is provided in the analysis of Proposition 1, in which the effects of the fundamental transformation is explored. In the analysis of the data set, the findings show that the fundamental transformation in defence leads to post-contract asset specificities (as outlined in TCE), but also creates pre-contract asset specificities for future transactions.

This case is observed due to the unique role the MoD plays as a monopsony buyer and an investor in defence acquisition projects, and it is also a consequence of the high capital needed upfront to initiate defence projects. This contribution provides new insight into the connection between post-contract and pre-contract asset specificity, and on the unique nature of the buyer-supplier relationship in defence acquisition.

1.4 Summary

The UK defence acquisition process is in a stage of flux, the 2010 Strategic Defence Review will signal the changes desired in defence acquisition. This is an exciting time to be studying defence economics. There are signs that serious changes are needed in the way the UK manages its defence acquisition. This research provides the reasons for change and how this may be achieved.

This research highlights the challenges facing the MoD in delivering defence projects. The aim is to provide the major factors affecting the timely, affordable and required performance in the acquisition of defence projects. The focus will be on the point of transaction between the MoD and its prime contractor in the project.

To deliver the research purpose three objectives have been set for this research. These objectives are to understand why projects fail to meet their VfM requirements, on the whole. To identify the common factors in defence acquisition to see what affects it has on the overall process. To apply TCE to the acquisition process of defence projects, in order to signify the findings of the research.

Three areas of focus will be applied to this research to provide the background and preliminary study of defence acquisition. This will be a historical perspective of the defence acquisition in the UK, an economic analysis of defence acquisition, and studies of NAO reports documenting the management of defence projects.

In order to deliver on the research objective, research questions and proposition have been outlined in this introductory chapter. These research questions will apply TCE theory to the VfM reports data set and the level of support for the propositions will be assessed. The findings of the analysis will then be used to provide solutions to the transactional difficulties in defence acquisition.

The contribution of this research is in practical terms to provide a systematic structured analysis of NAO reports on defence projects. The theoretical contribution to knowledge is the application of a transaction cost perspective to defence acquisition. The application of TCE theory in defence acquisition has provided greater insight into the nature of transaction-cost investments in defence acquisition, and their effects on the buyer-supplier relationship. The combination of these contributions is to provide greater understanding in the area of defence economics policy and to place a focus on UK defence acquisition.

2 UK Defence Acquisition

2.1 Chapter Overview

The UK Ministry of Defence (MoD) is responsible for the acquisition of equipment and services for defence, on behalf of the Armed Forces. The MoD engages with suppliers in the defence industry to deliver the operational requirements of the Armed Forces. The defence industry has evolved over time, beginning as a cluster of entrepreneurial businesses providing military equipment, to the MoD, to becoming nationalised as part of the War effort in the First World War, in 1914.

The defence industry, in the last fifty years, has gone through a number of changes in its structure: from nationalisation to privatisation; introduction of competition, consolidation of the national and regional defence industry and the liberalisation of the national defence sector.

These changes in the defence industrial structure have had a major effect on the defence acquisition practice of the MoD. It is true that the MoD has had to respond to the evolution of the defence industry in its acquisition practice; however this is not its sole reason for changing its way of doing business. The MoD has been driven by the purpose of becoming an 'intelligent customer' and engaging with the defence industry in improving the acquisition process.

This chapter will chart the evolution of the defence industry, discussing the processes of privatisation, national consolidation, competition, European consolidation and internationalisation. The question being posed in this chapter is: How has UK defence acquisition policy developed over time to impact the relationship between the MoD and Industry?

2.2 Privatisation of the Defence Industry

2.2.1 Monopsony and Monopoly

The movement towards privatisation in the defence industry is more of a full circle rather than a new way for defence. The war fighting effort in the history of the British military has been mainly supported by private enterprise. Edmonds (1999, p.115) points out 'the idea of looking to the private sector to provide for the defence and protection of the state is far from being a new phenomenon. Indeed, it might be argued that the assumption that armed forces and the provision of national defence is primarily, a state/public sector responsibility has been more the exception than the rule'.

In medieval times monarchs looked to their more privileged subjects to support military campaigns with practical and financial aid. It was also common to procure professional armies from abroad to support the conscripted forces, especially from the Swiss. It was King Henry VIII whom first created a nationalised Navy, expanded further by Queen Elizabeth I. This was all to protect merchant vessels from hostile nations and piracy. Once

the public exchequer could afford the cost of shipbuilding, maintenance and naval operations a fully state-owned Navy was in existence in the 16th century (Edmonds, 1999, p.116).

It was in the 20th Century when the UK Armed Forces took on the form it now resembles. With the race to build an Empire and the advances in military technology, the Armed Forces were expanding their role and purpose. The scale of the World Wars in 1914 and 1939 and the proximity to the home state created a need for a national defence force. Edmonds (1999, p.117) states 'the consequence was that throughout the remainder of the century, the armed forces not only continued to widen their sphere of interest and requirements, but also became increasingly a state-owned and state-run institution'.

Hartley (1997, p.40) explains 'the MoD has the task of obtaining a budget which enables it to achieve its objectives (missions). This requires difficult choices in a world of uncertainty and the results are reflected in the size of the UK defence budget and its allocation between capital (equipment) and labour (personnel)'. Until the privatisation of the defence industry at the beginning of the 1980s, the MoD had full control of production. Production was delivered through the MoD's in-house procurement; procurement from the market was limited to specialised goods and competition was limited at the time.

The Conservative Government of Margaret Thatcher initiated a policy of privatising the state-owned defence companies, in order to create a free market philosophy within the

defence sector (Bishop, 1995a). In 1979, the five largest defence companies were British Aerospace (BAe), British Shipbuilders (BS), Royal Ordnance Factories (ROF), Rolls-Royce, and General Electric Company (GEC); of which only GEC was privately-owned (Smith 1989, p.193).

The aim of the Government was to have an arms length relationship with industry, and to allow industry to define the way it undertakes its own day-to-day business. The Government sold its shares in BAe to the private sector in the period of 1981-85, and sold the ROF business to BAe for £190m in 1987. This was followed by the return of Rolls-Royce to the private sector, after 16 years of state-ownership.

The shipbuilding industry was also privatised in a sequence of sales ending in 1989 (Bishop, 1995a). These sales created the dominance of the defence market by: GEC, in electronics; Rolls-Royce in aero-engines; and BAe in airframes and missiles (Smith, 1990). The defence industry had to quickly adapt to a new kind of customer relationship.

While these new privately-owned companies had the technical know-how to undertake the business, they had to adapt to the new world of market transactions. The defence companies enjoyed a domestic monopoly in the areas which they specialised in. The MoD being a monopsonist (a single buyer), and the defence companies having a monopoly in their specialisations, created a long-term buyer-supplier relationship. Industry was also

able to negotiate cost-plus contracts which in effect put the risk of defence projects on the MoD's balance sheet.

Smith (1990, p.189) explains 'as one might expect, the combination of domestic preference and economies of scale makes monopoly common in defence markets, though, in some cases the monopolists are relatively small firms'. Such as Vickers, whose turnover was relatively small compared to BAe, GEC and other larger defence firms, had a monopoly in tank production in the 1980s.

The result of privatisation was that the MoD entered into a market where it dealt with monopolists who controlled the production of specialised defence materiel. As part of the arms race, due to the Cold War, demand was high for defence equipment. This shifted the buyer-supplier power towards industry, due to a lack of competition on the supply side.

With control of production being transferred to the privatised companies, the MoD, with a lack of commercial knowledge, found itself in a weak bargaining position. Thus, in the early days of privatisation, with a lack of competition, each side possessed considerable power in the buyer-supplier dichotomy.

The MoD's negotiating power was due to its consumer power. Hartley (1991, p.79), points out 'as a monopsonist or a single buyer, MoD's procurement choices can have a major

impact on UK Industry... Its purchasing decisions can also determine the size of an industry, its structure, conduct and performance of defence industries’.

The defence industry, however, were able to balance the consumer powers as they possessed greater control of the national defence market. Fraja and Hartley (1996, p.72) explain ‘on the supply side, the UK defence industry is characterised by domestic monopolies, especially for high technology equipment such as aircraft, helicopters, aero-engines, and missiles, together with submarines, tanks, and torpedoes. The result is an industry dominated by a small number of large defence contractors (e.g. British Aerospace, GEC, Rolls-Royce, and VSEL)’.

Due to a lack of trust (Humphries and Wilding, 2004a) and cooperation, an adversarial relationship was pervasive at the outset of the newly privatised defence industry and its customer. Adding to this difficult relationship between the MoD and the defence industry was the fact that contracts were predominantly written on a cost-plus basis (Cullen and Hickman, 2001), which put a lot of the risk on the MoD.

Defence project expenditures were insufficiently controlled. The risks in defence projects were, and still are, extremely high due to the extent of uncertainty and complexity in defence acquisition. Peck and Scherer (1962, p.44) explain ‘it is also that these uncertainties are greater than those existing elsewhere in the economy’.

With the MoD already taking on the expenditure of R&D, the extra added cost of a cost-plus project created a strain on the UK's defence budget. The other issue with cost-plus contracting is that it is difficult to assess the efficiency of defence projects due to underlying complexity and uncertainty. This can be advantageous for the defence companies as cost-reimbursable (Williamson, 1967) features of cost-plus contracts make costly investments attractive to companies.

2.2.2 Levene Reforms

Bishop (1995a, p.175) points out 'by the early 1980s there was considerable dissatisfaction with such traditional procurement policies. Lack of competition had, it was argued, created inefficiency in the defence sector, while cost-plus contracts created little incentive to keep cost down'. Within the Government free market perspective, was the underlying push for competition in the defence sector. The end of the Cold War allowed the Government to refocus its expenditure on less costly, low intensity operations and reap the "peace dividends" (Humphries and Wilding, 2001).

This led to the implementation of the Levene Reforms (Levene, 1987), which focused on a policy of 'price competition' and 'greater collaboration' with Industry. Peter Levene, (MoD Chief of Defence Procurement (1984 – 1991)) was responsible for the transformation from the MoD's traditional role of monitoring and auditing to a more stringent administrator role, transferring the risk in defence equipment procurement to industry (Smith, 1990).

However, as Mathews and Parker (1999, p.28) explain 'whilst the Cold War was the principal reason for rising defense expenditure, the maladies of cost-plus pricing and "gold plating' were also held to be attributable for the MOD's lack of cost control'. Thus, the MoD transferred the risk in procurement to industry by replacing cost-plus contractual arrangements, with firm or fixed price contracts offered as competitive tenders.

Defence spending peaked in 1985, but gradually fell by 18% in real terms between 1986-87 and 1990-91 (McIntosh, 1993). Bishop (1995, p.176) comments 'the attempt by the government to introduce greater competition into the defence industry has been heralded as a great success by the MoD. A government study in 1998 claimed a saving of 40 per cent on a sample of thirteen contracts'.

Competition policy meant the government was willing to allow market forces to mould the defence industrial base (Hartley, 1991). This in effect resulted in the consolidation of the national markets, with the dominant defence companies buying out smaller defence companies (e.g. the acquisition of Plessey by GEC-Siemens in 1989).

While competition in defence has been supported, as a policy, by the MoD; collaboration with Industry has been less successfully implemented. The MoD competitive pricing policies had a major impact on the survivability of a number of defence companies which relied on defence, thus resulting in many of them deciding to diversify or exit their

defence business (GEC, Ferranti etc.). This rather than creating collaboration resulted in a more adversarial industrial relationship.

2.3 Competition and Liberalisation

2.3.1 Competition

Fraja and Hartley (1996, p.76) state 'since 1983, competition has been central to MoD's procurement policy and its pursuit of best value for money which now embraces life-cycle costs and not solely acquisition costs'. The MoD was willing to look further than home in its aim to create competition and deliver value for money.

The free market policy of the Thatcher government signified liberalisation towards foreign interest in the national defence sector, as evident by the UK becoming a member of the Independent European Programme Group (IEGP). The IEGP was geared towards the opening of the European defence equipment market in Europe to greater international competition (Bishop 1990). While, on the surface the MoD was open to bids from international defence companies, the reality was a much more protective Ministry.

Fraja and Hartley (1996, p.76-77) point out 'during the 1980s, MOD developed its competitive procurement policy by reducing the entry barriers, so that UK and foreign firms were able to bid for major contracts and by increasing competition at the sub-

contract level together with allowing the possibility of competition for production work separately from development work’.

Competition was a means of keeping Britain’s defence giants on their toes, but placing major contracts with foreign firms was not common during the early stage of liberalisation. Smith (1990, p.191) states ‘in 1987-88 15 companies received over £100m from MoD. This 15 included one foreign company (Boeing, supplier of AWACS)... ’. However, it was a signal that the MoD was ready to do business with foreign companies, especially (or exclusively) with US and European companies.

In defence statistics reports by the Defence Analytical Services Agency (DASA), providing data from 1980 to 2010, it is clear the impact the Levene reforms had on contract type in the last three decades. The data clearly shows that ‘contracts priced by competition’ increases in share, over all contract types, in value and volume over the last three decades.

Table 2.1 is a breakdown of the information provided in the reports from DASA (1992,..., 2010), the data prior to 1992 is historic data shown in DASA (1992). The data in Table 2.1 shows the range (from the minimum to the maximum share within the decade) of contract share by value (percentage value of contract with respect to total contract expenditure for the year) and by number of contracts over the year. The data presents an

illustration of the trends; some data has been omitted in the ranges as they act as anomalies.

Table 2.1: MoD Contract Types 1980-2010 (DASA (1992,...,2010))

Contract Type (Contract priced by)	1980s		1990s		2000s	
	Value (% share)	Number (% share)	Value (% share)	Number (% share)	Value (% share)	Number (% share)
Competition	22 – 44	12 – 14	41 – 71	16 – 54	51 – 70	34 – 42
Market Force	14 – 26	59 – 72	4 – 23	33 – 67	8 – 12	25 – 41
Estimates	20 – 35	8 – 16	16 – 30	12 – 17	18 – 30	17 – 28
Incentives to minimise costs	3 – 20	1	1 – 5	0 – 1	2 – 17	0 – 3
Cost-Plus a % Fee	4 – 22	2 – 11	1 – 4	0 – 2	0	0

Table 2.1 shows that the lion share of the most valuable (monetarily) contracts in the 1980s were priced by competition. However, more than half of defence contracts in the 1980s were priced with reference to market forces. This trend continues in the 1990s, although during this period the share by value of competitive pricing contracts had doubled. The number of contract priced using market forces had reduced to between a third and two thirds; this is mainly due to an increase in competitive pricing contracts. In the 2000s, competitive pricing became the dominant contract type by value and share.

Other interesting trends in the figures for contract type in the last three decades is the demise of cost-plus contracting and the re-emergence of incentive-based contracting. Contracts priced using ‘cost-plus a percentage fee’ basis have gradually reduced from 22%

share in value and 11% share in volume in 1980-81 to 1% share in value and volume at the end of the decade(DASA 1992, p.19).

This trend continued through-out the 1990s and by the 2000s cost-plus contracting was negligible. There are two curious anomalies, however, in 1997-98 and 2009-10 cost-plus contracting registered a 3% and 4% share by value, respectively. The only connection in these two years is that they occurred during changes of government. I speculate that this may be due to contract awards made in the dying days of the old administrations.

In terms of incentive-based contracts, the trend shows that in terms of numbers it has been sparingly used never going above a 5% share of contracts (bar the anomaly of 16% in 1992-93). However, the value of these contracts has represented on average a tenth of the contract prices and the share has increased in the last three years to 24%, 14% and 17% in value, respectively.

The defence industry is facing a bidding process where competitive pricing has squeezed their profit margins. Hartley (1991, pp.75-76) states 'since 1983, MoD has become more conscious of the need to obtain better value for money in equipment procurement. As a result, it has become a more demanding customer, with competition as the central element in its more commercial approach'.

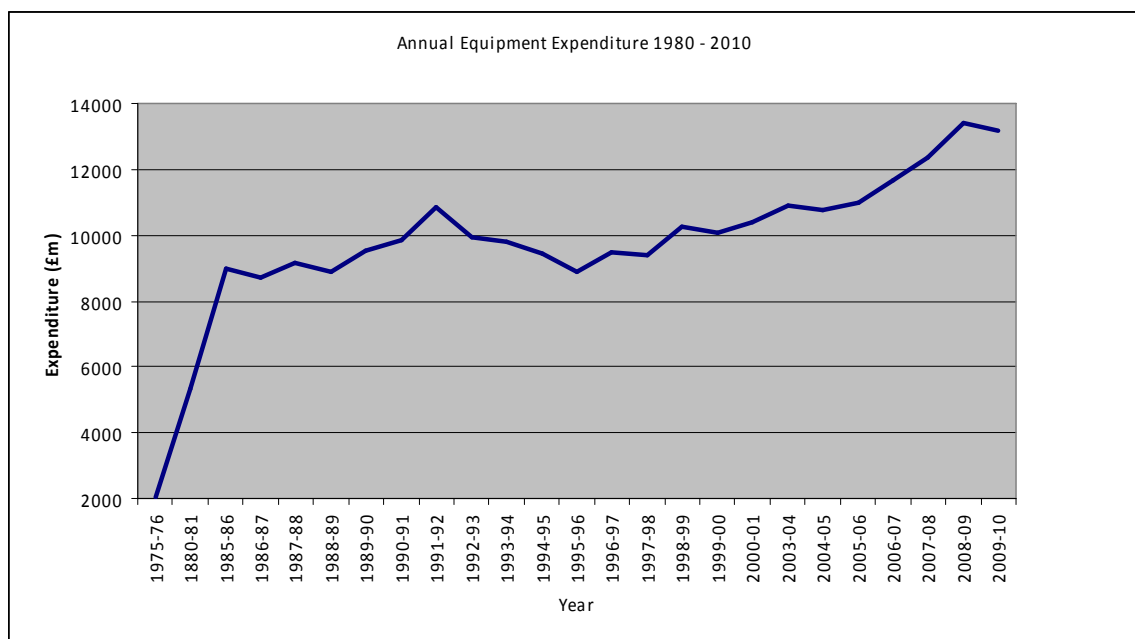
NAO (1994a, p.9) explains the aim: 'during the 1980s the department adopted a number of initiatives with the objective of setting their relationship with their suppliers on a more commercial footing. The main feature of this was a drive to increase the proportion of contracts let competitively, not just among United Kingdom contractors but also by inviting overseas bids, whilst seeking to bring market pressures to bear on the remaining unavoidable non-competitive procurements. The Department also sought to place greater responsibility for the delivery of goods with industry to provide a better incentive to them to manage cost and programme risk'.

The change in procurement policy, namely through competitive pricing, was not seen as a positive change in all quarters. The Society of British Aerospace Companies claimed it was the MoD using its position as a monopsonist to drive down profit rates and create excessive costs (Bishop, 1995) in the procurement tendering stage. The competition policy was creating frictions in the MoD's industrial relations within the defence market, which would have repercussions for future acquisition policy.

The late 1980's and early 1990's were a difficult period for the defence industry, the creation of competition and the reduction of military spending resulted in a downturn for the sector. Humphries and Wilding (2001, p.84) describe this period with some stark statistics for the defence sector. 'Thus, between 1985 and 1997 spending on equipment reduced by 40%, by 45% on R&D and industry employees fell by 50%'.

The deceleration in defence spending is shown in the trend line for defence equipment expenditure from 1980-2010, in Figure 2.1. Unfortunately, the results for 2001-02 and 2002-03 were difficult to ascertain in the DASA reports due to changes in accounting presentation in the latter reports. The figures are collated from DASA (1992, 1996, 1998, 2000, 2010) reports.

Figure 2.1: Defence Spending 1975 to 2010 (DASA 1992, 1996, 1998, 2000, 2010)



The graph shows defence expenditure dramatically rising from 1975-76 to 1980-81; gradually increasing until 1992-93; expenditure then falls until the mid-1990s; and a steady increase in the 2000s. This trend line thus indicates a slump in defence spending in the post-cold war era. This is due to the reforms in procurement and a reduction in defence spending in that period. However, as the UK engaged in a variety of military

operations, namely Iraq and Afghanistan, annual defence expenditure increased in the 2000s.

Competition had the effect of creating industry champions (Smith, 1990). The larger defence companies were moving to consolidate their positions in the sector by acquiring the smaller firms. This also coincided with the MoD allowing a few foreign-owned firms to enter the UK defence market, such as Siemens and Boeing.

The defence market was undergoing some radical structural changes, and the MoD wanted to stamp its authority on the sector by initiating a change in procurement policy. The changes which the MoD was demanding of industry were conveyed by the then Chief of Defence Procurement Executive, Dr Malcom McIntosh:

“Having achieved three-quarters by value of our equipment competitively, there is more to do. We are looking very hard at the factors which inhibit competition on the remaining quarter of our business, with a view to seeing how we can best introduce market forces into areas which have hitherto been the preserve of a few companies. The next few years will see us pushing very hard for more competition in the support areas, spares, repairs, overhauls, etc. I am less than satisfied with the service that industry has provided on support activities in the past and believe that competition will serve to sharpen things up.”

(McIntosh 1993, p.27)

The Chief of Defence Procurement was portraying a bullish attitude towards the defence industry. However, in the early 1990s he could afford to be highly critical, since defence spending had dramatically been reduced during the post-Cold War period. As the UK entered multilateral operations in the Gulf and the Balkans in the late 1990s, the MoD

became more reliant on the defence Industry. The adversarial nature in defence, which resulted from the competitive pricing policy, clearly impacted the strains in defence procurement during the UK's proactive international military interventions in places such as Sierra Leone and the Balkans.

2.3.2 Liberalisation

Hartley (1991, p.75) explains that due to political pressure, liberalisation of the UK defence sector was a slow and gradual process. 'There are pressures to buy British rather than foreign equipment (e.g. Nimrod AEW v. Boeing AWACS; UK v. Foreign tanks) and to support jobs buying from firms in areas of high unemployment (e.g. shipbuilding)'. The European and American defence companies thus entered the UK defence market using the strategy of acquiring smaller, more specialised, national defence companies or through joint ventures with larger defence companies.

Consolidation began in earnest, not only nationally but also regionally, as the European defence companies began their mergers and acquisition activity of British-owned firms. At this time, a lot of the national defence companies decided to exit the defence sector and diversify their businesses, due to the drop in demand for defence equipment.

Defence companies started either expanding their export business, entering joint ventures or exiting the defence sector to diversify into the civilian market (Bishop, 1995b) as a way

of coping with the downturn in the defence sector. GEC was one of those who decided to exit the defence industry and concentrate on the telecommunication sector.

By the end of 1999, BAE Systems (BAES) was formed, as BAe acquired GEC's defence business (Marconi Electronics Systems). In the same year, Thomson-CSF (a French defence company) acquired the UK defence companies, Shorts Missile System and Racal (the new company was later renamed Thales). Following this, the Italian defence company Finmeccanica merged their helicopter business with GKN (UK) in a 50/50 share, to create AgustaWestland (later wholly-owned by Finmeccanica). The list goes on (Anon, 2003); mergers and acquisitions were agreed at a great pace with some being reviewed by the Parliamentary Defence Select Committee.

The MoD was keen on these mergers and acquisitions occurring, as it would create the competitive industry that the MoD desired. Cook (2000, p.39) explains '...the UK MoD has encouraged Thomson CSF to emerge as an alternate prime contractor to BAE to sustain competition at the upper level of the chain'. With that purpose, Thales spent 1999-2001 buying up a number of British companies (Moores, 2001) to position itself as a competitor to the dominant prime contractor BAES.

Smith (1990, p.190) suggests 'at an international level competition is much stronger, and any reduction in the political preference for domestic production will make the U.K. market potentially contestable'. It would seem that the MoD was motivated, in the late

1990s, to make the U.K. defence sector more competitive by allowing entrants from abroad. The entry barriers to the defence industry were being lowered through a policy of competition and liberalisation. The MoD was well placed to decide how it wanted to structure the defence market by using its regulatory powers and its position as the major buyer, to regulate industry profits (Braddon and Hartley, 2007).

Although the MoD possesses strong buyer powers it hasn't always deployed them effectively, with cost and time exceeding budgeted and estimated contractual agreements. The MoD has within the last decade understood that it had to create a partnership with industry, by moving away from the pervasive adversarial nature that was common in the 80s and 90s. In order to create an effective and efficient supply relationship the MoD introduced a number of supply chain management initiatives in an effort to engage with industry.

It is also a response, in the effort to keep the national defence companies from relocating their operations in what is now a globalised defence market. An example of British companies looking beyond the national market is the global diversification of BAE Systems. BAE Systems (2010, p.5) identifies its home markets as 'where it has established, or seeks to establish a good position in the defence industrial base', thus United States, United Kingdom, Saudi Arabia, Australia and India.

Cook (2000, p.37) comments 'other UK Suppliers have shown themselves to be equally adept at winning more than their fair share of contracts on world markets'. The defence market, it can be argued, with the free market policies of western nations and customers in emerging nations (such as South Africa and Saudi Arabia) has become global.

NAO (1994a, p.33) explains 'the decline in the size of production orders means that overhead rates charged to the Department are increasing. Against this the Director General of Defence Contracts has estimated that, in 1992, the Department saved £340 million because exports of defence equipment lowered unit costs as a result of overheads being spread over a wider base'.

The national defence market is essentially still the number one focus for national defence companies, and governments are still selective in what contracts are awarded to foreign defence companies and which exports are allowed to foreign nations. However, there is an evident effect on the defence industrial base of the globalised defence industry.

Humphries and Wilding (2004b, p.261) explain 'UK defence procurement supply chain relationships are similarly long termed, inextricably linked and characterised by complex problems and, moreover, being also driven by global market conditions (concentration) and increased customer (MoD) sophistication to change'. They explain their concept of 'sophistication to change' in greater detail in Humphries and Wilding (2001). It is in the way the MoD has transformed its relationship with Industry to one of partnership as a

response to the globalised defence markets and the traditional adversarial stance towards Industry.

Whether partnership has become the modus operandi in defence acquisition is a central theme of the research questions in this thesis. It is difficult to see how such a radical change from the adversarial nature in defence acquisition to one with partnership has been achieved. The answer to this transformation lies in the policies followed by the MoD in the 2000s. The change in government in the 1997 elections, to the Labour party (commonly known as New Labour) may have created a stimulus for a revision of the defence industrial strategy.

The New Labour government undertook a number of studies, such as options for change and the strategic defence review, which reassessed defence procurement. A number of mechanisms were introduced to improve defence acquisition at the process level such as the Smart Procurement Initiative, later renamed Smart Acquisition. It is fair to say that the 2000s heralded a new way of engaging Industry in defence acquisition.

2.4 Defence Acquisition

2.4.1 Acquisition Process

Fraja and Hartley (1996, p.76) explain 'while there undoubtedly exist situations where only one potential contractor can be found by the agency (e.g. UK warship building), in the

vast majority of cases more than one firm has the ability of supplying the required system, especially if the domestic market is opened up to foreign suppliers'. Thus, the MoD can follow competitive pricing in a majority of cases, and as such has increased the use of competition in defence procurement.

Smith (1990, p.195) points out 'in recent years MOD has attempted to become more commercial in its purchase. This involved increased use of competitive tendering; the avoidance of cost-plus contracts, and tying payment to performance, the structure of the MOD Procurement Executive was also changed to make it a 'more demanding, better informed customer''. The effects of these changes are evident in the figures presented in Table 2.1, however organisational changes only started in the 1990s.

The 'Options for Change' defence review, in 1991, outlined the expectation that the armed services maintains the same level of performance and meet its policy objectives, while working at a reduced budget with 20% reduction in manpower (Smith, 1990, p.123).

One of the major changes implemented in the review was the opening up of the defence market to a diverse nature of defence requirements. Smith (1990, p.123) explains 'basic services, such as catering, cleaning, transport, and maintenance and repair, were among the first to be 'contracted out' as representing better value than when provided within the services themselves'. The level of contract tendering by the MoD was increasing in sum, value and diversity.

When placing a competitive contract for tender MoD had a list of companies they considered eligible. Where the procurement was of a high value, technically complex and high risk contract the eligible companies would be sifted to shortlist tenders. A bulletin was also created to ensure that interested parties, especially those abroad, could be aware of available opportunities. This was important to ensuring the competitive contracting route remained effective (NAO 1994a, p.17).

Fraja and Hartley (1996) point out 'interestingly, since the introduction of competition policy, imports into the UK have increased from 5 per cent of MoD equipment purchases in the mid-1980s to 9 per cent in the mid-1990s, although the share for UK industry remained remarkably constant at some 80 per cent over the period'. Competitive tendering was giving foreign firms a chance to enter the UK market; however it was still at a low market share.

NAO (1994a, p.18) explain 'one of the benefits of competition is that it can encourage tenderers to produce innovative and cost effective solutions to the Department's requirement'. Competition was effectively forcing industry to seek new ways of winning the contract by delivering well-balanced and costed bids.

There are costs attached to competitive tendering and bidding for the MoD and industry respectively. Costs for the MoD can arise from compiling tender documents, provision of advice, evaluations of tenders and negotiating contracts including iterative tendering. The

cost for industry is estimated at an average of 3 per cent of the contract value, which ultimately is passed on to the MoD. Therefore, the MoD recognising this problem in the 1990s moved towards creating a longer term relationship with suppliers governed by taut contractual conditions (NAO 1994a, pp. 18-19).

The MoD continues to look at ways of improving its tendering process. MoD (2005, p.48) states 'we are tackling industry's concerns about the expense and uncertainty that can arise from protracted and inefficient tendering. We are taking steps to speed up decision making and to minimise costs'.

In terms of awarding production contracts the MoD used separate contracts for production phases. NAO (1994a, p.20) explains 'previously, the Department have sometimes split production quantities into several tranches and competed them separately. However, with reduced quantities likely to be purchased in the future, splitting production into tranches is less likely to be cost effective'.

Competition was not suitable for all procurement projects; some could only be sourced by specialist defence companies. Competition was not effective where contractors had a unique capability. For such instances, the MoD introduced a policy of 'No Acceptable Price, No Contract' (NAPNOC). NAO (1994a, p.21) explains 'NAPNOC is predicated on the fact that the department's negotiating position is strongest before a contract is let'.

Where competition was suitable, the MoD recognised that its competitive tendering policy required adapting if it was to deal with the cost of tendering and unifying production contracts. The introduction of prime contracting provided the long-term relationship with suppliers the MoD desired. Prime contracting is the method of selecting a contractor to manage the project, empowering them to deal with the supply chain and making them responsible for the delivery of the project.

NAO (1994a, p.24) explain 'since the mid-1980s the Department's policy has been, where possible, to appoint a single company or consortium, referred to as the prime contractor, which has responsibility for co-ordinating the actions of sub-contractors and integrating the individual components of complex projects'. The prime contractor would also have some responsibilities for in-service phase.

This new procurement process was a good fit with the way the defence sector developed as a result of competition and liberalisation; a number of large companies were present in the defence sector which had the capability of managing large defence projects. It also removed issues with integration and compatibility of sub-systems, as this became the prime responsibility of the prime contractors (also known as primes). It allowed the MoD to tender the contract to a smaller group of companies which had the capability to provide such a large and complex project. The MoD also transferred management responsibilities for selecting and organising the supply chain.

Mathews and Parker (1999, p.30) explain 'MOD PE appoints a prime contractor responsible for providing the required equipment, making use of subcontractors where necessary and, indeed, for managing the project in its entirety'. Prime contractors are able to negotiate lucrative contracts, due to the risk involved in managing such large projects. However, it does make competition more difficult when the contracts can only be undertaken by a small group of companies who have the resources to manage such large projects and large supply chains.

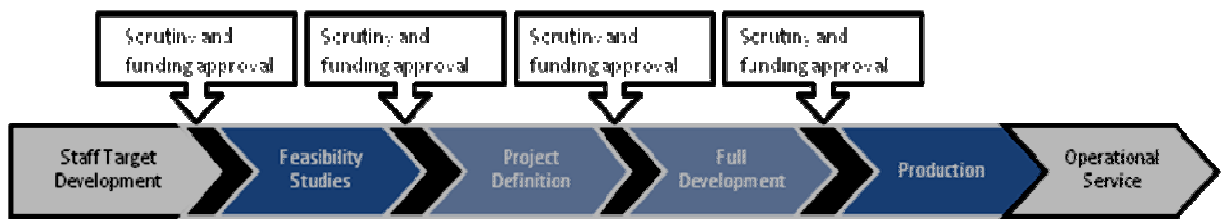
The award of prime contractorship transfers a lot of the management and organisation risk to the contractor. This in turn means the contractor will expect a premium for taking on the risk. NAO (1994a, p.24) points out 'contractors understandably seek to charge extra when asked to bear the risks involved with prime contractorship. However, the Department do not routinely assess these costs when deciding upon their procurement strategy for individual programmes'.

Mathews and Parker (1999, p.38) state 'on balance, prime contracting is of value to both MOD and industry because of the improved risk management that it fosters: minimizing cost and schedule over-runs as well as through-life costs; rationalization of R&D expenditure and facilitates an enhancement of systems integration'.

The focus, thus, turns towards the way in which the MoD structures its contracts in order to gain the most from the prime contractor, whilst allowing enough flexibility to deal with

uncertainty. The MoD implemented the Downey Cycle, shown in Figure 2.2, to manage the procurement of defence equipment and to provide a mechanism to control defence projects.

Figure 2.2: The Downey Cycle (NAO 1999, f.5, p.8). Each approval can take up to two years to decide to whether or not to proceed to the next stage.



NAO (2006a, p.5) states ‘the timely agreement of a contract is akin to managing a mini-project in its own right. As such, the contracting process should be well planned, agreed and understood. It should be resourced with suitably experienced and trained commercial staff and involve all stakeholders in the contracting process, not just the commercial officers and project leaders’.

Prime contracting has allowed greater amount of flexibility for the government in terms of the responsibilities it can transfer to its supplier. However, the challenge of writing and agreeing a contract, which has enough checks and balance, whilst ensuring the wording is not too restrictive, is still a major challenge for the MoD. The difficulty is that the contract is dealing with complexity and uncertainty at a larger scale, under prime contracting rather than under the multiple sub-systems contracts.

How much technical risk the MoD places on prime contractors plays an important role in the success of the project. MoD (2002, p.13) explains 'we also need to manage technological risk effectively. Burdening prime contractors with unmanageable levels of risk will not lead to efficient project performance. Neither of course does close government control or the protection of industry from the costs associated with normal commercial risk'.

NAO (2006a, p.11) points out 'contracts are most likely to support successful project delivery if they are negotiated against a common information base and with an understanding of stakeholders' aspirations. In applying the contract it will be important that all parties understand the way in which achievement of the desired outcomes is incentivised and the position of each stakeholder is protected'. It is not always clear what the desires of the MoD are nor do they always align with those of industry.

The transfer of risk from the MoD to the prime contractors became more evident with the introduction of Private Finance Initiatives (PFI). PFI is a type of Public Private Partnership (PPP) which aims to provide the commercial sector with opportunities to undertake public projects, in order to gain from improved business practice and save money. Parker and Hartley (2003, p.97) explain 'PPPs including in the UK 'private finance partnerships (PFIs) are part of a wider policy of 'privatisation' based on the expectation that the private sector provides services more efficiently and more effectively than the public sector'.

Gray (2009, p.198) explains ‘...in the UK most PPPs are funded via [PFI], in which the private sector provides the initial capital investment in return for future ‘rental’ payments from public sector. This model is also frequently implemented in situations where it is believed that the private sector can bring superior management and/or operational skills to public services, and ultimately benefit to taxpayers’.

PFI became a popular part of public project finance under the Labour Government; they used PFI to build hospitals, schools and other infrastructure projects. The Government would argue that this form of finance takes the cost off the taxpayer and allows the Government to pursue a greater number of public projects. NAO (2008a, p.13) points out ‘the first PFI contract signed by the Department covered the provision of non-combatant vehicles (known as the “white fleet”) in 1996. The Department has since signed a steady stream of deals’.

This research will include PFI procurement projects in the dataset. In fact, the PFI contract being described by NAO (2008) is one of the reports (The Procurement of Non-combat Vehicles for the Royal Air Force (HC 738, 1999)) which will be analysed.

In the MoD, PFI is an important part of the procurement method. NAO (2008a, p.12) states ‘in relation to the total defence budget, PFI represents a small, but important, part of the Department’s annual spending. In 2007-08 the Department paid £1.3 billion in PFI service charges, approximately four per cent of its total outturn of around £36 billion’.

PFI has its critics, and towards the end of the New Labour government many commentators criticised the poor cost controls in PFI projects especially in the NHS. Parker and Hartley (2003, p.97) comment 'at the same time, however, concerns have been raised about their true long-term costs and therefore on their ability to provide public investments more cheaply on a life-time cost basis'. One of their arguments is that the government can borrow money at a cheaper rate, thus public expenditure savings are not really achieved when the private sector absorb higher interest rate costs. The private sector will pass on the interest payments of the loans on the project to the MoD.

PFI is only one of many procurement routes which the MoD uses in its projects. When deciding the need for PFI there is a proper appraisal of other possible routes. NAO (2008a, p.21) explain 'before a large PFI project can be procured, it must in line with other Ministry of Defence projects satisfy the department's Investments Approval Board that there is value for money case for proceeding with the procurement. The Investment Approval Board also establishes whether the project is consistent with the Department's strategic investment plans, well-founded in relation to delivery of the customer's requirements, takes account of all key cost-drivers and is deliverable'.

MoD PFI projects are often managed by IPTs and are supported and scrutinised by the Private Finance Unit. Established in late 1990s, the Private Finance Unit was centralised in London in 2005 and given greater influence. The unit provides 'specialist commercial expertise', guidance and assistance. A study by the unit found that PFI procurements are

substantially delivered on-time, to-budget and deliver the services required (NAO 2008a, p.21).

Parker and Hartley (2003, p.102) explain the structure of PFI contracts. 'They differ from complete privatisation in that the MoD retains the responsibility for ensuring service delivery, with the private sector investing in, managing and operating any capital assets needed for delivering the service. As the customer, the MoD pays directly for services or output, usually through long-term contracts, typically in excess of 10 years, with MoD payments covering the whole or the majority of the project cost'.

One of the major reasons for PFI is the ability to transfer the risks of the projects to the contractors. Parker and Hartley (2003, p.102) state 'MoD believes that it benefits from PPPs/PFIs by obtaining value for money from existing budgets; from improved quality of services through opportunities for innovation and the application of the latest commercial techniques; from reduced risk to MoD by transferring risk to private sector and through the use of appropriate incentive contracts; and by exposing its staff to private sector management, commercial and financial skills'.

When assessing the risk in PFI projects the NAO (2008a, p.22) identified nine out of ten of the risk categories to be low or moderate. The one high risk category is 'specification of the asset or service'. NAO (2008a, p.25) recommends 'in order to allocate risk effectively, both parties need to understand the size and nature of that risk. For specifications to be

effective departments need to be clear on what they require, which in turn depends on accurate data relating to any existing service provision, the condition of assets being transferred to contractors and the future needs of the service users’.

Other procurement processes include Military Off-The-Shelf (MOTS), Commercial Off-The-Shelf (COTS), International collaboration and PPP’s based on PFI and Government owned – Contractor operated (Go-Co) arrangements. These are all ways that the MoD approaches its procurement in order to match the most effective way of working with industry and dealing with budget constraints. Table 2.2 provides a description of all these procurement processes.

The procurement process relies heavily upon a clear line of communication and data transfer from the MoD to industry. In order to ensure that the interests of the MoD and its suppliers are aligned there needs to be a strong and constructive relationship. NAO (2006a, p.17) states ‘the contract should provide suitable incentives to underpin such constructive working relationships and reward achievement of project outcomes, whilst adequately protecting parties in case of problems’.

Hartley (2007, p.1162) explains ‘procurement agencies have to select a contract type ranging between extremes of firm/fixed prices and cost-plus contracts and the ‘intermediate’ case of target cost incentive contracts. Each has different risk sharing arrangements between the buyer and seller; each has different efficiency incentives, rent

and equity properties; and each has different opportunities for strategic behaviour in contract negotiations’.

With Fixed Price contracts the prime usually agrees a premium for taking on the risk and the payment is agreed based on the contracted requirements being met. Contracting for Availability takes on a pay-as-you-go format, where the contractor charges the MoD each time it wishes to use the service. Incentive-based contracts take on a mix of performance-based and milestone payments with risk being a part of a pain/gain share arrangement. Cost-plus is where the contractor is reimbursed for any cost incurred in the project and the risk is taken on by the MoD.

Table 2.2: Procurement Process

Procurement Process	Description	Contract Types
Non-Competitive	A monopoly occurs on the expertise to undertake the project. A single contractor available.	Cost-Plus, NAPNOC, non-competitive Fixed-Price
Prime Contractor	Companies able to taking on the role of systems integration and managing the supply chain. This contract is tendered, usually 2 or 3 large defence companies bid. In some cases there maybe a long-term partnership in place.	Fixed- or Firm- Price, Incentive-based
PPP (PFI, Go-Co)	The Private sector works with the government on delivering projects using various separations of responsibilities on asset management, capital investment, project management and operation.	Contract for Availability, Incentive-based.
MOTS	The government buys ready made equipment from an ally nation, who was the projects original sponsor.	Memoranda of Understanding
COTS	The government buys ready made equipment from the commercial sector, mainly used in I.C.T or mass product non-complex procurement.	Fixed- or Firm- Price
International Collaboration	The UK jointly procures specifically large and complex equipment with allies such as the U.S, within NATO or European partners.	Memoranda of Understanding, Workshare Agreements

2.4.2 Smart Procurement Initiative

The reduction in government spending and the loss of the cosy relationship due to downsizing, competition and opening up the market to foreign firms created adversarial feelings between the MoD and Industry. The once, long-term cosy contractual relationship enjoyed in the defence sector became a thing of the past. The MoD was under pressure to restructure itself, and to change its acquisition practice by introducing more competitive contracts, focus on lifecycle costs and reduce specification rigidity (Humphries and Wilding 2001, p.84-5). The MoD had to change its way of doing business.

Edmonds (1999, p.125) explains 'the Strategic Defence Review 1997/8 recognised a problem that was costing the exchequer dearly, not to mention the frustration for the armed services when their equipment arrived late, expensive and not to specification. Convinced that there were efficiencies to be found the Review introduced a new process, that of 'smart procurement''. This initiative had the motto 'cheaper, faster, better' as its driving force.

The Strategic Defence Review in 1998 (SDR1998) looked at tackling the challenges facing defence procurement (MoD, 1998). It highlighted three areas where defence procurement was failing to achieve efficiency: poor value for money; poor project management; and poor industrial relations. The introduction of the Smart Procurement Initiative was to deal with these shortcomings. The initiative focused on changing the culture of MoD and the

defence industry, as a whole, moving the relationship towards a partnership, rather than the usual competitive adversarial one (Edmonds, 1999, p.125).

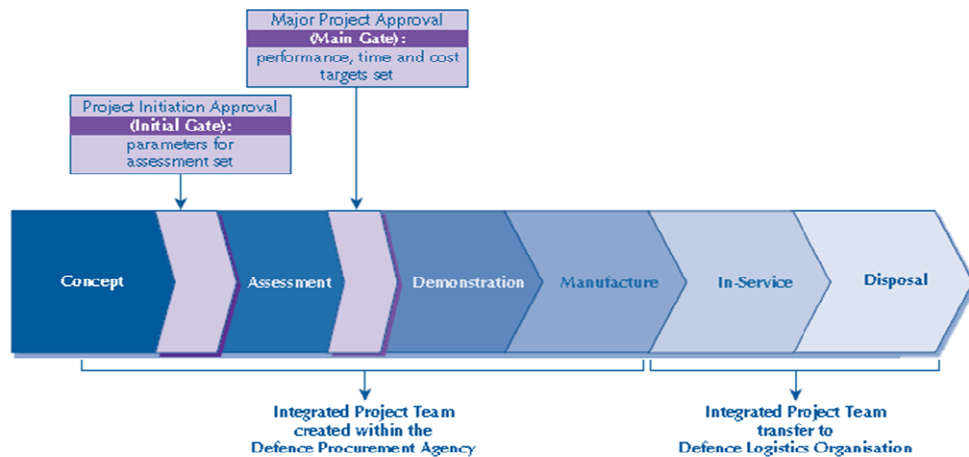
The initiative was a joint exercise with industry to identify a new set of procurement processes which will improve the way the MoD procures defence equipment. It also provided greater opportunities to industry by opening up more requirements to be met by the commercial sector.

The changes were brought about in consultation with the Defence Industries Council and the Trade Associations. The Defence Industries Council, is chaired by the Defence Secretary, and constitutes representatives from the defence industries and the four major trade associations (the Society of British Aerospace Companies, Defence Manufacturers Association, Federation of the Electronics Industry and British Naval Equipment Association). The purpose of the council is for the MoD to consult the defence industries on matters of common interest (MoD, 1998).

In line with the changes to the procurement process, the MoD made a few of its own organisational changes, recommended in SDR1998. In 1999, the three single service logistic organisations for the Royal Navy, Royal Air Force, and Army, were unified to create the Defence Logistics Organisation (DLO). In the same year, the Procurement Executive was given agency status, and became the Defence Procurement Agency (DPA). The

responsibilities of the DLO and DPA are shown in the lifecycle process CADMID (Concept, Assessment, Demonstration, Manufacture, In-Service and Disposal) in Figure 2.3.

Figure 2.3: The CADMID Cycle (NAO 2004a, p.29)



CADMID is a lifecycle process introduced to defence acquisition to provide a more efficient and effective through life capability management of defence equipment. MoD (2006, p.13) explains 'the CADMID cycle has been used since 1999, when it was devised as part of the 'Smart Procurement' initiative to deliver equipment capability within agreed performance, cost and time parameters'. Each phase within the lifecycle has its own objectives and delivery methods.

The Concept Phase is a statement of the military customer's requirement. It consists of a definition, risk identification and cost, time and specification outline. After this point the project needs to gain 'initial gate' approval. Approval for defence projects go through the

Investment Appraisal Board (IAB), as part of the Defence Management Board. The IAB will decide whether the project delivers current defence requirements and whether it is value for money.

After achieving initial gate approval the project needs to go through an Assessment Phase. The time, cost and performance requirement are balanced and the risks of the project are defined, quantified and controlled at this stage. Using these findings the project team will require a 'main gate' approval. This is the final approval required to bring the project forward. Again, the IAB will be responsible for assessing the merits of the project and deciding whether to invest in the project, ask for changes or to halt the project altogether.

The project, after gaining main gate approval, moves through the Demonstration Phase. During this phase continuous progress is to be made on risk reduction and performance targets being fixed for manufacturing. The project team will be expected to deliver the military requirements in the Manufacture Phase.

The equipment is provided to the front line with any provisions for support and upgrading of equipment being a part of the In-Service stage. The end of the equipment lifecycle is at the Disposal phase, which requires the project team to safely dispose of the equipment, a particularly important phase for equipment handling toxic and radioactive material, such as nuclear submarines (MoD 2006, p.13).

In line with the CADMID process, a project team is set up with responsibilities for delivering the procurement phase (CADM) by working with the Prime Contractor and the DPA. When the procurement has been completed the project is transferred to the DLO at the user phase (ID). This project team is known as the Integrated Project Team (IPT).

The IPTs are responsible for delivering defence capability to the customer (Armed Forces). NAO (2002a, p.7) states 'the introduction of IPTs has involved the reallocation of around 10,000 personnel into some 130 teams within 18 months'. IPTs consist of MoD personnel from key specialisations (such as finance and defence requirements office) working alongside business unit representatives from the prime contractor.

OGC (2007, p.10) explains the IPT concept in public procurement. 'The aim is to identify the most appropriate specialists and involve them at key points throughout the project where their expertise can contribute to the design process as well as the construction process'.

Cullen and Hickman (2001, p.527) explain 'the overriding objective of the IPTs is to reduce the costs of procurement by developing a more open relationship with their contractors promoting innovation and monitoring all operations within a 'shared data environment'. At the heart of the IPT concept is collaboration with industry, working in partnership to ensure value for money.

The introduction of the CADMID process and IPTs in the acquisition policy review of SDR1998 changed the focus towards a through-life approach.

The McKinsey review concluded that there should be a through-life approach to the acquisition of defence equipment, with each project being managed throughout its life-cycle by a dedicated IPT... For smaller projects where it was not practical to establish a dedicated through-life IPT the Department evolved the model to create 'cluster' IPTs which manage groups of capability related projects. There is a larger number of smaller projects and the results of our census highlighted the widespread use of cluster IPT concept, as only 20 per cent of IPTs were single project IPTs'.

(NAO 2002a, p.7)

The reforms made in the Smart Procurement initiative were aimed, not only at restructuring the MoD, but also at looking to create a partnership with the defence industry. A partnership, in which, competition would create better value for money and improve customer service in defence procurement. However, an important question posed in this research is whether competition and partnership can coincide harmoniously.

Where there is competitive pricing hard bargaining must exist, this will impact the buyer-seller relationship. There is a lack of focus on this point in the MoD's procurement policies in the early part of the 2000s, and thus a lack of improvement in the adversarial relationship. IPTs were introduced as a way of creating a post-procurement means of interaction between the MoD project team and that of the prime contractor.

Cullen and Hickman (2001, p.525) explain 'this introduces a 'whole-life approach' to acquisition, and has as one of the main tenets, the use of MoD Integrated Projects Teams to work closely with all contractors and their suppliers in order to identify 'Gainshare' opportunities'. Gainshare is the cooperation between MoD and its prime contractor to identify possible savings which can then be inserted into the contract agreement.

The MoD has fast-tracked the implementation of the IPT policy. The Smart Procurement Implementation Team (SPRINT) was tasked with creating the IPT structure by April 2000. NAO (2002a, p.11) comments 'the Department acknowledges that its approach to the creation of IPT structure was pragmatic and therefore likely to require modification. Since inception, the Department has made modification on a case-by-case basis through the creation of new IPTs, termination of existing IPTs and transfer of projects between IPTs as it has learnt from experience and its capability requirements have changed'.

Humphries and Wilding (2001, p.85) highlight 'the government made a clear statement of policy that its smart procurement initiative depended heavily on the concept of partnership in order to reap the benefits of competition and collaboration'. Cullen and Hickman (2001) argue that the initiative, however, tries to match opposing cultures. They suggest 'English commercial contract law' which has at its heart arms length contractual relations, prohibits the collaborative working relationship demanded of the IPTs ethos.

The NAO (2006a, p.18) report on successful projects through maximising contracts contradicts Cullen and Hickman's (2001) view on the effects of contracts on IPTs. 'Nearly 80 per cent of project teams surveyed considered they had a good relationship with their contractor... On the same basis, a similar proportion of industry contractors thought they had a good relationship with the Department... '.

The test of the success of this relationship ultimately lies in the ability of the IPTs to deliver value for money. The atmosphere under which the contract was agreed will also have an impact on the way the IPT mechanism will work. If the prime feels that it needs to regain some lose from its negotiated pricing; the IPT will most likely feel the strains of these price-focussed engagements. The point is that the success of the IPT is determined by the procurement process.

2.4.3 Acquisition Reform

The MoD recognised that in order to reform its industrial strategy it needed to look beyond procurement and focus on the entire acquisition process. The Smart Procurement Initiative was renamed Smart Acquisition, in 2000. MoD (2001, p.4) states 'the aim of Smart Acquisition is "to enhance defence capability by acquiring and supporting equipment more effectively in terms of time, cost and performance." Understanding this aim means understanding that the effective acquisition and support of defence capability.

This aim gives equal emphasis to initial procurement and support, as integral parts of the overall acquisition process’.

Smart Acquisition aims to improve the relationship between the MoD and the defence industry, like its predecessor. There are seven principles to Smart Acquisition:

- A whole life approach, typified by applying through life costing techniques
- Integrated Project Teams (IPTs) with clearly identified customers
- A better, more open relationship with industry
- More investment in the early project phases
- Effective trade-offs between system performance, through-life costs and time
- New procurement approaches, including incremental acquisition
- A streamlined process for project approval

(www.mod.uk, accessed 15 November 2008)

With these principles, the MoD is making an explicit change in the way it wants to do business with its industrial base. The MoD wants to move away from the adversarial relationship which has typified defence equipment acquisition and create a partnership approach.

MoD (2002a, p.14) explains ‘Smart Acquisition has engendered a profound change in the relationship with industry throughout the supply chain. With industry increasingly involved in providing long-term service to the MoD, we have recognised that a partnership approach, building reliable links with suppliers, is often the best means of realising our goals’.

This partnership is built on a number of acquisition models, which are chosen on the basis of project best-fit rather than “one-size-fits –all”. The DPA was responsible for using a variety of contractual models to support the partnership with industry, and to seek mutual benefit through appropriate acquisition models (MoD 2005, p.31).

NAO (2005a, p.7) explains that successful delivery of major projects requires certain characteristics in a partnership. ‘Successful working relationships are characterised by soft factors such as team working, trust and honesty, when the Department and industry partners on a project display these behaviours they are more likely to develop a common understanding of the tack, the progress being made and give early warning of problems’.

Tangible factors such as dealing with risk can play an important role too. MoD (2005, p.31) explains ‘partnering relationships, designed for mutual benefit, that recognise that risk is shared and reward performance, are more attractive to industry. The UK has a history of leading the way in deploying innovative acquisition and financing models in defence, for example PFI and PPP, and continuing to develop experience in these areas will allow us and our key suppliers to provide us with better value capability, more consistency and clarity and hence less risk, and better profit returns to industry’.

Effective ongoing management of a project and the interface with the prime contractor on the basis of a sound understanding of the remaining risk and the effectiveness of outstanding mitigation actions is fundamental to successful procurement performance. Where there is poor understanding and mitigation of risks, cost and time contingencies can quickly be eroded by cost escalation and delays, adding to the pressures on the procurement budget. Conversely, where there is good understanding and mitigation of risks, it may be possible to release some cost contingency, relieving pressure elsewhere on the procurement budget’.

(NAO 2004b, p.15)

Dealing with risk is an important part of Smart Acquisition. MoD (2002) states 'Smart Acquisition calls for a greater proportion of defence equipment budget to be spent during the earliest phases of projects, in order to reduce technical risk before their main investment decision is made'.

Participants from industry in Gray's acquisition review felt that the MoD moves to contract for procurement before properly assessing the technical risks of a project (Gray 2009, p.140). This is not in keeping with Smart Acquisition principles, nor does it follow the CADMID process where risk identification should occur in the concept phase.

MoD (2005) has in the Defence Industrial Strategy: Defence White Paper realised that there are challenges to acquisition reform. The way acquisition is being undertaken has significantly changed and Smart Acquisition is a part of this change. MoD (2005, p.131) states 'the nature of acquisition is evolving and we face an increasingly demanding and complex environment. Closer collaborative engagement between us and our industrial suppliers will be vital if we are to continue to deliver the improvements that the Armed Forces and UK taxpayers demand'.

Success in acquisition is judged, NAO (2005a, p.13) states, by 'the boundaries of a project [which] are the objectives, the time, cost and performance targets that the project has to deliver against and the plan for achieving them. The boundaries must be realistic and accepted by all stakeholders at the start of the project but, as with the project's

structures, must be flexible enough to evolve given that the circumstances to which the project is responding will inevitably change during its life’.

However, ultimately the success depends on how the project delivers the customer’s needs. MoD (2010, p.8) explains ‘success in acquisition ultimately rests on whether we deliver the equipment our Armed Forces need, when they need it, and to cost. This is not always a simple assessment to make; for example we might be compelled by circumstances to exceed a project’s budget in order to deliver required performance. We will, however, seek to develop better ways of measuring improvements in acquisition as part of implementing this strategy’.

Gray’s review to a certain extent places some of the faults of unmatched requirements with the customer itself. Customer 1 (to be explained further) is responsible for the formulation of the future military needs of the Armed Forces. Gray (2009, p.27) claims ‘unfortunately, this organisation (now the MoD Capability Sponsor) was denied the ability and authority to exercise proper control over its own budgets at that time, and this created a significant weakness in its structure. It was given power to choose what military capabilities it wanted to order, without being charged with the responsibility for balancing the books’.

This lack of cost control mechanism created the incentive for the Director of Equipment Capability (DEC) to order capabilities, which were not properly assessed for their cost

effectiveness. The representation in the Capability Sponsor also creates an unhealthy atmosphere according to Gray. The Capability Sponsor is comprised of single-services officers, which rotate into it and back to their own services. Their career progression is managed by their services rather than the joint organisation. This incentivises them to fight the corner of their own services, rather than look at the bigger picture (Gray 2009, p.30).

Staff rotation in MoD, specifically military personnel and civil servants, as a whole, is a major difficulty in the management of acquisition. IPT leader tenure (Gray 2009, f.8.2, p.184) compared between 2003 and 2009 levels of sample IPTs shows worrying signs of low levels of long-term tenure. The overall picture shows that IPT leader tenure is falling in 2009 in comparison to 2003. Thirty-seven per cent of IPT leaders stay with their IPTs for less than a year compared to twenty-three per cent staying for 3-5 years.

The MoD does believe, however, that it has achieved a great deal with Smart Acquisition. MoD (2005, p.131) states 'our Smart Acquisition initiative has delivered significant benefits for Defence in the form of improved performance and delivery of affordable, battle winning capability to the Front Line. The basic principles of Smart Acquisition still hold true and existing change programmes throughout the department provide a solid foundation on which to build'.

There has also been a positive view of the achievement of the implementation of the Defence Industrial Strategy. Gray (2009) states 'since the publication of the DIS in December 2005 there has been significant progress in five of the key sector strategies (maritime, rotary wing, complex weapons, fixed wing and land). These are beginning to result in noticeable benefits to the defence programme as a whole'. In fact Gray states that DIS reviews should be a regular part of acquisition review, possibly in conjunction with SDRs.

The implementation of its acquisition reform, in Smart Acquisition, and the Defence Industrial Strategy which laid out the way the MoD wanted to create collaboration with industry, was the beginning of the changes to the MoD. The latest of the reforms is the restructuring of its acquisition organisation with the merger of the DLO, DPA and the DCSA (Defence Communication Service Agency) to create Defence Equipment and Support (DE&S) in April 2007. DE&S has taken over all responsibilities of the previous departments; the main aim of the integration is to create a coherent organisation and remove dual accountability problems inherent in the past (MoD, 2007).

The merger of the DPA and DLO came about as a recommendation of the Enabling Acquisition Change report by McKane (2006). The difficulties of the acquisition process have been described as being due to the dual accountability of IPT Leaders to DPA and DLO creating conflicting priorities.

The changes implemented to resolve these problems have tackled the 'symptoms rather than the root cause' (McKane 2006, p.29). Thus, McKane (2006, p.30) recommended '...the establishment of an integrated procurement and support organisation by merging the DPA and DLO, led at 4-star level (or equivalent)'.

The merger has allowed the dual accountability problem to be removed, and in place is a single organisation responsible to overseeing the whole life cycle. The IPTs are encompassed within the DE&S structure and have a clear and single point of contact, in terms of accountability. The Gray (2009) report commended the speed and effectiveness in which the DE&S was established. However, there are some issues which it recognises as creating difficulties in acquisition with regards to the way DE&S works.

To deliver capability, the Capability Sponsor organisation and DE&S need to work closely together to ensure that Users needs and perspectives are considered alongside the industrial, technical and financial constraints that arise in meeting these needs. However, in practice, close working has translated into lack of clear project ownership and has diluted accountability for poor performance. Within the wider Defence community DE&S is often seen as "most responsible" for project difficulties, however the seeds of the problem were often sown in the planning systems, providing DE&S with an impossible task to deliver to time and budget from the outset'.

(Gray 2009, p.137)

Further changes occurred in the privatisation of some of the MoD research capability. The Defence Evaluation and Research Agency (DERA) were created when the Defence Research Agency and twelve science and technology offices were amalgamated in 1995.

The MoD wanted to explore ways of creating a PPP for DERA in 1997. NAO (2007a) explains 'the department divided DERA by reviewing each division and keeping the most sensitive areas of the business within a new trading fund, named the Defence Science and Technology Laboratory (DSTL). All other functions were transferred to a new corporate entity, 100 per cent owned by the Department, which became QinetiQ'.

QinetiQ became a private entity in 2007, when the MoD sold its shares (retaining special shares for national interests) to The Carlyle Group. The privatisation process was highly controversial (Mollas-Gallart and Tang, 2006) due to issues surrounding intellectual proprietary rights (IPR) in the commercialisation of QinetiQ. In the close partnership between industry and the MoD, the data sharing environment meant a great deal of IPR transfer was occurring.

NAO (2007a, p.15) explains 'one of the key areas of concern for the defence industry was the ability of QinetiQ to exploit commercially the wealth of intellectual property it had been given by the defence industry. Because DERA was seen as an extension of the Department, contractors had in the past exchanged intellectual property with DERA

without regard to whether this was required under their contract and sometimes without maintaining thorough records’.

The MoD undertook a Records Audit and Separation Project to classify and transfer intellectual property to the appropriate organisation. Where intellectual property was generated by DERA and where current work was being undertaken by QinetiQ using industry IPR, QinetiQ were able to retain these IPRs. However, QinetiQ was ordered to transfer previously attained IPR, from industry, back to the MoD. Not everyone was happy with this process and there is a feeling in industry that QinetiQ were able to gain an unfair advantage (Mollas-Gallart and Tang, 2006).

Financially the separation of DERA and the sale of QinetiQ proved successful. However, the MoD’s desire to become an ‘Intelligent Customer’ (MoD 2005) may have suffered. Mollas-Gallart and Tang (2006, p.205) suggest that ‘to remain an intelligent customer and decision maker the MoD needs to ensure that it has access to a foundation of knowledge covering a broad spectrum of technologies... This risk [to impartiality and independence] will be compounded if that knowledge and expertise is being re-interpreted for the Department by a commercially motivated DERA with its own shareholder-driven agenda’.

2.4.4 Organisation of Acquisition

This section will discuss the organisation of the defence acquisition process. This will focus on the customers of the acquisition, the role the DE&S plays on managing the defence acquisition process and the role of the IPTs as the mechanism for the process.

In the acquisition process the MoD delivers to two customers, these are known as Customer 1 and Customer 2. The nature and responsibilities of the two customers are outlined in the Enabling Acquisition Change report (McKane 2006, p.12):

- *Customer 1* identifies the equipment capability required to meet Defence Strategic Guidance and translates this requirements into a balanced and affordable equipment programme. Customer 1 is organised by capability area, each managed by a Director of Equipment Capability (DEC). Each DEC acts as a *Single Point of Accountability* responsible for coordinating the delivery of new and enhanced military capability across all Defence Lines of Development. In addition, each DEC has delegated authority from the Chief Scientific Adviser to define the need for research to capture capability requirements and to explore and de-risk possible technology solutions.
- *Customer 2* is responsible for the delivery of operational military capability through properly trained and equipped force elements, managing equipment once it is in-service, and providing advice and expertise to Customer 1. There are two dimensions to the Customer 2 role, *Core Leadership*, providing the user perspective and managing allocated resources to achieve the required output (undertaken by Front Line Commands).

However, the merger of the DPA, DLO and DCSA to create the DE&S has created a change in the way the defence acquisition process is managed. The MoD has used the merger and the Defence Industrial Strategy as a tool for changing the way it organises the acquisition process.

This has created an emphasis on creating a 'unified customer' represented by the Equipment Capability Customer (ECC). MoD (2007, p.7) explains ' the ECC, acting as Sponsor for new and enhanced military capability, will host and lead the Capability Planning activity, working with the Users (Single Services and Joint), DE&S, the central planning staffs, and the Science, Innovation and Technology (SIT) community to develop options to change military capability in response to changing policy priorities, threats, capability excess or shortfall, resource constraints, out of service or obsolescence, or industrial constraint and opportunities'.

In its blueprint for the DE&S, MoD (2008a, p.5) explains 'DE&S is part of the MOD 'Unified Customer', working with others to translate industrial capacity into effective military capability to conduct and support operation, merging equipment and support provision with other Defence Lines of Development. Fundamental to the success of the MoD Unified Customer is that participants exercise shared ownership for Through Life Capability Management decisions, whilst retaining clear responsibility for delivery of business activities within the defence acquisition process'.

In its business strategy the MoD (2008b, p.7) sees 'DE&S works as part of "Team Defence" including Head Office, User, Sponsor, technology community and Industry' as shown in Table 2.3.

Table 2.3: DE&S Interface (MoD 2008b, p.7)

Group	Activity
Sponsors – Deputy Chief Defence Staff (Equipment Capability)	Leads TLCM, including commissioning DE&S to deliver an Equipment & Support Plan over the long term (10 years). The Sponsor programmes the costs of new equipment and associated support in years 1-10 and support for in-service equipment in years 5-10. The main effort of DECS moves, therefore from supervision of DE&S projects to planning and managing through life capability.
User – the single Service Chiefs of Staff and Front Line Commands.	Responsible for programming the support of in-service equipment and delivery of commodities (e.g. fuel) and services (e.g. strategic communications) supplied by DE&S over the short term (4 years). The User is also responsible for merging Defence Lines of Development into effective military capability within a specific Service domain, and bringing a greater awareness of the opportunities and limitations of in-service equipment and support. The User also has an independent assurance role at Main Gate, assessing whether the proposed solution can be delivered as an effective and integrated military capability at an In Service Date.
MoD Centre – the central finance staff.	Generates Resource Control Totals for the Sponsor and the User, and programming Operating Costs for DE&S. The RP divisions also input central planning guidance and resource constraints to Through life Capability Management decision-making and take impacts and opportunities for non-equipment Defence Lines of Development to the relevant owner for consideration or action, where these are beyond the User’s authority.
Science, Innovation & Technology community	Supports decision making, investigates and tests proposals, advises on the technical “art of the possible” and encourages innovation. DE&S interface with SIT is key to making sure that capability solutions fully exploit and pull-through technology opportunities.
Industry – DE&S Clusters are the primary MOD point of engagement for Industry.	Working under the strategic direction of the Defence Commercial Director to establish effective business arrangements with industry. DE&S will be commercially robust but flexible and fair. Through greater transparency and closer working with industrial capacity to meet the demands of TLCM. And, through netter understanding of the industrial supply chain, DE&S will explore a broader range of commercial approaches that deliver continued value for money.

The MoD (2008b, p.8) comments on its future, ‘by 2012, through PACE, we expect to have evolved into an effective and agile organisation where people are motivated by delivery and actively seek out opportunities to work here. Shorter acquisition timescales will help

people see results of their efforts. Specialist staff will be deployed where they are needed, using their expertise to better effect. Our simplified processes will allow us to work more effectively with Industry, and our innovative approaches will allow us to speed up acquisition and actively prioritise work to meet the needs of Sponsor and User’.

In the desire to ensure a unified organisation during the merger, it was decided that DE&S would become an integral part of the MoD rather than given agency status. This, however, has resulted in a lack of independence for the DE&S. This goes against the Smart Procurement Initiative which aimed at creating a clear distinction in the role of the requirements and the acquisition community (Gray, 2009, p.8).

Gray (2009, p.181) suggests ‘since cost estimates and technical specification are subject to influence from both Head of Capability and the military, DE&S is not sufficiently ‘arm’s length’ to be held accountable for problems in project delivery’. The recommendation by Gray was to give DE&S a Go-Co or Trading Fund status, in order to create a more arms length approach (Gray 2009, p.210).

This recommendation was rejected by the MoD. The MoD (2010, p.13) states ‘we decided not to follow the Gray recommendation that Defence procurement be undertaken at arm’s length from MOD, possibly by a [Go-Co] entity. In our view, acquisition is core business for defence and there is strong benefit from involving the military in the process,

and from developing a more integrated approach to managing military capability. Both would be much harder under an arm's-length relationship'.

The Gray report also suggests that the command structure in DE&S needs to change. It points out that there is only one three-star official, the Chief Operating Officer, responsible for the acquisition programme, it suggests this task is too large and needs support. The report also suggests that while the Chiefs of Materiel were of use in establishing the DE&S, the role held by three 3-star chiefs is no longer required. Continuing on the command structure, there is also a suggestion of rationalising the roles of Finance, Chief of Staff and Corporate Services (Gray 2009, p.43).

In a speech at the Royal Institute of Chartered Surveyors, the current Defence Secretary – Dr Liam Fox stated his desire to 'decentralise the MoD'. The Defence Secretary outlines his plans to split the MoD into three areas 'policy and strategy, the armed forces and procurement and estates'. He also stated his view that the MoD "can't keep on making long specification and then re-specifications".

Dr. Fox hinted at the restructuring of the top ranks, as well as the reduction of civilian workforce at the MoD. A Defence Reform Unit has been set up as a steering group for the reforms by the coalition Government (Conservative Party and Liberal Democratic Party) to be led by Lord Levene (ex-Chief of Defence Procurement) (BBC NEWS, 2010).

The DE&S will manage the IPT mechanism throughout the CADMID lifecycle, taking on the role once held by DPA and DLO. The unification of the role is to create better management of the process by removing dual accountability and allowing the DE&S to support the acquisition process from 'cradle to grave'.

MoD (2007, p.15) states '...the primary "building block" of DE&S will continue to be the Integrated Project Teams (IPTs). Many of these are already genuinely through-life and for these the most significant change may be to the clusters in which they sit. All IPTs will continue to develop and maintain their relationships with the ECC, as Sponsor, and the Front Line Commands/PJHQ, as User, governed by CSAs with their customers'.

Kebede *et al.* (2009, p.323) describe the mechanisms used to create an IPT for an Advanced Military Vehicle (AMV) acquisition. 'One important idea behind the IPT was to have a co-located project team that could take advantage of team working, good communication and cooperation. This notion was realized through continuous interaction enabled by prescribed tasks, teams and routines. The management of the relationships (customer, user, suppliers) was therefore a key tactic in this programme'.

The case study, however, identified a number of challenges for encompassing the collaborative nature of the IPTs. The bidding process of the AMV was through a competitive bid process which required a great deal of negotiation on the pricing. This created the difficulties in investing funds into the collaborative process, such as the

'shared data environment'. The difficulties of bringing forward the customers requirements negotiated in the bid created tensions between industry and the MoD, which made it challenging to incorporate collaboration in the IPT (Kebede et al., 2009, p.323).

The primary purpose of the IPT is to be a mechanism for delivering and managing defence projects by engaging with the prime contractor. Kebede *et al.* (2009) provide the structural organisation of the AMV IPT, which is based on sub-system teams, providing a clear identification of the roles, responsibilities and routines of the IPT team members.

However, Kebede *et al.* (2009, p.325) find that 'the dynamics of task and team are structured around the best practice routines at both the corporate and IPT levels, yet these are perceived to be inadequate. Those at the IPT level are mandated by the MoD; while those at the company level are mandated by the corporate level'.

The IPT mechanism provides a process in which DE&S can manage and support the acquisition process. The structural organisation of IPTs creates clear identification of responsibilities for the acquisition process, which DE&S and industry can identify when engaging with the project. The case study of the AMV IPT by Kebede *et al.* (2009) identifies the challenges facing IPTs in order to encompass the desired collaborative relationship with Industry. This will be further challenged by changes in defence capability, which complicates the number of stakeholders engaging with IPTs.

2.5 Changes in Defence Capability

2.5.1 Network Enabled Capability

The organisational changes in the MoD of the last decade have been matched by the developments in technology and capability of the UK Armed Forces. There is a transition from platform-centric to network-centric equipment in defence capability. This is a consequence of the MoD realising that it needs to take advantage of the advances in information communication technology to meet its operational requirements.

In this vain the MoD has introduced a programme known as *Network Enabled Capability* (NEC) as part of its modernisation of defence capability. James (2004, p.15) describes 'Network Enabled Capability comprises three core elements: sensors (to gather information); a network (to fuse, communicate and exploit the information); and strike assets (to deliver military effects)'.

Platform-centric equipment differs from network-centric equipment in that they are based on a separate and individual configuration. Platforms are purposely built as self-sustaining components, which may provide a number of capabilities. Within network-centric equipment the component is network-ready, as in it is ready to be virtually connected to other equipment which has a network infrastructure.

It is enabled by information communication capabilities to work as a system of systems. A platform may have its own information systems, but it is not designed to connect with other systems other than through communication systems. Networking systems have the ability to exchange data and even commands in certain circumstances.

The challenges which would face the MoD as part of the introduction of a move towards network-centric equipment were identified early on. The MoD (2002, p.22) states 'the strategic environment will continue to change, and our military priorities will develop likewise. Exploitation of the potential of networked capability, using information superiority linked to precision attack systems to achieve a rapid response to often fleeting opportunities, poses new challenges both to Smart Acquisition and to our industrial policy. It presumes a further shift of emphasis away from platform-based acquisition, and towards the development of sub-systems independently from their host platforms'.

A graphic representation of NEC is shown in Figure 2.4; in the graphics MoD represent their expectation of NEC. Platforms will be connected using ICT systems creating a network which will take advantage of C4ISTAR (Command, Control, Communication and Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance) capability to create a coherent operation involving a range of personnel in the Armed Forces (Figure 2.5) abroad and at home.

The MoD is engaged in a significant modernisation of its communication capabilities (James, 2004) in order to meet the challenges and requirements for NEC. The MoD views the introduction of NEC into the armed Forces as a long term process. The plan is to achieve interconnection by 2009 in the initial state; a transitional state characterised by integration in the middle of the next decade; and mature state characterised by synchronisation in the second decade (MoD 2005, p.106).

Figure 2.4: An Example of NEC (MoD 2005, p.21)

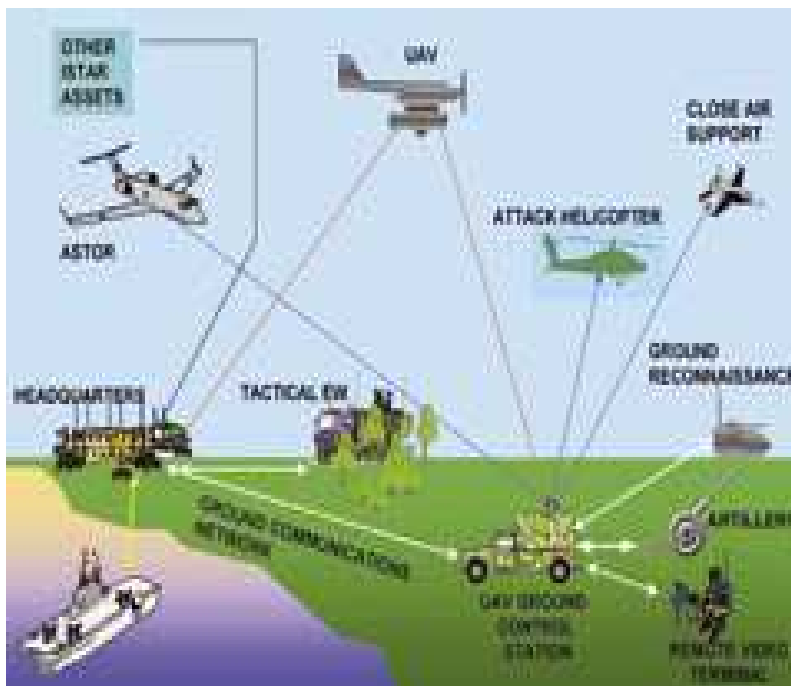


Figure 2.5: High-Level Network Map of NEC (MoD 2005, p106)



The figures emphasise the interconnectedness of the sub-systems to create a network in the operational arena. This is emphasised by the description provided by the MoD (2005):

The growing importance of networks and their interactions may make a platform-centric perspective less useful in future when considering how to meet operational capability requirements, and where the critical interfaces between systems may reside. Some systems, particularly those which seek to integrate a number of different sensors and weapons systems across platforms, are likely to require deeper and more complex integration into their platforms and into networks. This may sometimes require deep knowledge of the sub-systems involved and their potential contribution to military capability separate from their physical integration into a platform system'.

(MoD 2005, p.61)

The challenges to the acquisition of NEC equipment is the speed at which procurement is undertaken, the inherent risk involved in such a process and the regular disposal of legacy C4ISTAR systems. Quintana (2007, pp.5-6) explains 'but speeding up acquisition will also require the MoD to accept greater risk... In addition, industry stressed the need for rapid prototyping... Finally, industry believes that the MoD also needs to be serious about early disposal of equipment. The C4ISTAR sector moves too fast to think in terms of 25-30 years. There is a real incentive to buy rapidly if equipment is only going to last five years!'

2.5.2 Capability Management

The MoD emphasises that in order for NEC to become a part of the MoD's defence capability, changes in the management of defence capability are just as important. MoD (2005, p.59) points out 'in a period where platforms are likely to remain in-service for many years, unless systems engineering capability and vital long-term knowledge are maintained, it is little use investing in cutting-edge science. New technologies will have less benefit without knowledge of how they might be exploited into existing equipment'.

The NEC programme will rely on embedding new networking technology into existing platforms and systems, as well as newly procured equipment. How the technology will be procured is also an important question for the MoD and its partners in Industry, whether it should be done through COTS procurement or through customised designs from existing systems providers. As explained earlier, NEC has put the spot light back on the defence

acquisition process; the main issue being whether current acquisition practices are adequate to deal with the complexity behind NEC.

James (2004) states 'NEC poses a challenge for Smart Acquisition because the delivery of NEC requires very different acquisition practices to those used for platform-centric equipment'. Through-life costing techniques and investment during early phase of development are particular points of Smart acquisition which do not fit the lifecycle of NEC technology.

Whereas platform lifetimes can reach 30 to 40 years NEC technology, specifically computer software and hardware for networking have much shorter lifetime of 2 to 5 years. This creates a challenge for the MoD's acquisition policy and structure, especially for the CADMID lifecycle.

With the changes in defence capability MoD has been looking at how it manages its capabilities:

There is a general shift in defence acquisition away from the traditional pattern of designing and manufacturing successive generations of platforms – leaps of capability with major new procurement or very significant upgrade packages – towards a new paradigm centred on support, sustainability and the incremental enhancement of existing capabilities from technology insertions. The emphasis will increasingly be on through-life capability management, developing open architectures that facilitate this and maintaining – and possibly enhancing – the systems engineering competencies that underpin it'.

(MoD 2005, p.17)

A result of this and in consultation with the Acquisition Policy Board (APB) an examination of the through-life capability management (TLCM) approach was reviewed by McKane (2006). The APB is responsible for acquisition policy, consulting with a number of stakeholders in industry and government to implement changes in the MoD's acquisition process. It reports to the Defence Procurement Minister.

McKane (2006, p.10) provides the APB definition of TLCM as '...an approach to the acquisition and in-service management of military capability in which every aspect of new existing military capability is planned and managed coherently across all Defence Lines of Development (DLOD) from cradle to grave'.

McKane (2006, p.22) comments 'TLCM implies an approach to the planning and management of military capability which takes a holistic view of current and future capability, including all its components. This implies arrangements which enable those responsible for planning individual capabilities to trade between the present and the future. In the context of incremental acquisition, this applies in particular to the mix of expenditure on new equipment and on maintaining in-service equipment, though it could also apply to the other components of capability'.

MoD (2007, p.7) explains 'TLCM will consider a much wider range of options for meeting capability needs, examining both new and in-service equipment solutions, exploring opportunities and implications for trading across all DLODs – Equipment (including

Support), Personnel, Training, Logistics, Infrastructure, Concepts – while considering capability delivery on a much longer term, programme basis’.

Gray’s acquisition review was highly critical of the implementation and implications of TLCM. Gray (2009, pp.40-41) explains ‘as a general proposition, it is hard to argue with the assertion that managing these related activities in a co-ordinated way is anything other than a good thing. It is in the execution of this assertion that potential problems lie. In the first instance, the objective that TLCM is trying to achieve is fearsomely complex and inherently based in financial data’.

Gray believes that the Programme Boards, under the control of Capability Planning and Capability Management Groups, created to co-ordinate the financial and programme data, do not have sufficient data or adequate financial modelling provisions. He argues that the ‘Lines of Development’ represented on the Programme Board create an extra layer of difficulty in decision-making, compounded by the regular staff rotation system. The board lacks a leader in the form of an accountable decision maker (Gray, 2009, p.41).

Gray (2009, pp.41-42) comments ‘furthermore, a key consequence of effective TLCM may be to increase short-term spending to gain economies in the longer term (i.e., “spend to save”). The current structures and financial environment within the MoD do not provide fertile ground for this type of trade-off to take root. The TLCM structure is, therefore, unobjectionable in principle, but fraught with potential pitfalls in practice’.

The response in MoD (2010, pp.15-16) is 'the through-life approach to managing capability was established in 2006, and is continuing to evolve. It has already delivered benefits, but will take some time to achieve its full potential. In line with Government best practice, our approach has widened its focus from individual projects, to embrace 'programme management' – the co-ordinated management of groups of related projects and activities'.

While it is understandable that the MoD argues TLMC is still maturing and expanding its focus to the programme level, it fails to address the crucial issue of funding. TLMC relies, as Gray points out, heavily on a 'spend to save' philosophy. This philosophy has become even more difficult to implement in the last few years due to the effect of the financial crisis on government spending. The current Coalition government are looking to make savings now; this creates a challenge for TLMC.

With the introduction of complex networking technology to the more platform centric technology, how the system is managed and maintained will differ from usual practice. With networking technology maintenance needs to occur more frequently than the normal ICT components in platforms. Networks require updates in software more regularly, and to a lesser extent to hardware.

Networks will also be open to a more unconventional attack than the Armed Forces are used to, through technological warfare. Attacks on computer systems are more easily

deployed in a network environment. It is also important to recognise that by deploying networking capability, the effective use of such means of warfare becomes an important part of the operation.

Thus, the MoD (2004, p.7) highlights 'the key to NEC is effective information management. The availability and use of information has always been essential, but we have not always been as effective as we should be in making it available. As newer information systems are introduced, the function of Information Management (IM) will grow in importance and effective IM tools will become a key enabler'.

It is difficult to see how the MoD can continue to fund its modernisation programme in telecommunication, which is key to NEC success, under current financial constraints. The operations which the UK is currently engaged in Iraq, Afghanistan and Libya are unlikely to hinge on superior telecommunication, but rather on ground and air force capability.

NEC is a modern military capability, one which may be crucial in the future if the UK is threatened by more sophisticated enemies. However, at the moment the threat emanates from the challenges of asymmetric warfare, and thus information superiority is secondary to the need for ground and air superiority.

The MoD's recent *Strategic and Security Defence Review 2010* (SDSR2010) has signalled that there will be minimal support for expensive modernisation programmes. HM

Government (2010, p.9) outlines 'one clear lesson since the last Strategic Defence Review in 1998 is the need more frequently to reassess capabilities against a changing strategic environment. We must avoid the twin mistakes of retaining too much legacy equipment for which there is no requirement, or tying ourselves into unnecessarily ambitious future capability'. This does not bode well for the NEC programme.

The impact of SDSR2010 on defence acquisition policy is, in my view, minimal in terms of process. Unlike SDR1998, the Coalition government refrained from introducing new procurement, or acquisition, methods in the review. While they outlined a number of defence equipment programmes which will be cut as part of the review, there was a lack of vision in acquisition strategy. However, they have set-up a parallel review to look into the running of the MoD and reform of the Armed Forces, to be led by Lord Levene.

What is clear is that the MoD will be engaged in frequent, and rather uncomfortable, renegotiation of contracts with Industry as part of its obligation to reduce the defence budget deficit which the Coalition government puts at a figure of around £38 billion (HM Government, 2010, p.31).

These renegotiations will certainly create a strain on defence industrial relations and will have an impact on the 'partnership' ethos. It is going to be a hard sell for the MoD to be urging for greater partnership from Industry, while at the same time having to renege on its commitments on previous and current defence contracts.

These developments in defence will have a major impact on defence industrial relations for the next few decades. It is too early to say how this will impact the move to partnership. Partnership may be the tool to ease the transition towards leaner defence acquisition or it may break under the strains of the conflicting interests in profit versus value for money.

2.6 Summary

The privatisation of the defence industry by the Thatcher government in the 1980s has been a catalyst for change in the defence sector. Privatisation returned the way defence equipment is developed and acquired, by government, back to its original space in the private sector. This industrial change forced the restructuring of the defence sector, beginning with the consolidation of the national defence industry.

In a market-based industry, the MoD was forced to review its role as a customer and its position as a monopsonist. With the power of being a single buyer, and at a time when defence spending was at a low, due to the post-Cold War era, the MoD used its regulatory powers to create competition within the defence sector. It changed the type of contracts it used for defence acquisition from the 'gold-plated' cost-plus approach to competitive pricing. Commentators of this change believed that this signalled the end of the 'cosy relationship' between the MoD and industry.

Due to the monopolistic nature of the national defence industry, MoD followed a policy of economic liberalisation. It sought and encouraged bids from foreign companies interested in entering the UK defence industry. These competitive pressures and the reduction of defence spending had a profound effect on the national defence industry. Some defence companies decided to divest their defence business, enter strategic alliances with other national or foreign-owned companies, or commit investment to the global defence industry.

The larger UK defence companies became competitive in the global defence sector and gained considerable power in the national defence industry. This balanced the MoD-Industry relationship, to one where a monopsonist was dealing with mainly monopolist sectors. The relationship turned adversarial. The MoD tried to use its powers to exert time and cost pressures on industry and in turn, industry used their expertise to extract greater amount of investment and transfer more risk.

The MoD recognised in the late 1990s and early 2000s that this had to change. This created the introduction of the Smart Procurement Initiative and later the Smart Acquisition Principles. The introduction of IPTs and the CADMID lifecycle resulted from these policy initiatives.

The Defence Industrial Strategy in 2005 and Enabling Acquisition Change in 2006 reviewed how the MoD delivers its acquisition projects and recommended certain organisational

restructuring. This resulted in the MoD describing its desire to work collaboratively with industry using a Prime Contractor arrangement and IPT mechanism. The creation of DE&S is supposed to facilitate a more coherent organisation working with IPTs to facilitate collaboration with industry.

DE&S was successfully established and is continuing its operations as the organisation responsible for managing the acquisition process, as a whole. It uses the IPT mechanisms to manage individual defence projects, and clusters them into TLM groupings. While the IPTs provide a structural advantage to managing the acquisition process, the case study by Kebede *et al.* (2009) provides evidence for some concerns in terms of the way it engenders its aim of collaboration with industry.

The Gray (2009) report criticised some of the changes made in the conception of the DE&S, specifically the role it plays in the MoD, its leadership structure and some issues of accountability. The MoD (2010) while accepting that more work needs to be undertaken to create the desired performance of the DE&S, on the whole rejected a number of the recommendations made by the Gray report.

However, it is clear that the MoD will be facing some major changes to its structure under the current coalition government of the Conservatives and Liberal Democrats, who are looking to make savings for their programme of reducing the national budget deficits. It is

clear in speeches by the Defence Secretary, Dr. Liam Fox, that the restructuring of the MoD is one area of change.

Some of the comments made by the Defence Secretary had similarities to the recommendations made in the Gray Report. The decentralisation of the MoD and the restructuring of the top rank in the organisation seemed to be in synch with the Gray Report recommendations. While it is most likely the DE&S will continue to exist as it is (especially due to the time and money put into its establishment) its relationship with the MoD is likely to change.

The introduction of NEC has created a number of challenges for defence acquisition. The MoD is assessing how NEC can be fully implemented as part of the UK's defence capability. The change from a platform-centric to network-centric equipment programme has created a number of technical and acquisition challenges for the MoD.

In terms of the acquisition challenges, the major challenge is how the flexible and rapid pace of NEC technological change can work with Smart Acquisition principles. The CADMID process is known for its long-term, through-life focus; it is not clear how this process would work with NEC acquisition. There are also issues as to how IPT clusters would share information for NEC systems, where intellectual proprietary may belong to more than one company.

The MoD is facing dynamic and immediate operational requirements; change is an important part of being able to deal with emerging threats. What the MoD requires from procurement projects can change from its inception to when it is scheduled for service. It is important that flexibility in the contract allows for negotiation with suppliers on adjustments.

These changes, however, need to be appropriately costed and provide value for money. The MoD feels that it needs to create a collaborative relationship with prime contractors, specifically using an IPT mechanism, in the defence acquisition process in order to fully utilise this new method of contracting.

The challenge is how the MoD facilitates a truly collaborative relationship with its primes after decades of adversarial contractual relations. It also becomes a greater challenge under the financial pressures the Coalition government finds itself in. SDSR2010 has outlined the cuts in the defence budget, facing the MoD, which will result from cutting, scaling back or renegotiating defence programmes.

Therefore, the answer offered to the research question posed in the introduction section of this chapter is: the transaction between the MoD and Industry is dependent on the acquisition policies followed by the MoD and the processes implemented. The changes in defence policy over time have transformed defence acquisition from one where there was a 'cosy relationship' with industry to an 'adversarial relationship'. Recently, the MoD has

made certain efforts to move to a more 'collaborative relationship' with industry. This research will ascertain the success of such a policy.

An investigation of the economic arguments for collaboration can aid understanding on why it may be an important change in acquisition policy. The contribution of this paper to knowledge and research will be in an analysis of these economic arguments. The research will look at the defence acquisition process using the economic factors that represent it.

This thesis will also present some ideas as to how the collaborative agenda for defence can be attained. The contribution of changes in defence policy – such as IPTs, the CADMID process and TLM – to creating collaboration will be investigated looking at historical documentation. This will allow us to understand what changes are needed, if any, how these changes may be implemented and what difficulties may arise.

3 The Economics of Defence Procurement Policy

3.1 Chapter Overview

Having described a brief history of UK defence acquisition; the focus of the thesis turns to a discussion of alternative economic theories applied to defence procurement policy. Defence procurement has been a focus for several economic theories. Economic theory desires to explain the structural and philosophical aspects of human engagement with respect to monetary exchanges. The question in this chapter is, thus: Which economic theory can be best applied to understanding defence procurement?

The focus of the economics of defence procurement policy is to understand the structural and philosophical aspects of the organisational engagement of the MoD (in the UK perspective) and Industry. This research favours the application of Transaction Cost Economics (TCE) principles to defence procurement. Through providing alternative approaches to TCE, it will be argued that the strengths of applying TCE to defence procurement out-weights alternative economic theory.

The discussion will begin by reviewing the general economic arguments in defence procurement policy. The focus will then move to recent examples of discussions on the economics of defence procurement policy. The economic principles of competition theory, principal-agent theory, and game theory have been chosen as alternatives to TCE,

as they are the most frequently applied theories to defence procurement. The use of these economic theories in defence procurement policy will be addressed.

TCE plays an important role in defence procurement policy. The theoretical basis of TCE will be presented, in greater detail, in the following chapter. In this chapter the focus will be to critique studies which have used TCE for defence procurement in order to see what lessons can be learnt from the authors approaches. The purpose of structuring the thesis in this way is to provide first a comparative discussion of the economics of defence procurement and then to look at greater detail (in Chapter 4) the TCE approach used in this research.

3.2 Economic Description of Defence

3.2.1 Uncertainty in Defence Markets

There are three seminal works on the economics of defence procurement policy. These are Hitch and McKean (1960), Peck and Scherer (1962) and Williamson (1967). The authors lay out the economic nature of defence. While they speak mainly of the US case, it can be equally applied to the similar transactional context of the UK. The discussions vary from the value of using economic analysis for defence procurement, uncertainties which exist in defence production, the market-based transactions, to the contract design of the exchange of products and services.

Hitch and McKean (1960, p.4) provide the foundations for an economic analysis of defence. They state 'national security, from the point of view of an economist, may be said to depend on three things: (1) the quantity of national resources available; (2) the proportion of these resources allocated to national security purposes; and (3) the efficiency with which the resources so allocated are used'. The aim of this research is based mainly on the third point of efficient use of resources in defence procurement.

The authors support the basis of applying economic analysis to defence strongly. They argue that it is not merely an administrative question to be solved using management theory, but that there are alternatives to the approach of managing the resources of the State in the pursuit of national security, which needs to be analysed using an economic perspective. It seems their analysis is based on the view that management theory is limited to the appropriate use of available resources, whereas economic theory describes choices to be made in deploying the resources to alternative outcomes.

As such, Hitch and McKean (1960, p.118) explain 'the essence of economic choice in military planning is not quantitative analysis: calculation may or may not be necessary or useful, depending upon the problem and what is known about it. The essential thing is the comparison of all relevant alternatives from the point of view of the objectives each can accomplish and the cost which it involves; and the selection of the best (or a "good") alternative through the use of appropriate economic criteria'.

It is, therefore, as applied to this research, a question of what is the best possible way for the MoD to procure goods and services from the supplier. This leads to several alternative routes of procurement, supply agreements, requirements and so on. The economic analysis is thus in the choice of these alternative routes, which can deliver 'value for money' for the MoD. In this, lies the justification for using an economic approach for defence procurement – specifically, alternative choices in resource allocation in defence procurement.

This choice of alternative use of resources is not as straight forward as it may seem. The choice is impacted by uncertainties in defence markets. These uncertainties make it difficult to make informed decisions of the alternative routes available in defence procurement policy. It is impossible for humans to calculate all contingencies in the uncertain defence market. There is then a risk in any decisions taken that unforeseen events may take place, which adversely affect the decision taken.

Peck and Scherer (1962, p.17) define uncertainty as 'the relative unpredictability of the outcome of a contemplated action'. What makes the economics of defence different to any other economic process? Peck and Scherer (1962, p.17) believe '...uncertainty is a pervasive feature of all economic activity, and most of the uncertainties in weapons acquisition have their commercial counterparts. But there is uniqueness in both the magnitude and the diverse sources of uncertainty in weapons acquisition'. Uncertainty is seen to be at the centre of the economics of defence.

The magnitude of the uncertainty is characterised by the lengthy process of defence contracting. This uncertainty pervades the product lifecycle of the defence equipment. Defence products such as fighter aircraft, nuclear submarines, and helicopters and so on, can take up to 20 years to enter service and can be expected to stay in service up to 50 years.

The lengthy production and service time's puts a great amount of uncertainty on the efficacy of the product in a changing operational environment. The strategic uncertainties may mean that a certain weapon may no longer be appropriate in a new terrain or operation.

The diversity of the uncertainty in defence acquisition can be seen in all aspects of the process. Starting with the threat, in a complex international political framework it is difficult to predict where the threat may come from. We may identify certain nations which pose a threat to our security, but it is difficult to say what may take that threat towards a direct attack on the nation, allies or interests. It is also uncertain for those in charge of procuring weaponry at which point the civilian government will decide action is required to confront the threats.

Those who are charged with deciding the requirements of the Armed Forces face political uncertainty. Political uncertainty is only one facet of the uncertainties facing defence acquisition; there are uncertainties in contracting process, the supplier, the technology,

the cost, time and performance etc. The magnitude of the uncertainty intensifies and creates greater risk.

Peck and Scherer (1962, p.24) make these points by explaining the uncertainty in two dimensions: internal and external uncertainty. 'Internal (or technological) uncertainties relate to the possible incidence of unforeseen technical difficulties in the development of a specific weapon systems. External uncertainties relate to factors external to an individual project and yet affecting the course and outcome of the project, they originate in the pace of technological change in weaponry, changes in strategic requirements, and shifts in government policy'.

Williamson (1967) concentrates his efforts on the contractual uncertainties of defence acquisition. Williamson (1967, p.222) explains 'what I want to call attention to is that it is not merely cost uncertainty, but uncertainty together with large size, that is responsible for the large financial risk associated with defence contracts'. Williamson, like Peck and Scherer, points to the size of the uncertainty.

Peck and Scherer (1962, p.44) go one step further by suggesting it is not only that the uncertainty increases with the number of contracts in defence, but it is also unique in nature to defence. It does not exist elsewhere in the economy. We therefore have the magnitude, diversity of cause and uniqueness of the uncertainty, which makes the economics of defence separate to any other.

3.2.2 Contract Mechanisms

As with any economic activity there must be a buyer and seller. In the case of defence this is rather straightforward in that the buyer is usually a single source. This is the case in the UK, and also in the US. Peck and Scherer (1962, p.49) explain 'there is in this country but one ultimate consumer of advanced weapons, the United States Government'.

This point has been discussed in length in Chapter 2 with regards to the UK case. The monopsonistic and monopolist nature of the defence economy plays a great role in the varying economic theories of defence, as will be discussed in the next section. Exports may provide an alternative source for the seller; however this is regulated by government and is mainly for the purpose of off-loading surplus production in order to reduce production costs. The government is able to withhold any defence products it deems of strategic importance, from the international market.

The private enterprise of defence production has been a more regular form of defence economy in the US, rather than the UK, in the last century. Peck and Scherer (1962, 57) describe the transaction involved in the US defence acquisition. '... The price of a weapon system is not determined by market competition. Instead, the price is largely determined by reimbursement of costs actually experienced plus a fee bargained for in advance'. Deciphering the price, after the production, creates a great amount of difficulty for the buyer.

The fact that private enterprise is unable to raise the large capital required (specifically during the 20th Century) to fund the production of defence equipment is an important factor in defence economics. It leads to Peck and Scherer (1962) arguing 'it is not only that a market system does not now exist in the weapons acquisition process. We can state the proposition more strongly. A market system in its entirety can never exist for the acquisition of weapons'.

This is due to the fact that the pure market system provides a clear division between the seller and buyer, the producer and consumer. I specify the 20th Century because there have been instances before that period where the state leased or bought weaponry (much less complex and costly than now) directly from private enterprise or individuals. In the 21st Century we have also seen the introduction of PFI as a clear indication of targeted private funding of defence equipment production.

However, the level of investment required to build technically complex equipment is unmanageable for the private sector to undertake independently. Thus, the norm is that defence departments invest a majority of the funds for defence projects, especially the procurement costs such as feasibility studies, production and manufacturing costs. Suppliers may invest their own funds in the project in order to gain ownership of certain assets. Since, the investment requirements of major defence projects in the 21st century are of the level unaffordable to the private sector, this supports Peck and Scherer (1962) proposition of a pseudo-market system in defence.

Nevertheless, there is still the issue of how the buyer ascertains the true price of the product. This is done through a contracting process, where the transacting parties agree to the conditions of the exchange. Williamson (1967) addresses the economics of defence contracting by discussing two specific contracting processes popular in the US and UK, at the time of his writing, cost-plus-fixed-fee (CPFF) contracts and incentive contracts. These days in the UK cost-plus contracts are rarely used, instead it is more common to see incentive-based and firm- or fixed- price contracts. It is, however, important to highlight how Williamson (1967) provides the economic argument for contracting.

Williamson (1967, p.222) explains 'the overriding justification of CPFF contracts is that of cost uncertainty. A degree of uncertainty pervades all R-and-D work, and early production runs frequently involve product modifications and technique developments that render cost estimation on these items difficult'. The major reason for CPFF is to protect the supplier from ruin. The alternative would be to give the supplier a portfolio of defence contracts or large profits in order to protect themselves from bankruptcy. The alternatives are not politically favoured in the US and thus CPFF provides for a risk-aversion mechanism (Williamson 1967, pp.222-223).

Peck and Scherer (1962, p.206) point to the disadvantage of CPFF. 'Throughout the weapons industry the use of cost reimbursement contracts makes economies of scale less decisive than in commercial operations. Under such contracts the firm with higher costs

because of its size can pass such costs on to government, if the buyer either does not recognize these costs or is willing to bear them’.

The issue with cost-plus contracting is that it is perceived as encouraging ‘gold plating’. The contractor will do all that they can to increase the costs to ensure a greater return. There are no incentives to reducing the expenditure of the project. Williamson (1967, p.228) explains ‘... it has long been recognized that overruns have been excessive and that incentives for cost control have been weak under the CPPF form of contracting, as a remedy for this condition, incentive-fee contracts have been employed’.

Incentive fee contracting places some of the risk towards the contractor. The contractor gains the savings when the project is within or below cost and is responsible for the costs if it overruns. It is in the interest of the contractor to be economical when planning their expenditure. The efficacy of the incentive-fee contract, for the buyer, thus no longer lies on the production side, but on the negotiating power.

The risk of cost escalation may be averted by incentivising the seller; however, the issue turns to the effectiveness of target cost estimations. Williamson (1967, p.230) explains ‘although an underestimation bias exists when CPPF contracts are in force, an overestimation bias may operate when incentive-fee contracts are used; for the greater the differential between negotiated target costs and true expected costs, the larger the potential profit return to the contractor’.

The incentive-fee contract sets up the bargaining situation between the buyer and seller. The buyer has a great deal of negotiating power due to its position as a monopsonist. The seller, however, can rely upon the scarcity of competition to drive a hard bargain. Williamson (1962, p.232) points out that the US Services (procurement agencies for the Armed Forces) are at a disadvantage due to '... inferior status is generally imputed to the civil servant relative to his counterpart in private industry'. This makes bargaining, even in a position of superiority through monopsony, a difficulty.

3.3 Applying Economic Theory to Defence

3.3.1 Economic and Formal Contractual Relationships

Cullen and Hickman's (2001) conceptual paper discusses contractual arrangements and their effects on collaboration between buyer and supplier. They use a case study of the Aerospace sector, mainly in the defence industry. The use of IPTs as a mechanism for contractual relations is a central part of their study. They use TCE as one of their economic theories to describe contractual relations, as well as using the principal-agent theory, and extensions to both these theories. The basis of their paper is to argue that the English commercial contract law with its characteristics based on an arms length relation is incompatible to the collaborative nature of IPTs.

TCE is a theory developed by Oliver Williamson, as an extension of Ronald Coase study of *The Nature of the Firm*, looking at the way transactions occur within the firm and across

markets. The aim is to understand the elements involved in the exchange of goods or services between a buyer and supplier. Williamson outlines a number of factors affecting the transactions, within the firm and across the market, and develops this over time to include environmental conditions and human behaviour assumptions.

In terms of the environmental conditions affecting a transaction are uncertainties, asset specificity and frequency and the behavioural assumptions are that of bounded rationality and opportunism. These environmental conditions and behavioural assumptions interact in the transaction and can lead to an 'organisational failure' problem.

The transacting bodies can follow a variety of transaction governance frameworks from market, hybrid to hierarchical governance in order to install contractual safeguards in the transaction to counter-act the hazards created by the environmental conditions and human behavioural assumptions. As such this all takes place under the institutional context (or as Williamson called it 'atmosphere) in which the transaction is placed (Williamson 1975, 1981, 1985). This theory will be explored in greater detail in the following chapter, as it is the basis on which this research relies upon.

The Principal-Agent theory, on the other hand, is an expression of the relationship between a principal who seeks an agent, with specialist knowledge or due to the reason that the task requires coordinated action. The theory is then based on the alignment of interests between the principal and the agent. Since, the principal may have conflicting

interests with the agent, whom may have his/her own interests at heart, or that such interests may not be efficiently delivered by the agent.

Therefore, the principal will seek to create incentives for the agent to align its interests with that of the principals. The challenge then becomes how the principal can effectively design such incentives and the adverse selection and moral hazards which need to be mitigate in these incentive mechanisms. The principal-agent exchange (e.g. shareholder and manager or manager and worker) is based on hierarchical control under conditions of information asymmetry and the conflict of each party seeking to maximise their own self-interest (Moe, 1984, pp.755-757).

Cullen and Hickman (2001) use TCE as a way of explaining how a bilateral relation prevails and how in such situations defence transactions can be understood in terms of uncertainty/complexity etc. The principal-agent theory, however, is used to discuss the effectiveness of the contract in creating (or inducing) a collaborative relationship. Their main argument is that the situation, which the IPTs are placed in, creates a conflicting atmosphere between collaboration and contracting, which assumes failure to deliver. This results in a less open relationship between the MoD and the prime in the IPT.

The threat of claims being made against the prime due to observable delays and other performance criteria, whilst in a transparent IPT environment, is of great concern to the authors. Cullen and Hickman (p.531, 2001) explain 'however, if they [the prime

contractor] do not reveal their fears and they manage to put their programme back on track, unless the product that they ultimately deliver is defective, they will not have exposed themselves to a risk of a contract claim as they have withheld information from the other party'.

This suggests the MoD would use the IPT mechanism as a monitoring mechanism. The prime would in this environment be risking a claim for not meeting contractual obligations. It would therefore be in the interest of the prime to limit or withhold information, in certain areas, to the MoD. This would damage the collaborative nature of the IPT and would limit its effectiveness. Thus, the authors point to the conflict between collaboration and contractual controls.

It is an assumption by Cullen and Hickman (2001) that the purpose of the IPTs is to monitor the primes. No evidence of that has been presented by the authors, nor has this been an espoused aim by the MoD. Secondly, if the programme is completed in the long run, and the recovery is successful, the MoD will have no basis on which to make a legal claim. As delivery of the project would already have been discussed beforehand at conception, or would be under continuous assessment between the MoD and its primes. As such, the MoD would already be privy to the information which the authors claim they seek.

A second example given by Cullen and Hickman (2001), for the problems of contracting and collaboration, is one of new product development. Proprietary rights of innovative products during the production phase, which the prime discovers and wants to keep secret. They argue that as the new 'innovative' idea is not part of the contractual obligations of the prime, they may seek to keep this hidden from the MoD, which would be difficult in an IPT situation.

This situation may be due to the fact that the MoD provides the investment in the production phase. They therefore may have an IPR claim for any new product development, which results from this investment. The primes would want to exploit the new product development, which they may argue was not in the contractual terms. This creates a conflict, which exists only in the case of the IPT mechanism where the staff from the MoD would be able to identify such opportunities.

Cullen and Hickman (2001) thus highlight the difficulty of sharing data and space between buyer and supplier. There are conflicting desires, and while sharing information may reduce transaction costs it may also create opportunistic behaviour, they argue. It would seem asymmetry of information provides some protection for the prime.

One can argue that if the primes were worried about such issues they would not enter into the collaborative working arrangements of an IPT in the first place. Since the primes under prime contracting possess greater control and influence on investments and

proprietary rights, in return for greater risk-sharing in the contract. Therefore, the fact that the MoD is aware of the product does not necessarily disadvantage the prime, as is assumed by the authors.

I suggest that Cullen and Hickman (2001) concentrate their efforts too much on how the contractual arrangements of 'English commercial contract law' will negatively impact on collaboration, rather than discussing how commercial contracts can be written to further collaboration and reduce organisational failure. They do suggest, however, a 'code of conduct' which would preside over the rules of engagement in IPTs, in order to create a tradition of trust.

3.3.2 Porter's Five Competitive Forces

Braddon and Hartley (2007) approach the aerospace industry (military and civilian) with a different economic perspective. They look at the competitive forces driving the UK aerospace industry. Braddon and Hartley (2007, p.716) explain 'the UK aerospace industry is highly imperfect comprising domestic monopolies in military and civil aircraft (BAE Systems), helicopters (AgustaWestland) and engines (Rolls-Royce), a duopoly in missiles (MBDA; Thales: Racal and Short Missiles Systems) and oligopoly in the equipment sector (BAE Avionics; Thales; Smiths; Cobham)'.

The study by Braddon and Hartley (2007) assesses 'Porters five competitive forces model' for the aerospace industry. Braddon and Hartley (2007, p.718) suggest 'the UK aerospace industry has at least three intense competitive forces, namely, powerful buyers in both military (government) and civil markets (prime contractors), fierce competitive rivalry and substitute products: hence the prediction that UK aerospace will have few firms which are very profitable for long periods'.

Porter's (1980, p.4, f.1.1) five competitive forces model has *industry competitors* at the centre of the model, with *potential entrants, suppliers, buyers* and *substitutes* impacting competition. He explains 'the goal of competitive strategy for a business unit in an industry is to find a position in the industry where the company can best defend itself against these competitive forces or can influence them in its favor'.

Braddon and Hartley (2007) assess these competitive forces using statistical indicators for the period 1980 to 2000. The indicators they look at are: labour productivity, output, size of firms, development time-scales, labour hoarding, exports and profitability. These indicators are used to identify the UK aerospace industry strength as compared to the USA, within the EU and other rivals. It is clear that the military market plays a major role in the competitiveness of the industry as a whole.

Braddon and Hartley (2007) conclude 'the UK aerospace industry is the largest in the EU. The USA is the UK industry's major rival and provides the 'benchmark' for assessing its

performance. On this basis and using the indicators reviewed in this article, the UK industry improved its competitiveness over the period 1980 to 2000'. It is important, especially in the military market, that the UK aerospace industry can be competitive in the global market.

Export is an important part of the defence industry; it allows UK market leaders to take advantage of surplus production and allows the government to offset production costs. Hartley (1997, p.45) explains 'the UK defence equipment industry is a major exporter, achieving a substantial surplus on its balance of trade. Aerospace dominated defence exports, averaging 85% of total defence export sales over the period 1990-95 with the Middle East as a major export market (e.g. Al Yamamah contract with Saudi Arabia)'.

The competitiveness of the UK defence industry in the global market plays an important role on the national buyer-supplier dimensions. This has become especially true in recent years, where the dominance of large UK defence suppliers, such as BAE Systems, has been pronounced. However, the MoD is able to influence BAE Systems activities in export using its regulatory powers. BAE Systems, for its part, has become a multinational organisation and is able to use that as leverage in its home markets (UK, US, Saudi Arabia, Australia and India).

3.3.3 A Game Theory Approach

Gardener and Moffat (2008) from Defence Science & Technology Laboratory explore how game theory can be used to understand the prevailing 'conspiracy of optimism' in defence acquisition.

The 'conspiracy of optimism' Gardener and Moffat (2008, p.226) explain is '... a potential source of poor behaviours in some acquisition programmes, whereby the uncertainty of the acquisition environment can be exploited by both sides for short-term gain. This has effects similar to the Prisoner's Dilemma, in which the rational strategy for any player is to defect from the common good; here the rational view must be short term focussed although this is very much at the expense of behaviour which would benefit the whole community'.

The *Prisoner's Dilemma* game is a non-zero sum game which results in a greater or less than zero outcomes. Thus, two actors may not cooperate in the game even where it is in their interest to do so. In game theory non-zero sum games represent social-economic questions (von Neumann and Morgenstern, 1953, p.504), such as the one Gardner and Moffat (2008) represent in the conspiracy of optimism.

Gardner and Moffat (2008) suggest optimism-bias creates the cost and time overruns which plagues the defence acquisition programmes. It is also what creates the adversarial nature of defence acquisition. In its desire to create a more collaborative partnership the

MoD needs to identify the reasons behind the optimism-bias. The study by Gardener and Moffat (2008) provides an explanation looking at the acquisition process at the point of equipment planning.

This is at the point where decisions are taken to procure the equipment. This point is where the 'Capability Goals' flows to 'Current Capability' creating the 'Unidentified Capability Gap'. Gardener and Moffat (2008, p.226) state 'the point at which the unidentified gaps become identified, and by whom, is a critical question which lies at the heart of trust and communication between integrated customer-supplier project teams. The obsolescence rate drains the current capabilities tank in a predictable way'.

When the capability gap has been identified and is ready to be exploited, it is up to the MoD and Industry to decide the structure of the programme. Gardener and Moffat (2008, p.227) explain 'in the very broadest terms both MOD and Industry make a choice between a realistic strategy or an optimistic strategy when it comes to estimates of performance, time and cost for a given project'.

The game they identify is a 2 by 2 matrix of the choice, by the MoD and Industry, to be optimistic or realistic. They identify the payoffs qualitatively for each scenario and then transform this into numerical format using a mathematical formula which identifies the 'degree of realism', 'threshold of credibility', 'real cost of a project' to calculate getting the Equipment Plan and winning the bid.

Gardener and Moffat (2008, p.229) find 'certainly in the case where both parties are knowledgeable, or where the procurement is off-the-shelf, any conspiracy of optimism will have little credibility'. This finding is when the 'threshold of credibility' is at 95%; several games take place at differing levels of credibility.

The 'threshold of credibility', denoted as r , is linked to uncertainty. Gardener and Moffat (2008, p.229) explain 'as the level of uncertainty (corresponding to the value of the parameter r) varies, we in fact have a family of such games, and we investigated the change in payoff to the players as a function of r '.

Uncertainty plays an important role in the way the transacting parties behave. As was suggested, when there are higher levels of uncertainty the parties feel they will gain from acting opportunistically and creating an optimism-bias. This optimism-bias then distorts the cost, time and user requirement targets for a defence project.

Gardener and Moffat (2008, p.230) conclude 'with certain incentives, the rational strategy is to be overly optimistic at the initial stages of a project. Discussion of how pay-offs may be changed to influence behaviour in desirable directions has identified *uncertainty* as a key factor. Uncertain contexts provide more opportunity for unreality or optimism in time and cost estimates'.

While game theory can provide a sense of understanding for the motivations of the optimism-bias and what the optimal choice in the game should be; it provides little in terms of a solution to the problem. In that, these games are given as pre-determined moves rather than changeable situations. This research instead approaches UK defence acquisition with the view that by identifying characteristics of the acquisition process, recommendations can be made for changes to be made.

3.4 Applying TCE to Defence Acquisition

3.4.1 TCE in MoD Supply Chain Management

Humphries and Wilding (2001; 2004a; 2004b) undertook lengthy research on the supply chain management of the MoD supply base which involved '54 monopolistic, two party relationships' between the MoD and its suppliers. Questionnaires were given to 600 staff (including MoD and Industry) and a semi-structured interview with 115 team leaders, were undertaken using Williamson's (1975) framework (Humphries and Wilding, 2004b). Williamson's (1975) framework was adapted by transforming the negative aspects into positive proxies, such as changing opportunism into reliability (Humphries and Wilding, 2001; 2004b).

The authors phrased their questionnaire in order to identify the framework in terms of the level of negativity in the response to their ‘positive’ questions. Humphries and Wilding (2001) list their five dimensions in the questionnaire which they apply in their pilot project, as shown in Table 3.1.

Table 3.1: Humphries and Wildings Proxies for TCE Factors

TCE Variable	Humphries and Wilding (2001) Proxy
Bounded rationality	Creativity
Uncertainty/complexity	Stability
Information Impactedness	Communication
Opportunism	Reliability
Small Numbers	Quality

Humphries and Wilding (2001, pp. 85-88) outlines the ‘drivers that lead to the adoption of supply chain management’ which are: search of flexibility, SCM Relationships, Partnering for Supply Chain Success and Partnering in Practice. Humphries and Wilding (2001, p.91) explain ‘the main obstacle is motivating chain members and company staff by communicating a clear vision of the benefits to be achieved in an environment of great complexity and uncertainty’.

Humphries and Wilding (2001, p.92) justify their use of TCE by stating ‘although the authors can find no empirical research on the Williamson’s economic organization failure framework, it seems to have face validity because the factors it represents are readily observable in the defence procurement situation’.

Humphries and Wilding (2001) study begins with a pilot project of a \$40 million per year contract between the MoD and a monopoly supplier of aircraft spare parts and provision of repair services. They use the questionnaire mentioned, providing them to team leaders and staff on the project. This was followed-up by a 30 minute semi-structured interview with two team leaders (Humphries and Wilding, 2001, p.93).

Using the responses Humphries and Wilding (2001) built a conceptual framework which mirrors Williamson's organisational failures framework. Their conceptual framework uses the key word responses to represent each of Williamsons TCE factors. Of the findings Humphries and Wilding (2001) point out '... the lowest scoring aspect (stability and reliability) especially highlight a mutual lack of confidence and trust and explain the poor performance against the contract. Although the communication dimension rated 58%, both team leaders mentioned the poor quality of shared data and their fear that the other party would use honest performance figures as a weapon against them'.

Humphries and Wilding classification method is, in my view, problematic. It can be contested that the 'positive' elements that they have assigned do not provide the opposite and equal meaning to the 'negative' classification of the original Williamson (1975) framework. For example; Williamson (1975) suggests '...information problems can develop even when parties have identical information and, a fortiori, if information differences exist'. Humphries and Wildings (2001) labelling of the 'positive' element of information impactedness being 'communication' seems to be inconsistent with TCE.

The existence of communication does not necessarily remove the problem of information impactedness. To explain this further, there are two cases of communication which can lead to misrepresentation. The first; information can be deliberately misrepresented by being erroneous or incomplete information. The second case is a lack of accuracy in 'forecasting' information which the authors have included in this dimension.

These examples clearly point out that communication can occur, however information impactedness still remains, communication cannot represent the opposite effect of information impactedness. The other four classifications can also be deconstructed in a similar manner; therefore the questionnaires do not, in my view, provide an accurate representation of the Williamson (1975) framework, as suggested by Humphries and Wilding (2001).

If the so called 'positive' elements do not represent the TCE organisational framework, Humphries and Wilding (2001; 2004b) can not make generalisations from their questionnaires, only assumptions. However, Humphries and Wilding (2001; 2004a; 2004b) do provide a clear and concise discussion of how the TCE framework can apply to the defence acquisition case, even if their methodology seems somewhat flawed.

Humphries and Wilding (2004a) develop the theory further using the finding of the pilot project. They identify the changes in the way the MoD does business with Industry in terms of the principles of TCE. Humphries and Wilding (2004a, p.101-102) suggest the

consequences of ending the 'cosy relationship with industry' is that 'in seeking to obtain public expenditure value for money the UK MoD attempts to drive down industry's profit to a "reasonable" level, and in turn the contractor attempts to inflate the view of his costs to ensure the best possible rate of return'.

This situation mirrors that of Williamson's (1962) explanation of introducing incentive-fee contracts in place of CPFF. In that situation, the contractor reacts to the change in contracting terms by overestimating costs to ensure they gain on virtual savings. The economic problem in the desire to bring the contractor in line with the buyer's expectation is identified as information impactedness by Humphries and Wilding (2004a, p.102). This then creates a situation of bounded rationality, where industry loses its incentive to perform better and MoD reduces the resources available. The consequence is an adversarial relationship between Industry and MoD (Humphries and Wilding, 2001, p.102).

Humphries and Wilding (2004a) explain the reasons for the lack of positive outcome in the study. Humphries and Wilding (2004a, p.107) suggest 'information impactedness and bounded rationality have been added as negative influences. The model defines "reduced propensity to leave" as a significant outcome. However, in a UK DP [Defence Procurement] monopoly neither side is free to quit and this would instead provide a further negative input to relationship commitment and exclude the beneficial influence of relationship termination costs'.

Humphries and Wilding (2004b) build on the pilot project and extend it to encompass a larger sample of respondents and projects. The 'exploratory research' of 54 monopolistic, two-party relationships, surveying 600 staff and 115 team-leader semi-structured interviews was undertaken. The same theoretical framework using Humphries and Wilding (2001) five dimensions was applied to the questionnaires and interviews, and the findings are explained below.

As predicted by the model, lack of investment in specific assets such as workforce stability and product/process development, the use of inadequate performance measures, opportunistically providing poor goods and services, and using proprietary information as a weapon, reduced the chances of achieving interdependence and equitable outcomes. On the other hand, despite the adverse monopolistic influences, strong counterbalancing, positive business drivers were able to produce examples of relationship-building, specific investments, co-operative behaviour, open communications and a desire to reduce the burden of governance through more equitable, long-term arrangements.

(Humphries and Wilding 2001, pp.266-267)

Humphries and Wilding (2001; 2004a; 2004b) use the TCE framework as a process to explain the economic nature of a monopolistic supply chain. They attempt to show the factors which greatly affect the relationship between the MoD and Industry, using their five dimensions developed from the TCE organisational failures framework.

The study highlights the unique nature of the defence economics that it exists between monopoly and monopsony pairings. This particular aspect makes the industrial relations an interesting area of economic analysis. While, the findings of their research provide interesting insight into UK defence procurement their application of TCE is, in my view, over-stretched.

3.4.2 Transaction Costs in US Defence Acquisition

There are more cases of a transaction cost approach to defence acquisition in the U.S as compared to the UK. This is to be expected as TCE originates from the US and is more widely accepted there. Masten *et al.* (1991) test the make-or-buy decision in Naval Shipbuilding and, Crocker and Reynolds (1993) look at contractual completeness in Air Force engine procurement contracts.

A more recent application of TCE in defence acquisition practice is a paper by Melese *et al.* (2007), which applies TCE to the US defence acquisition practice. Melese *et al.* (2007) focus their attention specifically on the question of how TCE can explain and reduce cost growth in US defence spending. Franck and Melese (2008) follow-up the 2007 paper with a discussion on the make-or-buy dilemma in defence for which TCE, they suggest, is well placed to answer.

Furthermore, they explain a second desire, if buy is the answer to the dilemma, how can the US Department of Defence (DoD) ensure a 'better outcome for taxpayers and the military'. This is the value for money question posed in UK MoD projects. Angelis *et al.* (2009) build on the theoretical work with a study exploring transaction costs on DoD cost estimates.

Masten *et al.* (1999) case of Naval Shipbuilding is an empirical test of the transaction cost approach. Masten *et al.* (1999, p.2) wanted to directly test the 'internal organisation costs

in integration decisions and identify ways of overcoming the difficulties inhibiting direct tests of transaction-costs arguments’.

They state that the basis of TCE is that the analysis of transaction costs of an organisational form is focused on identifying minimising costs of governing exchange relationships by choosing the most effective organisational arrangements (Masten *et al.*, 1999, p.2). They assign algebraic expressions to the internal organisation, market organisation, and ‘true’ cost of organisation to create mathematical expressions of the make-or-buy decision. Masten *et al.* (1999, p.4) explain ‘the resulting model is amenable to qualitative choice estimation techniques such as probit and logit’.

Masten *et al.* (1999, p.8) apply TCE to the ‘... procurement of components and services by a large naval shipbuilder. Whereas previous empirical research on the determinants of vertical integration has dealt with manufacturing applications, the process of building a ship more closely resembles a construction project. Differences in the nature of construction and manufacturing operations, in turn, influence the circumstances that give rise to opportunism and that determine the level of organisation costs more generally’.

The hypothesis of the research is that in the first place, the costs of human and physical capital specificities on internal organisations would be less than in a market organisation. However, it is temporal specificity which is of more consequence to the reason for internal organisation. In that the effective use of human and physical asset specificity is

reliant on the scheduling, and as such the cost for internal organisation may be of concern but are less than the strategic holdups in the market.

The advantages of internal organisations in deploying human and physical capital specificities are that they are not dependant on the supplier, but in-house sourcing. As TCE theory suggests the cost of transaction in internal organisation is reduced since the exchanges are internal and are governed through hierarchical administration. In terms of the temporal specificities, it is clear from that, the hierarchical administration has greater control over scheduling as compared to out-sourcing from the market. The market as a whole is expected to create greater transaction costs when dealing with idiosyncratic investments, due to the strategic hold-up by suppliers.

Using Coase's argument, the final hypothesis is that the shipbuilders primary operation is the organisation of low-technology, labour intensive task and thus internal organisation costs should smaller and vertical integration more likely (Masten *et al.*, 1999, p.11). Masten *et al.* (1991), however, provide a caveat in terms of the limits in testing transaction cost hypotheses using a 'reduced-form equation'. Such a caveat should equally apply to Humphries and Wilding's studies.

Masten *et al.* (1999, p.20) conclude 'the results support some but not all of the standard transaction-cost arguments. One of the principal findings is the temporal specificity can be a major determinant of organization form in some settings. The results consistently

indicate that the prospect of holdups where the timing of performance is critical represents a significant hazard of contractual exchange in construction projects and increases the likelihood of integrating the corresponding activities’.

The results present a mixed view, while the effect of relationship-specific asset specificity makes integration more likely; it is primarily due to internal costs rather than market costs as the theory suggests. The effect of complexity on human asset specificity is antithesis to the theory. The physical assets specificity findings show that the cost of organisation and integration vary and shows a weak indication for the hypothesis (Masten *et al.*, 1999, p.22).

The authors suggest that explanation is elusive for this effect. However, I argue that Williamson viewed complexity as, on par with uncertainty, a destabilising factor in the contract environment and as such would drive the transacting party toward the ‘make’ decision. This reduces the effects of complexity and the uncertainties in the transaction, by allowing the hierarchical administration to manage these factors. Whereas in the market, the transaction will require contract safeguards to be put in place to deal with transacting under conditions of complexity and uncertainty.

As for the physical capital asset specificity, Masten *et al.* (1991) found weak indications for a make or buy decision; as such they explain recent theory and evidence suggest a move towards “quasi-integration”. This hybrid form of governance is accepted as an alternative

form of governance mode. It may not have been appropriately captured in their research as they were looking at it in the form of make or buy (i.e. 0 or 1), rather than as a choice of alternative governance modes for transactions encompassing varied organisation arrangements.

Masten *et al.* (1999, p.22) make an important point ‘... the independent variables in our estimations, with the exception of SCHEDULE, have their principal influence on the costs of *internal* organisation. This both illustrates the hazards of testing transaction-cost hypotheses using reduced-form equations and argues greater attention should be paid to the determinants of internal organization costs as Ronald Coase has long contended’.

The authors are warning that to start of on the basis of identifying costs rather than the causes of costs can create a bias in the results. The determinants of transaction costs in internal organisations are of the same-kind as those in the market, however they manifest differently in these two forms of organisation. Thus, when identifying the costs it is important to focus on how these transaction costs impact the current form of organisation and how they may be affected if another form was taken – it is not given that changing organisational form will improve the situation.

Crocker and Reynolds (1993) focus their study on the contracting process involved in an Air Force engine procurement contract to assess how contractual completeness impacts the economic costs of contractual exchange. The arguments of the extent of

completeness in contracts are thus explored in this research. Crocker and Reynolds (1993, p.128) explain:

If all potential contingencies are covered by a total complete contract ($p = 0$), then there will be no opportunities for *ex post* bargaining. Alternatively, a totally incomplete contract ($p = 1$) places no strictures at all on the terms under which subsequent trade may be effected. Intermediate degrees of contractual completeness specify duties for some contingencies, perhaps the more easily anticipated ones, leaving the other possibilities to future resolution as events unfold. The degree of specificity actually chosen by the parties in a particular contractual setting should reflect an efficient tradeoff between the expected costs and benefits of contractual incompleteness.

The investigation into contractual completeness looks at the possible contracting schemes (as shown in Crocker and Reynolds (1993, Table 1, p.130)) with varying completeness. The data used in the study is of engine procurement by the Air Force from Pratt and Whitney and General Electrics for installation in F-15 and F-16 fighters. The contract for this procurement used pricing mechanisms spanning all the contract types, as shown yearly during the period 1972 to 1991 (Crocker and Reynolds, 1993, Table 2, p.134).

The case study thus presents an opportunity for a comparison looking at the transaction-cost argument of ex-post opportunism in incomplete contracts which Crocker and Reynolds (1993) argue is evident in defence acquisition. This research uses algebraic expressions, describing the empirical relationships in the choice of contractual completeness as a function of the variables that shift benefit and cost schedules (Crocker and Reynolds, 1993, p.138). Crocker and Reynolds (1993) point to a number of contributions their research makes to procurement policy.

Our results also have several implications for procurement policy more generally. The first concerns the emphasis by policymakers in the mid-1980s on firm-fixed pricing in development contracts to constrain seller opportunism and to contain cost overruns. While more complete contracts certainly mitigate *ex post* redistributive efforts by contractors, our analysis indicates that such benefits may be dwarfed by the costs of drafting truly complete agreements, particularly in complex exchange environments. A second and related point is that procurement officers should be granted the latitude to craft agreements on a case-by-case basis, where the design of a particular contract would depend on the specifics of both the product and the contractors'.

(Crocker and Reynolds 1993, pp.144-145)

The authors' conclude that contract incompleteness creates ex-post opportunism in the transaction. However, it is questionable that such behavioural assumptions can be measured empirically through purely contractual data. Opportunistic behaviour is difficult to identify due to its subjective and psychological nature, even if the authors point to rent-seeking evidence from suppliers in past incomplete contracts.

Opportunism is a more malign behaviour, which can be explained in terms of decision-makers self-interest seeking through improper behaviour. While it is true that complete contracts *may* safeguard from opportunistic behaviours, it may be presumptuous to suggest that the suppliers have behaved so.

In a more recent study Melese et al. (2007) apply TCE to US defence acquisition. Melese *et al.* (2007, p.357) explain 'this article uses [TCE] to help characterise, explain, and ultimately reduce the cost growth that plagues many of today's major investments in military capabilities'. Cost-estimating is the process in which forecasts are made in assessing the cost of the program or weapon system (Melese *et al.*, 2007).

The recommendation of the paper is to develop a cost-estimating technique which has greater scope than a focus on production costs. It is argued by Melese *et al.* (2007) that transaction-costs should be taken into account when making these cost-estimates, and by applying TCE these costs can be better understood.

It is suggested by the authors, that where production plus transaction cost savings can be made the make-or-buy decision is in favour of buy (i.e. outsourcing). Once such a decision has been made, then the questions left are what transaction costs accrue in dealing across the market and how these are represented by contract type. The authors go on to demonstrate how different transaction costs can create differing contractual arrangements.

The uncertainty/complexity, frequency and asset specificity within defence transactions will determine the type of contracting terms used, such as Fixed Price, Performance Based Logistics and Fixed Price (cost reimbursement) contracts (Melese *et al.*, 2007). Melese *et al.* (2007) provide a number of recommendations to reduce the cost growth evident in defence acquisition to cut the coordination and motivation costs, which they have identified in their application of TCE.

In an extension of the study, Franck and Melese (2008) focus their attention firstly, to the make-or-buy dilemma, and then on the mechanisms which ensure effective procurement projects. Franck and Melese (2008, p.110) explain the decision to make-or-buy hinges on

economic co-ordination and motivation. 'Organizations tend to specialize in "core" activities in which they have a comparative advantage, and engage in transactions (or outsource) to acquire other resources (e.g. contract labor), intermediate goods (material supplies, equipment, platforms, etc.), or services (IT, building, maintenance, etc.)'.

The decision in the military arena comes down to the advantage of outsourcing military equipment production. In terms of the coordination of resources the DoD, as does the MoD, recognises that Industry is best placed to provide equipment manufacturing services. Thus, even though there is transaction costs to be saved from internal organisation out-sourcing can provide advantages in managing transaction-specific investments.

However, this does not necessarily mean a move to a pure-market orientated transaction, rather that the organisation moves from the firm to a bilaterally dependent relationship with a private contractor. Therefore, the focus will turn to how the relationship between the bilaterally dependent DoD and military contractors can be structured.

As such the second aspect of the decision is motivation. Franck and Melese (2008, p110) state 'TCE predicts that parties involved in a transaction can benefit from co-operative agreements, but they are assumed to be self-interested and to have conflicting objectives (e.g., DoD – maximizes effectiveness subject to a budget constraint; defence industry – maximizes profits). As a consequence, parties in a transaction will not always have the

motivation to follow through on agreements – particularly when specific asset/investments are involved, and information is imperfect (incomplete and uncertain) or asymmetric (one party has an information advantage over the other)'.

In terms of dealing with the motivation problem, transaction governance can provide alternative means of structuring the relationship to ensure contractual fulfilment. There is the option of creating sanctions to ensure that the supplier is punished for any defaults on agreements.

However, there exists a problem in implementing the ultimate sanction, removing the supplier from future contracts. The reason for this is due to the “hold-up” problem, as Franck and Melese (2008) point out. The Government is locked-in to the supplier, and this may attract the supplier to behave opportunistically especially when it comes to pricing.

In TCE, the combination of transaction-specific investments and an absence of ex-post competition raises the possibility of a “hold-up”. The “foot-in-the-door” strategy adopted by some defense contractors offers an example. In that case, a low bid induces the government to hire the contractor, but the contractor anticipates that as it works closely with the government, and as it makes specific investments that facilitates that relationship (e.g. human and physical asset specificity), the government will become increasingly dependent on that contractor’.

(Franck and Melese 2008, p.112)

The government can deal with the “hold-up” problem by incentivising the contractor to act more efficiently by removing the risk. This can be achieved by the Government investing funds in the more risky parts of the project or by taking ownership of some

assets. The government can also induce the contractor with attractive rewards through an incentive-based contract (Franck and Melese, 2008, p.114).

Franck and Melese (2008, p.119) discuss the governance structures which can enable the transaction of defence equipment from Industry to DoD. They suggest that a hierarchy can lead to 'sub-optimisation' where 'lower-level goals fail to coincide with the global objectives of the organization'.

In order to facilitate cooperation in a situation where Franck and Melese (2008, p.119) state '... *ex-ante* competition among suppliers is transformed into an *ex-post* bilaterally dependent relationship, additional governance structures are required to induce cooperative adaptation'. These governance structures would look at 'verifying cost and performance information in incentive contracts'. However, such measures can increase 'external transaction costs'.

Angelis *et al.* (2009) build on the theoretical work done in Melese *et al.* (2007) and to a certain extent on Franck and Melese (2008). The focus in Angelis *et al.* (2009) is a study which investigates the possibility of measuring transaction costs on DoD cost estimates. They suggest that, as is the case with production costs being identified by a Work Breakdown Structure, transaction costs can also be identified. Thus, Angelis *et al.* (2009) hypothesise that transaction costs can be identified prior and during the project, in terms of the governance mechanism used.

Further, Angelis *et al.* (2009, p.5) suggest 'that higher programme costs observed during and after the acquisition project are *ex-post* indicators of hidden or unanticipated cost'. In identifying these transaction costs they believe that they can improve cost estimation methodology by explaining systematic cost estimation bias and generally improving the explanatory power of cost estimations (Angelis *et al.*, 2009, p.6).

The authors used a proxy for transaction costs in their study. The proxy is known as the Systems Engineering/Programme Management (SEPM) costs. They decided due to the difficulties in identifying costs from the buyer side, the DoD programme manager, they used the contractors programme manager cost information.

They were able to gain this from Cost Data Summary Reports. Angelis *et al.* (2009, p.13) explain 'a ratio of SEPM costs to total program cost (per the CDSRs) was calculated for each program. The hypothesis is that a higher ratio could be an *ex-post* indicator of higher transaction costs. To offer a preliminary test of this hypothesis, we developed two case studies (Javelin and ATACMS [Army Tactical Missile System])'.

The study looked at which programme had higher transaction costs. It was found that Javelin had higher transaction costs than ATACMS. The *ex-post* indicators identified a greater number of contracts used, for the former. There were three sources for the Javelin and only one for ATACMS. This indicated that the Javelin programme had greater complexity attached to it. Javelin was procured using cost plus contracting, whereas

ATACMS was mainly firm- and fixed- price. This indicated more uncertainty resulting in greater risk on the Javelin programme (Angelis *et al.*, 2009, p.15).

The calculated SEPM ratio also indicated a higher score for Javelin. Angelis *et al.* (2009, p.15) conclude 'this supports the hypothesis that programs with more complex, risky relationships (as evidenced by ex-ante indicators) will have higher transaction costs as evidence by the ex-post SEPM ratio indicator. What is not clear at this point is whether the SEPM ratio reflects management's efforts to control those transactions or if they are merely caused by the riskier relationships'.

Whereas identifying transaction costs in defence procurement can be undertaken using TCE with relative success. The challenge for TCE in transforming defence procurement is in the focus of 'motivation'. How to bring the interests of private contractors to be aligned with the DoD, or in the UK case MoD.

The work by the authors Masten, Meehan Jr., and Snyder; Crocker and Reynolds; Angelis, Dillard Franck and Melese, provides an example of how TCE can be applied to defence acquisition. There is, however, still a gap to understanding the means of using TCE to resolve the defence acquisition challenges of improved transaction governance.

Review of works done by Humphries and Wilding has provided an example of how TCE can be applied to the UK case and has highlighted the plethora of discussions it creates.

However, the works of the authors have also demonstrated, in my view, the frailties of trying to use abstract proxies as equivalents for transaction costs.

From the economic theories of defence procurement policy, presented in this chapter, the strengths of TCE as an applied tool has been justified above the others. TCE provides a focus on three main areas of procurement: the transaction environment, behavioural assumptions of decision-makers and the transaction governance. These three areas are key to understanding UK defence acquisition, the challenges and the way forward.

3.5 Comparative Discussion

The research question in this chapter focuses on assessing the most suitable economic theory for defence procurement policy. The choice made from the alternative approaches discussed in this chapter is Transaction Cost Economics. While not all economic theories have been discussed in this chapter the choice has been made on the basis that TCE is the most applicable economic theory in examining UK defence acquisition.

TCE provides discussion on not only how the procurement approach can be undertaken, but also post-procurement effects such as bilateral dependency and organisational changes. At the procurement phase itself the nature of defence procurement, in that it involves monopsony and monopoly players where the power balance is not as straightforward as a principal-agent interaction, makes TCE theory more applicable to this study.

Game theory looks at optional moves by each player neither focusing greatly on the motivation nor the various surrounding factors involved in decision-making. As for the competitive theory used in Braddon and Hartley (2007) study, its focus is on the macro-economic policies at the institutional level. While that plays a role on the transaction, it is not the main focus of this study.

There are other economic theories which haven't been chosen even though they provide a basis in procurement policy, such as resource dependency theory or path dependency. These theories do not match the transactional focus of this research, while they may discuss procurement decision there is less emphasis on the institutional efficiency focus of TCE.

Sherer and Lee (2002, p.103) suggest '[resource dependency theory] allows scholars to see how a standard has implications for change in terms of competition among organizations on the resource or input side'. This provides a greater focus on the resource than it does on the exchange.

The exchange relationship in the defence industry is not only dependent on the scarcity of the resources, but also on the nature of the transaction i.e. the interactions between the MoD and the prime contractor. Furthermore, the focus on resources in TCE is satisfied by the asset specificity factor.

In terms of path dependency theory, Kay (2005, p.553) explains 'a process is path dependent if the initial moves in one direction elicit further moves in that same direction; in other words the order in which things happen affects how they happen; the trajectory of change up to a certain point *constrains* the trajectory after that point'. This theory is similar to game theory in its emphasis on its choice sets and decision making.

However, it provides a narrow view of defence procurement since it provides sequential moves rather than the more complex situational nature of defence transactions. Even where similar situations occur, the choices taken for procurement may differ due to conditions of say uncertainty. In resource dependency theory and path dependency there is a focus on identifying the changes which occur due to resource constraints or decision making.

In TCE the aim is to understand changes where they occur or identify where changes are required, in terms of organisational failure. To understand the procurement decisions made by the MoD TCE provides a better prospective. It may take sometime to exhaust all possible economic theories which can be used to apply to UK defence acquisition. Some of the more commonly used theories have been presented, with specific studies being mentioned, and some have been discussed in this section. Nonetheless, it is clear in the comparative analysis, TCE makes for an effective economic theory to apply to this study.

TCE has its complexities, and as shown in some of the studies presented, applying TCE, there are cases where caution is required in its application (specifically in the use of approximations). However, overall it provides the best fit to the purpose of this research; that mainly being the interaction between the MoD and defence contractors in UK defence acquisition. In the following chapter a more in-depth analysis of TCE will be presented.

3.6 Summary

Hitch and McKean (1960), Peck and Scherer (1962) and Williamson (1967) provide the fundamentals in the discussions of defence economics. The focus is on the pervading uncertainties in defence acquisition and, the nature and uniqueness of these uncertainties. Uncertainty in the economics of defence is due to the scale of the complexity in political, strategic, technological and transactional sense.

It is difficult to predict wars, the way adversaries may engage in those wars may change and the terrain of the theatre may not be familiar. All these unknowns or unfamiliarity create a challenge to those responsible for defining the requirements and equally for those procuring the equipment.

Take for example the two wars which the US and UK, with varying coalition forces, are engaged in: Iraq and Afghanistan. The strategies in these wars differ due to the differing

nature of the adversaries, terrain, political stability and operational requirements. However, there have been problems in the deployment of equipment in both these wars.

In Iraq it was the inability to identify the dangers of road side bombs (improvised explosive devices). The transport vehicles were not adequately equipped to deal with such threats early on. In Afghanistan it was, in addition, the lack of helicopters and a deployed aircraft having to be recalled due to it being unable to land on the difficult Afghan terrain.

In these cases, the uncertainty was in the inability to identify the changing nature of the operation. It has been suggested on various news media that the post-invasion planning did not foresee the rise of militias and the entry of Al-Qaida in the Iraq conflict. Regarding Afghanistan, UK and US politicians have argued that changes in Taliban tactics from conventional to insurgency warfare transformed the operational requirements. These changes have been dealt with by Urgent Operational Requirements (UORs) rather than conventional acquisition.

These examples illustrate the difficulties in defence acquisition projects as a consequence of operational uncertainties. The long procurement and in-service timelines of defence equipment makes it challenging to plan contingencies for future missions or requirements. The speed of technological change also means that the I.C.T infrastructure of platforms or systems may become obsolete sooner than expected.

Cullen and Hickman (2001) apply TCE and the Principal-Agent theory to UK defence acquisition by presenting the nature of the exchange between the MoD and supplier in the form of IPTs. They suggest that IPTs may be used as a monitoring mechanism and that the English commercial contract law negatively impacts collaboration in IPTs.

I have presented my disagreements with these views, on the basis that the authors fail to provide evidence that the MoD is motivated in monitoring its suppliers using IPTs. I also fail to see how the authors have provided an adequate contribution to improving the IPT mechanism, rather their focus on contract law negates certain elements of the relational contracting approach that IPT emphasises.

Braddon and Hartley (2007) focus their economics description on the UK aerospace industry, in terms of its competitiveness with comparable nations. They found that the UK has the largest aerospace industry in the EU and its major rival is the US.

The competitive forces argument provides an interesting mechanism for comparing large scale industries, or even national companies. However, it is less applicable in understanding the defence acquisition process at the micro transactional level of my interest. Its purpose is to deal with the macroeconomic issues of defence, at which the economic theory of competitive forces best applies.

The application of game theory by Gardener and Moffat (2008) however provides a great deal of insight to the microeconomics of defence. It delivers a sound theoretical understanding of the reasons for the 'conspiracy of optimism' in defence acquisition. However, apart from stating that this can be solved if the players in the game act in the interest of the defence community – it provides very few solutions to resolving the problem.

Humphries and Wilding (2001; 2004a; 2004b) studies present a basis in which TCE can be applied to defence procurement policy. While, overall I can see the advantages of the application of a TCE perspective, I am not convinced they provide appropriate justification for the TCE proxies they employ. In fact, I suggest that using proxies for TCE is fraught due to the complex nature of the TCE factors and care must be taken in this task.

Masten *et al.* (1991) explore the make-or-buy decision using a case study in Naval Shipbuilding in the U.S. Their findings in the choice of organisation focused mainly on three aspects of asset specificity, that of the human, physical and temporal-kind. There was support for the transaction cost hypothesis favouring integration for the temporal specificity case; the results were mixed for human and physical capital specificity. In terms of the human capital specificity integration was favoured for complex components, but not so for less complex technologies.

Crocker and Reynolds (1993) provide a discussion of the contracting process in the procurement of an Air Force engine for the F-15 and F-16 aircraft. They found that the early development uncertainties regarding technological difficulties created an incentive for incomplete contracts, as it was difficult for the contractor, Pratt and Whitney, to predict the potential costs.

The dual source contracts for Pratt and Whitney and General Electric differed in terms of the contract type negotiated highlighting the firm specific effects. This I would explain as the risk preference of the firms, whether they are risk-averse, risk neutral or risk taking. This will depend on how they deal with uncertainty and complexity and on their strategic orientation.

Crocker and Reynolds (1993) provide evidence for a more balanced view of procurement policy in defence. While, it is attractive to write complete contracts and bind them with firm or fixed pricing this may come at greater cost. Removing opportunism may be a desire, but this may not be achieved due to the presence of uncertainty and complexity, and its effect on complete contracts.

Melese *et al* (2007) provide an impressive application of TCE to defence acquisition in order to design an efficient means of cost estimating. Their methodology can be extended not only to look at improving cost estimating, but also to tackle the issue of collaboration

and contracting. By identifying the factors which create cost estimating difficulties they provide a greater understanding of the reasons for costing failures.

Franck and Melese (2008) continue the work they undertook with their colleagues in Melese *et al.* (2007). They suggest that firstly, it is right to assume that the private sector is able to coordinate resources more efficiently than the State. Secondly, mechanisms need to be put in place to motivate the supplier to act in good faith. These mechanisms come in the form of governance structures, which deals with differing type of transactions between the buyer and supplier.

Angelis *et al.* (2009), the same authors in differing order as Melese *et al.* (2007), continue their previous work by providing their findings of a preliminary study. Their study focuses on two cases of defence projects, Javelin and ATACMS, using the 'SEPM costs to total program costs' as a proxy to transaction costs. As with the Humphries and Wilding (2001, 2004a and 2004b) study, I do not feel their justification for their proxies are fully consistent with the TCE approach.

Overall TCE is identified as being the most suitable economic theory for defence procurement policy, and is also suitable in application to the full defence acquisition cycle. The choice of TCE, over comparative economic theories, is justified on the grounds that it matches the research purpose of understanding UK defence acquisition with respect to MoD and Industry engagement.

4 Transaction Cost Economics

4.1 Chapter Overview

Having discussed alternative theories to Transaction Cost Economics (TCE), this chapter will focus solely on a review of TCE theory. The research question in this chapter is: what are the strengths and weaknesses of TCE as an economic theory? The review of TCE theory will, thus, be separated into three sections: the origins, developments and critique of TCE.

In the first section I shall trace the beginnings of TCE by discussing the theories of Ronald Coase and Oliver Williamson. Coase begins a new way of thinking in institutional economics, with his ideas on the nature of the firm and its distinction to the market system. He creates the space in which a new economic theory can be introduced, in order to explain alternative means of transactions.

Williamson takes on the ideas of Coase to create this new economic theory, TCE, in which he develops the idea that the firm and the market are alternative mechanism for the transaction of goods and services. Williamson develops TCE beginning with the organisational failures framework, presenting the behavioural assumptions of managers' decision making and the environmental factors of transactions. I will explain, using Coase

and Williamsons work, how the TCE perspective discusses the economic problem of transactions.

The following section looks at developments in TCE by a number of economists and sociologists. These authors use the TCE perspective to apply to various case studies, surveys and conceptual discussions. There are those who have sought to add to the TCE model, others who empirically test TCE, and some use TCE model to describe the trends in their case study. This section will critically discuss the studies presented by the authors. Williamson introduces the concept of the New Institutional Economics in his most recent work on TCE, this will be discussed further.

The third section will present a more critical view of TCE. It is clear within this chapter my support for TCE as the main theory for explaining the transaction cost phenomena and the explanation for alternative governance structures. My views will bring me into direct conflict with some of the papers reviewed in this section. The section will also present reviews undertaken of TCE with respect to an evaluation of its empirical success.

4.2 Transaction Cost Economics

4.2.1 The Nature of the Firm

In understanding TCE, it is important to begin with Ronald Coase discussion of *The Nature of the Firm*. Coase (1937) wrote the paper in order to present a definition of 'the firm' in economic terms, and to provide a clear understanding of what constitutes a firm.

Coase (1937, p.386) explains 'economic theory has suffered in the past from a failure to state clearly its assumption. Economists in building up a theory have often omitted to examine the foundations on which it was erected. This examination is, however, essential not only to prevent the misunderstanding and needless controversy which arise from a lack of extreme importance for economics of good judgement in choosing between rival sets of assumptions'.

The paper provides a starting point for discussions of TCE, as it attempts to understand how price movement differs within and outside of the firm (i.e. internal and market organisation, respectively). Coase (1937) argues that the view which economists hold of the economic system is incomplete in stating that the normal economic system is under 'no central control', this view does not hold true for economic organisation within the firm.

Coase (1937, p.388) explains 'outside the firm, price movements direct production, which is coordinated through a series of exchange transactions on the market. Within a firm, these market transactions are eliminated and in place of the complicated market structure with exchange transactions is substituted the entrepreneur-coordinator, who directs production'. As such, there is a clear distinction in economic organisation in the market and within the firm.

Within the firm production is controlled by the entrepreneur-coordinator, rather than the variables effecting market transactions. The distinguishing mark of the firm is thus, the supersession of the price mechanism (*ibid*, p.389). The price mechanism is the defining nature of the market. It determines the value of goods and services being provided according to the fluctuating price for the demand and supply of the goods and services.

The nature of the firm and that of the market are shown to be alternative modes of organisation, in which the choice is between using the entrepreneur or the price mechanism as the coordinator of production. When such a choice is faced, the argument put forward by TCE is that it comes down to the alternative transaction costs involved within the decision. Coase (1937, p.390) begins this discussion by pointing out 'the main reason why it is profitable to establish a firm would seem to be that there is a cost of using the price mechanism'.

Transaction costs became the central argument for Coase (1937) in the creation of a firm. He provides reasons as to why internal organisation can save on transaction costs as compared to the market. There are, for instance, the cost of discovering relevant prices, cost of negotiating and concluding individual contracts, and the cost linked to risk preference within contracts (i.e. long-term or short-term contracting). Such considerations have been discussed further by Oliver Williamson, and will be presented in the following sub-section. Coase (1937) definition of the purpose of 'the firm' can be described using a transaction costs approach.

Three reasons are provided by Coase (1937, p.394-5) as to why the entrepreneur may decide that transactions may be more effective within the market or undertaken by an alternative entrepreneur. Firstly, as the firm expands in size due to the number of transactions which the entrepreneur is coordinating. 'A point must be reached where the costs of organising an extra transaction within the firm are equal to the costs involved in carrying out the transaction in the open market, or, to the cost of organising by another entrepreneur'.

Secondly, it is a question of production efficiency organised by the entrepreneur as the transactions increase. '...a point must be reached where the loss through the waste of resources is equal to the marketing costs of the exchange transaction in the open market or to the loss if the transaction was organised by another entrepreneur' and 'finally, the

supply price of one or more of the factors of production may rise, because the “other advantages” of a small firm are greater than those of a large firm’.

Let us assume that the firm in question is not affected by management problems (i.e. the decisions of the entrepreneur) then the firm has reached a point where market transaction costs are more favourable. This assumption is based on the fact that the transactions which are undertaken within the firm or the market are themselves heterogeneous.

Rather than expecting the first and second situation to be a matter of diminishing returns to management; it is reasonable to expect the transaction cost of carrying out the exchange within the firm may be greater than using the market. Therefore, what Coase (1937) does is to provide a preliminary discussion into the make or buy decisions facing entrepreneurs (nowadays managers who are vested with the power to make such decisions on behalf of the owner-entrepreneur). Oliver Williamson expands this discussion in his book *Markets and Hierarchies*.

4.2.2 Transaction Cost Economics Variables

Williamson provides a summary of his general approach to economic organisation, which is useful to highlight here:

- (1) Markets and firms are alternative instruments for completing a related set of transactions;
- (2) whether a set of transactions ought to be executed across the markets or within a firm depends on the relative efficiency of each mode;
- (3) the cost of writing and executing complex contracts

across a market vary with the characteristics of human decision makers who are involved with the transaction on the one hand, and the objective properties of the market on the other; and (4) although the human and environmental factors that impede exchange between firms (across a market) manifest themselves somewhat differently within the firm the same set of factors apply to both'.

(Williamson 1975, p.8)

With these four points he provides the conditions under which the decision for the exchange of goods or services should take place in either the firm or the market. Whereas, points one and two are straight forward provisions in the decision making process; points three and four are the complex factors involved in the decision making process, this needs to be taken into account by the decision maker.

The complex factors involved in the make-or-buy decision are a set of interrelated 'human factors' and 'environmental factors'. These factors, Williamson (1975, p.9) states, 'explain the circumstances in which complex contingent claims contracts will be costly to write, execute, and enforce'. Contingent claims contracts are contracts in which all contingencies or events within the exchange can easily be identified and stipulated within the written contract. Such a contract cannot be costlessly formulated due to the environmental and human factors pervading an exchange within the firm or the market.

The make-or-buy decision, therefore, becomes a question of which form of economic organisation can best economise on the transaction costs resulting from the combination of these factors. The purpose of TCE is thus a means for economists to understand

alternative governance structures, and for managers to view the variables involved in making transaction decisions.

Williamson (1975) began by describing the factors which lead to 'The Organisational Failures Framework', in which he lays out the environmental and human factors which leads to transactional problems, and the break down of the governance structure of a transaction. Williamson (1975, p.20) states 'only to the extent that frictions associated with one mode of organisation are prospectively attenuated by shifting the transaction, or a related set of transactions, to an alternative mode can a failure be said to exist. Remediable frictions thus constitute the conditions of interest'.

The existence of friction in the transaction is created by the joining of human and environmental factors, which results in the failure of the organisational mode. The remediableness will thus be the adaptations either through contractual changes, where possible, or in the transaction governance.

Williamson (1981, p.553) explains 'the two behavioural assumptions on which transaction cost analysis relies that both add realism and distinguish this approach from neoclassical economics are (1) the recognition that human agents are subject to bounded rationality and (2) the assumption that at least some agents are given to opportunism'. These two behavioural assumptions are the human factors which effects a transaction. Bounded

rationality is an assumption of the limits of decision makers to make wholly, all encompassing decisions, which are seen as rational with hindsight.

What may seem as a rational decision by the decision maker at the point of making the decision, can later turn out to be irrational due to unforeseen contingencies. As Williamson (1975, p.22) explains 'bounds on rationality are interesting, of course, only to the extent that the limits of rationality are reached – which is to say, under conditions of uncertainty and/or complexity. In the absence of these conditions, the appropriate set of contingent can be fully specified at the outset'.

It is the introduction of the environmental factors, uncertainty/complexity, when joined with the human factor, bounded rationality, which creates the economic problem. This creates a comparative institutional choice in which, an analysis of the governance mode that can best economise on the transactional problem needs to be decided upon.

With uncertainty/complexity as a condition in the environment of the exchange combined with bounded rationality, will the transaction costs be greater within the firm or in the market? The costs of planning, adapting, and monitoring transactions (under bounded rationality conditions) need to be expressed when faced with the dilemma of choosing between these two governance structures (Williamson, 1985, p.46).

The second behavioural assumption is that some decision makers are guided by opportunism in a transaction. Opportunism involves self-interest seeking with guile, as such, making “false or empty, that is, self-disbelieved, threats or promises” in the expectation that individual advantage will thereby be realised (Goffman, 1969, p.105).

Williamson (1981, p.554) points out ‘ubiquitous, albeit incomplete, contracting would nevertheless be feasible if human agents were not given to opportunism. Thus, if agents, though boundedly rational, were fully trustworthy, comprehensive contracting would still be feasible (and presumably would be observed)’.

Opportunism is an action taken by one, or both, of the parties in the exchange, taking advantage of the presence of uncertainty/complexity. A major effect of opportunism is the distorted disclosure of information (Williamson 1985, p.47).

This results in ‘information impactedness’, which Williamson (1975, p.31) explains as being ‘a derivative condition that arises mainly because of uncertainty and opportunism, though bounded rationality is involved as well. It exists when true underlying circumstances relevant to the transaction, or related set of transactions, are known to one or more parties but cannot be costlessly discerned by or displayed for others’.

Information impactedness creates significant problems in writing contingent claims contracts. As such TCE poses the question of which governance structure can minimise the effects of information impactedness in the transaction.

Williamson (1975) discusses the issues concerning 'small-numbers' bargaining. An *ex ante* small numbers bargaining can exist if the exchange is undertaken between a single seller and a single buyer. As there are no alternative buyers or sellers of this specialised good a bilateral monopoly problem exists (e.g. the defence industry) (Williamson, 1975, p.29). This situation becomes more relevant to the organisational failures framework for recurring transactions.

A merger may become an attractive mode of organisation, internalising the transaction, if the transaction costs are favourable. If not, then the exchange may be more suited to the market; such a decision will be affected by the information impactedness problem. *Ex post* small numbers bargaining can also exist even if 'large-numbers exchange condition obtains at the outset'; it is transformed during contract execution (Williamson, 1975, p.29).

Williamson (1985, p.61) explains 'monopolistic terms will obtain if there is only a single highly qualified supplier, while competitive terms will result if there are many. Transaction cost economics fully accepts this description of *ex ante* bidding competition but insists that the study of contracting be extended to include *ex post* features. Thus, initial bidding

merely sets the contracting process in motion. A full assessment requires that both contract execution and *ex post* competition at the contract renewal interval come under scrutiny'.

This is described by Williamson (1985, p.61) as the 'fundamental transformation'. It is through an investment in transaction-specific assets, of many kinds to be described further, which provides the initial winner of the bid with an advantage over its rivals. Without transaction specific investment the winner has no *ex post* advantage. If the buyer wants to switch supplier then they must attract transaction-specific investment of the same kind. Therefore, the fundamental transformation creates *post-contract asset specificities* in the transaction.

In awarding the contract to a specific seller in a competitive large numbers bargaining situation, the buyer thus enters into a bilateral exchange relationship. The bilateral relationship may then become longer term than desired, by the buyer, due to information impactedness suffered by the buyer.

Williamson (1996) points out 'faceless contracting is thereby supplanted by contracting in which the pair wise identity of the parties matters. Not only is the supplier unable to realize equivalent value were the specialised assets to be redeployed to other users, but the buyer must induce potential suppliers to make similar specialized investments were he to seek least-cost supply from an outsider. The incentives of the parties to work things

out rather than terminate are thus apparent. This has pervasive ramifications for the organization of economic activity’.

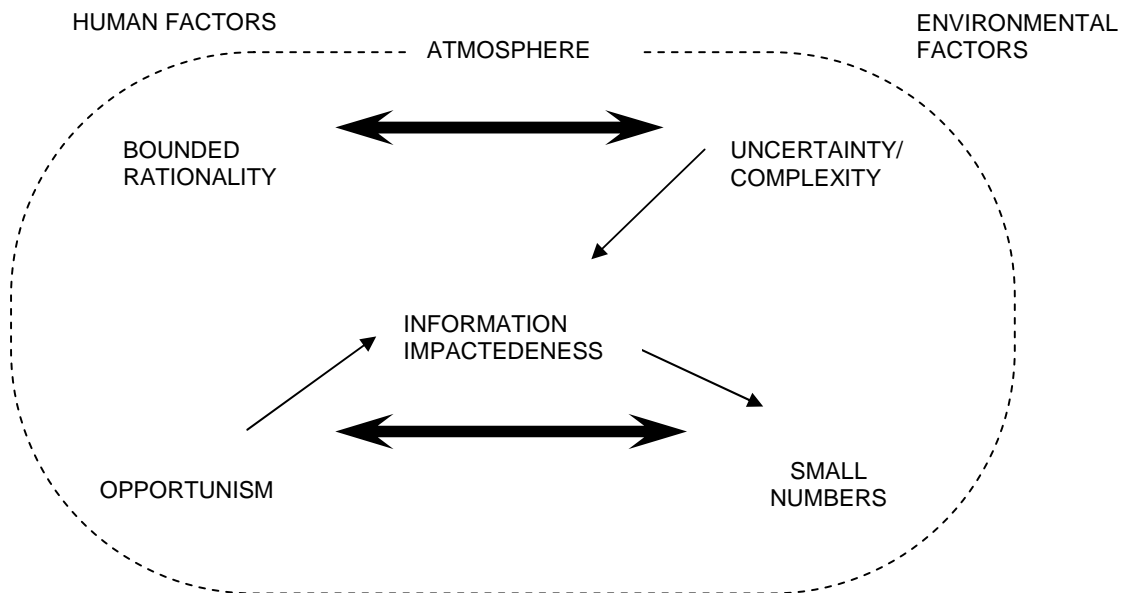
The seller can lock-in the buyer by using information disparity opportunistically. The switching cost might then become too great for the buyer, or the bounds on rationality may make it difficult for the buyer to detect any ‘foul play’ by the seller. The buyer might then be forced to undertake the transaction within an internal organisation (the firm) either through vertical integration or making the goods/services themselves.

This is explained by Williamson (2002, p.176) as the vulnerability of the bilateral dependency as a result of the fundamental transformation. ‘As a result, value-preserving governance structures - to infuse order, thereby to mitigate conflict and to realize mutual gains - are sought. Simple market exchange thus gives way to credible contracting, which includes penalties for premature termination, mechanisms for information disclosure and verification, specialized dispute settlement procedures and the like. Unified ownership (vertical integration) is predicated as bilateral dependency hazards build up’.

Atmosphere as discussed by Williamson (1975) is an overall consideration of the economic problem. While transactions are undertaken through technological separability, this does not imply attitudinal separability (Williamson, 1975, p.37). This attitudinal separability which will affect the transactions is named ‘atmosphere’ by Williamson (1975).

Atmosphere describes the attitudinal interactions and the systems consequence that impact the transaction. This in essence discusses the socioeconomic nature of the transaction. While the socioeconomics of a transaction may be the same for both internal organisations and the market, the way they manifest in each mode can differ and thus create the question which we are used to by now: Which governance structure best economises on the transaction cost?

Figure 4.1: 'The Organisational Failures Framework' (Williamson 1975, f.3, p.40)



Thus far, uncertainty is an environmental dimension which is of importance specific to the effects it has on transaction costs when joined with the human factors explained using the behavioural assumptions. Small numbers bargaining has been added to the mix, as an environmental factor which facilitates the economic problem, this is clearly shown in Figure 4.1.

However, in Williamson (1979, p.239) paper on TCE, he states 'the three critical dimensions characterising transactions are (1) uncertainty, (2) the frequency with which transactions recur, and (3) the degree to which durable transaction-specific investments are incurred'. I take this to mean that, small numbers bargaining rather than being a dimension of the transaction is actually a process within the transaction. Whether the transaction is A to B or A to Many, the dimensions is of the same characteristics, even though they manifest in different ways.

Of the environmental factors Williamson (1985, p.52) suggests asset specificity 'is the most important and most distinguishes TCE from other treatments of economic organisation, but the other two play significant roles'.

He indicates four ways asset specificity can materialise in a transaction. Site specificity is the geographical distribution of the transaction, physical asset specificity is the investment in physical components for the transaction, and human asset specificity is firm-specific knowledge possessed by human resource (Williamson, 1981, p.555).

The fourth Williamson (1985, p.95) explains is 'dedicated assets, which represents a discrete investment in generalised (as contracted with special purpose) production capacity that would not be made but for the prospect of selling a significant amount of product to a specific customer'.

The investment characteristics identified of 'transaction specific (nonmarketable)' – i.e. asset specificity – are typified by Williamson (1979) as being nonspecific, mixed and idiosyncratic. Asset specificity in transactions is the presence of idiosyncratic investment, effectively creating a bilateral (or at least quasi-bilateral) exchange relationship for a considerable period of time (Williamson, 1981, p.555).

This lock-in effect is different to the one described in terms of information impactedness and opportunism conditions, these are post-contract effects. The seller in this case creates *pre-contract asset specificities* in order to establish itself as the main supplier to the buyer in the long-term. Asset specific investments are not effective for the investor unless such investments are undertaken for a recurring transaction, rather than an occasional transaction.

The frequency of the transaction, one-time, occasional or recurrent, plays an important role, in combination with asset specificity, in economising on transaction costs. Williamson (1979, p.247) explains 'the frequency dimension refers strictly to buyer activity in the market'. The advantages gained by a buyer who undertakes recurring transactions in the market, would seem to be that of transaction-specific learning.

Williamson (1985, p.62) explains how frequency can economise on transaction costs. 'Additional transaction-specific saving can accrue at the interface between supplier and

buyer as contracts are successively adapted to unfolding events and as periodic contract renewal agreements are reached’.

However, Williamson fails to highlight the underlining reason why transaction-specific savings can be made under recurring transactions, which must be transaction-specific learning. This is, instead, developed by Winch (2001) who discusses, briefly, the link between recurring transactions and relational-specific learning. Williamson (1979) links frequency to transaction-specific investment (asset specificity).

It is asset specificity, which provides the most important characteristics of TCE, for Williamson, as he comments:

To be sure, asset specificity only takes on importance in conjunction with bounded rationality/opportunism and in the presence of uncertainty. It is nonetheless true that asset specificity is the big locomotive to which TCE owes much of its predictive content. Absent this condition, the world of contract is vastly simplified; enter asset specificity, and nonstandard contracting practices quickly appear. Neglect of asset specificity is largely responsible for the monopoly preoccupation of earlier contract traditions.

(Williamson, 1985, p.56)

As such the behavioural assumptions of manager decision making are bounded rationality and opportunism and the environmental factors affecting the transaction are uncertainty, asset specificity and frequency. In combination, these transaction characteristics create the organisational failures framework. Contracting and governance structures are designed to mitigate or diffuse organisational failure.

Williamson (1996, p.336) explains 'the problem with transaction costs in the early 1970s is that the concept was too elastic: Anything could be explained by invoking suitable transaction costs after the fact. This tautology was overcome by moving the analysis of transaction costs from (vague) generalities to the microanalytic particulars of transactions and governance: Transactions were dimensionalised; the fundamental transformation was explicated; the discrete structural attributes of governance were displayed; and so forth'.

4.2.3 Transaction Governance

TCE subscribes to and develops the view that economising is the core problem of economic organisation (Williamson, 1996, p.55). The principal question which TCE puts forward is whether to 'make or buy' intermediary goods/services. This is a question of the efficacy of alternative means of contracting (Williamson 1990) in search of the most profitable means of transacting.

The purpose of 'make' is to internalise the production in order to save on transaction costs of the market (i.e. the cost of using the price mechanism); and ultimately to use those saved transaction costs to gain profit by selling the made goods/services in the market to consumers/businesses for a profit.

Alternatively, the transaction costs might be more favourable by procuring from the market, in the intermediary stage. The seller in the market might have savings in

transaction-specific costs, which makes contracting in the market more effective and profitable.

Williamson (1990, p.15) describes the governance trade-off as 'the basic trade-off that characterises the choice between markets and hierarchies – or, more generally, between the use of rules governance and discretion – is between high-powered incentives and bilateral adaptability. Rules governance support incentives but sacrifices adaptability. Discretionary governance (administration) reverses this relation. Which governance structure to employ where is the comparative institutional issue of interest'.

The frequency of the transaction and its asset specificity, play a key role in the governance structure. The high-powered incentives and adaptability of the transactions are affected by the combination of opportunism, bounded rationality and uncertainty. The alternative governance choice between markets and hierarchies (and of course hybrids) is thus decided on these factors.

Williamson (1979 p.247) states 'three broad types of governance structures will be considered: non-transaction-specific, semi-specific, and highly specific'. Each governance structure is supported by a range of contracting methods to outline the means of dealing with disagreements; these are classical contracting, neoclassical contracting and relational contracting (Williamson 1979; 1985). For non-transaction-specific governance of

occasional and recurrent transactions, market governance is favoured applying a classical contracting approach (Williamson, 1979, p.248).

Classical contract law is interpreted in a highly legalistic way; monetised in extreme degree; with formal terms superseding informal terms of agreement (Williamson, 1991, p.271). Hard bargaining is an important part of this market-based transaction. The parties to the transaction, in recurring exchange, use their experience of previous transactions to decide on the continuity of the trading relationship.

In an occasional exchange transaction the parties rely upon others' experience in order to ascertain the efficacy of engaging in the transaction (Williamson, 1979, p.248). Reputation plays an important role in protecting the parties from opportunistic tendencies from prospective partners.

In an occasional transaction of the mixed and highly idiosyncratic kind, trilateral governance structure exists. In trilateral governance neoclassical contracting is a mechanism to represent the close ties between the buyer and supplier. The transaction forms hybrid modes of organisation, which is supported by the nature of neoclassical contracting (Williamson, 1991 – e.g. in franchising agreements).

Williamson (1991, p.272) explains 'By contrast with a classical contract, this contract (1) contemplates unanticipated disturbances for which adaptation is needed, (2) provides a

tolerance zone (of $\pm 10\%$) within which misalignment will be absorbed, (3) requires information disclosure and substantiation if adaption is proposed and (4) provides for arbitration in the event voluntary agreement fails’.

It is in the interest of the transacting parties to deal with disputes in a less formal manner due to the investment-specific and long-term nature of the relationship. A third party is brought in to arbitrate any disputes and evaluate performance.

The third type of governance structure is transaction-specific governance of which there are two kinds: (1) bilateral governance in which the transacting parties maintain their autonomy, and (2) unified governance in which the transaction is removed from the market and internalised within the firm (Williamson, 1979, p.250). Transaction-specific governance tends towards relational contracting.

Williamson (1979, p.238) paraphrases from Macneil (1978) to explain ‘by contrast with the neoclassical system, where the reference point for effecting adaptations remains the original agreement, the reference point under a truly relational approach is the “entire relation as it has developed ...[through] time. This may or may not include an ‘original agreement’; and if it does, may or may not result in great deference being given it” ’.

Similar to trilateral governance, bilateral and unified governance transactions are of a mixed and highly idiosyncratic kind, however they are of recurrent transactions. It is in the

interest of both transacting parties in a bilateral and unified governance structure to ensure that opportunism is minimised. The cost of opportunistic behaviour by either party to the transaction will affect the contract renewal stage adversely.

Due to the bilateral dependency of the transacting parties, under a mixed and highly idiosyncratic and recurring transaction, relational contracting creates greater flexibility in the relationship and allows the parties to adapt to unforeseen contingencies more effectively and collaboratively. In bilateral governance transaction-specific investment is of a mixed kind, engendering autonomy for the transacting parties, which encompasses 'scale-economy considerations' and 'elicit cost control for steady-state supply' (Williamson 1979, p.250).

When the transactions become progressively idiosyncratic, incentives for trading are weakened and economies of scale can be realised within internal organisation as much as in a bilateral exchange. As Williamson (1979) explains 'the advantage of vertical integration is that adaptations can be made in a sequential way without the need to consult, complete, or revise [inter-firm] agreements' (p.253).

The exchange is therefore between one part of the organisation with another (functional, departmental, or divisional, whatever the organisational structure). If disputes arise they cannot be taken to court, instead the contract law is that of forbearance (Williamson, 1991), the hierarchical structures takes on a courts of appeal format.

The organisational failures framework is created as a way of understanding how transaction governance fails, and as such can be 'fixed'. The organisational failures framework represents the applied nature of TCE. The framework provides an analysis of the economic system by putting the existing governance under the microscope and looking for the 'frictions'.

As Williamson (1996, p.58) points out, the framework poses the questions: 'do the parties to the exchange operate harmoniously, or are there frequent misunderstandings and conflicts that lead to delays, breakdown, and other malfunctions'. Such an analysis allows the transacting parties to decide whether an organisational failure exists in the transaction, and if so, does the governance (and the contracting) structure need to be adapted in order to best suit the transaction.

4.3 Developments in Transaction Cost Economics

4.3.1 The Transaction Cost Economics Framework

I shall now examine contributions made by authors of TCE, to add new knowledge and understanding to the TCE framework. First, I examine the work of Graham Winch, who contributes to TCE by introducing *learning* as a behavioural factor in the framework, and by creating a spatial visualisation of the 'appropriate transaction governance' within a generic *transaction governance model* (Figure 4.2). I shall then look at the validity tests of

TCE, as a theory, by Lyons (1995) and Maher (1997). Their contributions are focussed on the environmental dimension, asset specificity.

Winch (1989) discusses TCE, by investigating the project application in the construction industry. He applies the 'make or buy' problem to the case of contracting in the construction industry. Winch (1989, p.341) argues UK construction firms would be better served internalising construction services, than contracting from the market. 'Hierarchy would economise on bounded rationality due to uncertainty and complexity. In particular, the designer/main contractor, and contractor/specialist subcontractor transaction interfaces could be beneficially governed by hierarchy rather than the market'.

Winch (1989) supports his argument by suggesting that the expertise required can be transferred more easily and effectively from project to project in hierarchical organisation and in so doing, better deal with complexity and uncertainty. The transfer of expertise from project to project using a feedback loop from construction to design suggests the ability to learn from recurring transactions (Winch, 1989, p.341).

From these theoretical discussions he adapts TCE to incorporate learning. Winch (2001, p.808) explains 'Williamson and his followers tend to ignore frequency in their analyses, and Williamson himself never associated a behavioural factor with it. I propose learning as that missing behavioural factor'.

Winch introduces the idea of learning to the model; there has been a lack of focus on learning as compared to other transaction cost factors. In terms of learning in a transaction cost perspective or an explicit discussion of its purpose, within Winch's work or from other TCE authors, there is a gap. However, the idea of learning being an important behavioural aspect of frequent transactions is not a minority view.

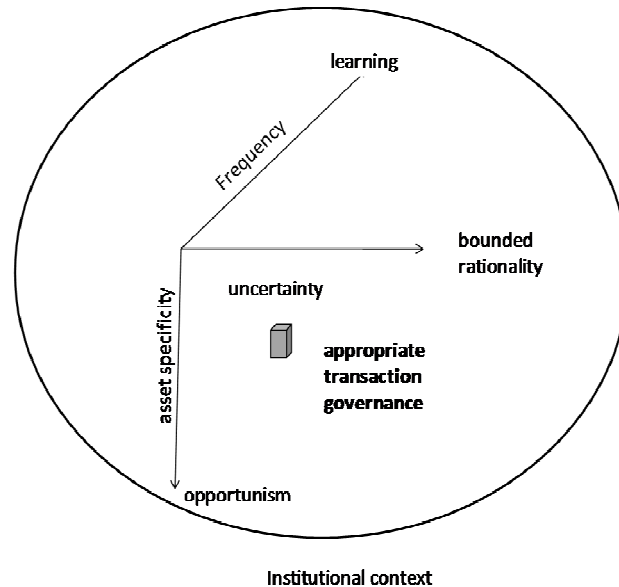
Melese and Franck (2008, p.117) state 'recurrent transactions often justify the setup costs of specialized assets and special governance requirements. They also offer the opportunity to apply learning curves (cumulative cost-quantity relationships) to lower production costs, and for gradual reductions in uncertainty as both parties learn more about costs. Recurring transactions also offer the possibility for the accumulation of goodwill and to build reputations'.

Winch (2001) graphically presents the behavioural assumptions and environmental factors discussed by Williamson, in Figure 4.2. The mutual relationship between the behavioural assumptions and environmental factors described in Winch (2001) are best understood by analysing Figure 4.2.

Firstly, the behavioural assumptions are indicated as a function of the environmental factors (e.g. bounded rationality = $f(\text{uncertainty})$). Secondly, the space is limited by the 'institutional context', what Williamson described as atmosphere. Lastly, the purpose of this framework, unlike Williamson's Organisational Failures Framework, is to provide an

idea of where appropriate transaction governance is placed in the hypothetical spatial context.

Figure 4.2: 'Transaction Governance Framework' (Winch 2001, f.1, p.800)



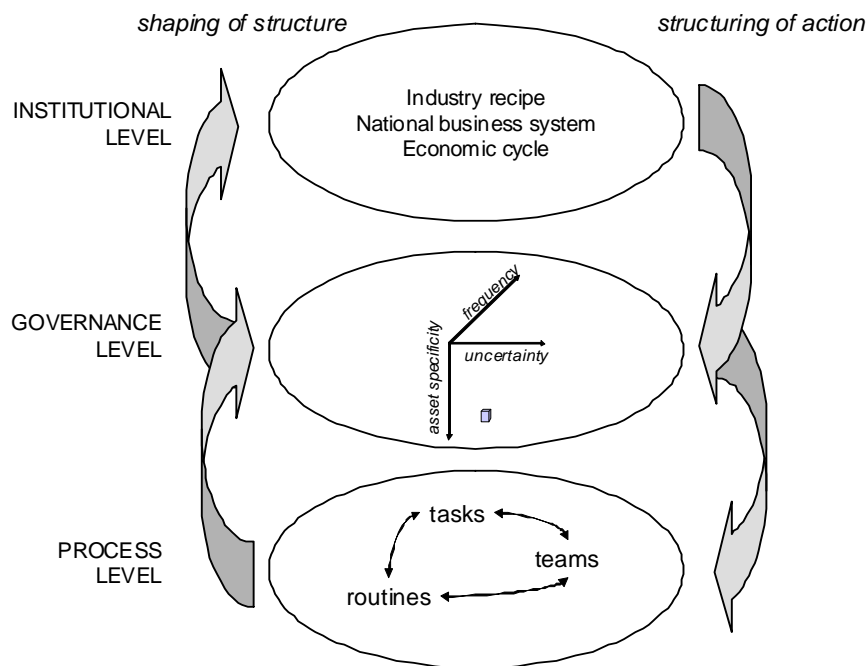
The trouble with this framework and in general with the TCE frameworks, are that it is difficult to assign quantitative data to them. As Winch (1989) comments ‘...one of the problems with working with Williamson’ framework is that while there is a lot of data available on production costs, very little is known about the scope and magnitude of transaction costs’ (p.340).

Nonetheless, I would argue that the TCE frameworks can be a useful visualisation tool to an important economic problem, of transaction costs. In Winch’s (2001) model, we have an updated version of the organisational framework using a new way of thinking about the interrelated nature of the behavioural assumptions and environmental factors in a transaction, within a specific institutional context.

Winch (2010) develops the TCE framework further by providing a tectonic approach to the transaction cost analysis for project organisations (see Figure 4.3). Kebede *et al.* (2009) use this model to discuss the transaction cost implications of a defence project, within the bilateral transaction context of an IPT.

The levels are analysed separately in order to describe their effects on the project. The interactions of the levels are then explained in ascending in terms of the ‘shaping of the structure’ and descending the ‘structuring of action’ of the project organisation.

Figure 4.3: ‘The Tectonic Model’ (Winch 2010, f.1.5)



Winch makes a major contribution to TCE by proposing a relationship with the frequency of the transaction and learning opportunities for decision-makers. While, some authors have mentioned learning when discussing transaction-cost approach, a more thorough empirical research is required to solidify *learning* as a TCE variable.

Lyons (1995) work on the TCE framework is to discuss the connections between asset specificity and, economies of scale and scope. Lyons (1995, p.432) begins his discussions by describing Williamson's make-or-buy decision as a result of the presence or absence, of asset specificity, and how that is related with economies of scale or scope. 'A trade-off between asset specificity and economies of scale or scope is central to the transaction cost theory of vertical integration as developed by Oliver Williamson'.

Economies of scale and scope are production cost factors in which savings can be made according to the quantity of the units and the reuse of goods, processes or equipment in the production process, respectively. Transaction cost savings can be achieved through investment into asset specificity such as physical, human and site specific assets.

Lyons outlines his interpretation of this situation as being a deciding factor of whether transactions are undertaken in the market or within the firm. Lyons assigns an independent variable, k , as the specific asset specificity and measures its effect on the dependent variable, C , the transaction cost advantage of the market. Lyons (1995, p.433)

finds 'in the absence of economies of scale or scope, the make-or-buy decision is simple: produce in-house if optimal asset specificity exceeds k , and buy-in otherwise' (p.433).

The advantages gained from economies of scale or scope is specified in terms of the investments in specific assets. Where the firm has invested in specific assets in-house production becomes preferable. If such investments are not sought the market is able to aggregate demand, and thus create economies of scale or scope through market conditions.

Lyon (1995, p.434-435) uses stochastic formulation to produce three testable hypotheses:

H1: Inputs requiring a specific production technology are more likely to be produced in-house

H2: Inputs requiring a technology which exhibits economies of scale or scope are less likely to be produced in-house.

H3: Economies of scale or scope have a greater impact on the make-or-buy decision in the absence of specific assets

Lyons (1995, p.438) finds that 'overall, in the absence of economies of scale, specific assets do not significantly affect the organisation, and in the presence of specific assets, economies of scale have no influence'. The findings suggest a strong support for TCE, with the important exception that specific investments only affect the make-or-buy decision in the presence of economies of scale or scope (Lyons, 1995, p.442).

Lyons (1995) findings are questionable. Specifically, in that, the significance of asset specificity in the transaction cost approach can be viewed in the same way as a

production cost approach, of economies of scale and scope. The importance of asset specificity in the transaction cost approach, as outlined by Williamson, is on its influence on the mode of governance.

It is therefore, more a question of how transaction cost savings can be accrued under differing levels of asset specificity, uncertainty, and frequency. Rather than whether the production cost variables of economies of scale or scope will determine the make-or-buy decision.

The make-or-buy decision in terms of the transaction cost approach is a description of the transaction-specific investments which creates the boundary choice dilemma, regardless of economies of scale or scope – since production costs are held as constant. This suggests that the underlining effect of asset specificity in TCE is the affect it has on the buyer-supplier relationship dynamic. I am, therefore, sceptical of the value of Lyons (1995) contribution to TCE.

Maher's (1997) contribution is in the empirical tests of the TCE model, put forward by Williamson, by investigating a number of case studies across four industries. She describes opportunism as the most important aspect of TCE. She suggests that contracting between buyer and supplier is designed to mitigate opportunism. The case studies are in the automobile, mechanical engineering, electronics, and gas industry.

The findings, in terms of the contractual governance between buyer and supplier, almost fully follow the TCE model. However, she argues that the model ignores one important aspect of the institutional context of the exchange relationship, this being the market structure of the industry.

In the automobile industry she suggests that the lock-in effect for suppliers is due to the cost of switching linked not to asset specificity but due to difficulties in seeking alternative buyers. Maher (1997, p.155) explains 'in terms of asset specificity, suppliers tended to be less locked-in, since if they had to find an alternative buyer it would not require any new investment on their part. However, it would take time to replace the buyer and the supplier would lose volumes'.

If the buyer accounts for a substantial amount of the transactions of the suppliers' business, the loss in volume if the exchange is terminated can have detrimental effects for the suppliers' accounts. This Maher (1997) believes is a lock-in effect due to market structure, rather than asset specificity.

Temporal asset specificity is introduced by Masten *et al.* (1991) as an addition to Williamson's four distinctions of physical asset specificity, site specificity, human asset specificity, and dedicated assets. Temporal asset specificity is defined as:

Where Timely performance is critical, delay becomes a potentially effective strategy for exacting price concessions, knowing that interruptions at one stage can reverberate throughout the rest of the project, an opportunistic supplier may be tempted to seek a larger share of gains from trade by threatening to suspend performance at the last minute. Even though the skills and assets necessary to perform the task may be fairly common, the difficulty of identifying and

arranging to have an alternative supplier in place on short notice introduces the prospect of strategic holdups. Expanding Williamson's original four way classification, we refer to this latter source of holdups as temporal specificity.

(Masten *et al.* 1991, p.9)

The fact that switching costs are incurred due to the time taken to find a replacement buyer is a crucial aspect of the temporal asset specificity explanation. Winch (2001, p.801) comments 'thus clients are exposed to the costs of opportunistic behaviour up to the full replacement costs of the supplier or, conversely, suppliers make transaction specific investments which would have to be written-off if they abandoned the project'.

The link between market structure and temporal specificity can be further argued in Maher's case study of the mechanical engineering industry. Maher (1997, p.158) explains 'in this case the degree of lock-in was practically zero and the market provides for effective alternatives. In the event that the buyer had to find a new supplier it would not take him/her very long and would not really require any new investment'.

In the mechanical engineering industry case, it seems that the temporal specificity is low. TCE reasoning suggests that under a low asset specificity condition, the lock-in effect is removed making it easy to find alternative transacting partners; this is inline with her comments.

In the electronic industry case study, she identifies a different explanation for the effects of market structure on transactions. The explanation for market structure is in fact more applicable to the fact that the firms were transacting within the defence industry, than being a typical case of the electronic industry. Maher (1997, p.162) points out that, even though the transaction should be characterised by monopsonistic terms, in which TCE would predict that the buyer would behave opportunistically, this does not occur.

Maher's (1997) case study of the defence sector, I believe, does not take into account what Williamson (1975) describes as atmosphere, and Winch (2001) elaborates as the institutional context of transactions. The defence industry is, compared to other industries, highly influenced by the institutional context – i.e. social, political and economic consideration will have a major effect on the transaction governance.

The monopsonist in the defence industry, the MoD in the UK case, may be reluctant to behave in an opportunistic manner with its suppliers due to the national interest of the transaction. If the MoD were widely seen to be an opportunistic buyer and deterring suppliers from the electronic industry to provide their services, this would have a negative effect on the defence sector and consequently national production and even security. This would not be the same as say, Microsoft behaving opportunistically towards its suppliers due to its monopsonist buying powers.

Similarly, the case Maher (1997) puts forward as an example of market structure in transactions, in the electronic industry case study, is an example of the effects of the institutional context of the transaction. While, I agree that market structure is an important part of the lock-in effect, this does not necessarily remove it from the realm of asset specificity. In fact, I would suggest the lock-in effect described purely as market structure, may be a more general manifestation (in this case) of temporal asset specificity.

Maher (1997) quite rightly identifies Williamson's model as not explicitly specifying the factors of market structure. However, I do not agree that this is as important as she suggests. The discussion she presents of market structure within the paper can quite easily be identified in terms of either asset specificity (the temporal case, in her paper) or in the institutional context (where market structure plays a greater role).

4.3.2 Relational Contracting

Other TCE authors have focussed their discussions of TCE on governance structures. Of these governance structures, relational contracting has been the most discussed by authors. In fact, Williamson (1979, p.250) himself suggested 'bilateral structures have only recently received the attention they deserve and their operation is least well understood'.

The first paper to be discussed is by Pilling, Crosby and Jackson (1994); this paper looks at long-term relationships in manufacturer-supplier exchanges in the aerospace, electronics,

and defence industries. Pilling *et al.* (1994, p.248) state 'this research is both the first experimental test and an extension of the TCE framework'.

They use relational exchange theory to provide greater understanding in, what they see, as the gap between the market-based exchange and vertical integration. Their view is that TCE does not provide much enlightenment on the relational aspects of the transaction (Pilling *et al.* 1994, p.238).

I agree that TCE has not developed relational contracting as a mechanism for bilateral governance in great enough detail, and as such identify their work as an important step in this direction. Nonetheless, I would argue that TCE has identified aspects of bilateral governance which require a relational style of governance using concepts of trust, cooperation and communication as an important safeguard to opportunistic behaviour.

Pilling *et al.* (1994) present an empirical test of the TCE dimensions of uncertainty, asset specificity and frequency along with relational dimensions within the exchange, contracting, information sharing and they test these dimensions for transaction costs. Of the transaction dimensions, Pilling *et al.* (1994, p.242) they state 'overall, it is predicted that increasing levels of transaction costs will enhance the relative attractiveness of long-term exchange arrangements'.

Their method is to test the hypothesis on transaction cost and relational dimensions using a between-groups factorial design of 2 x 2 x 2 of Factor A, B and C assigned as asset specificity, environmental uncertainty and frequency, respectively. The sample chosen were mid-level purchasing personnel in the aerospace, electronics and defence industries of which twenty firms agreed to participate (Pilling *et al.* 1994, p.243).

The findings were mixed in terms of the support of the model, with the tests on asset specificity providing the strongest support for their hypothesis. Pilling *et al.* (1994, p.248) make an interesting comment on the limitation of their study. 'The theory predicts that increased relationalism will be the logical response to increasing costs of guarding against opportunistic behavior. However, the subjects apparently viewed relationalism unfavourably in anticipation of the possibility of opportunistic behavior on the part of the hypothetical supplier. If a purchasing agent knew in advance that a company would behave opportunistically, he or she would quite likely not want to have a relationship with that company'.

This is interesting because the purchasing agent would have prior knowledge to the transaction of the suppliers' behaviour. This may be through the reputation of the firm, if that is the case then it is reasonable to assume that the firm would lose many more contracts and lose its business opportunities.

If the supplier possesses transaction-specific investments and, thus, the purchaser is dependent on the supplier then relational contracting is the best safeguard for the purchasing agent. If there is environmental uncertainty in the transaction, even where classical or neoclassical contracting (with its stronger formal safeguards) is deployed the purchaser can not cover all contingencies and opportunistic behaviour hazards can easily follow.

Relational contracting instead provides greater incentive for the supplier to persist from taking an opportunistic route because of the long-term nature of the business and the bilateral dependency, which links the health of the relationship to the mutual success of the transactors. If the aim of the business is to gain profit, it is unlikely that the manager of a company (following shareholder interests) would harm the profit margin by harming its most important customers.

Therefore, the response of the purchasing agents to this hypothetical situation does not portray the most crucial reason for using relational contracting, which is the bilateral dependency factor. Relational contracting is a safeguard designed to deal with the lock-in effect of high asset specificity transactions.

In the early part of this decade there are two papers which have discussed the issue of relational contracting in bilateral governance further. Artz and Brush (2000, p.338) discuss the '*ex-post* costs of periodically renegotiating and adjusting [contracts]'. They use

transaction cost and relational exchange theories in discussing coordination costs in collaborative strategic alliances. Poppo and Zenger (2002) discuss the idea that formal contracts can act as a complement to relational contracts in bilateral governance, rather than the presumed substituting function.

Artz and Brush (2000) support the traditional TCE idea that relational contracting can reduce transaction costs in a bilateral governance exchange. They present their findings by investigating the exchange relationship between original equipment manufacturers (OEM) and their, self-selected, supplier.

A survey of purchasing managers from the OEM, with two years experience as sole/lead negotiator, was undertaken. Their empirical study is a test of Williamsons (1975; 1979) description of relational contracting in the TCE perspective. They chose, as their principle variables relational norms, investment in transaction specific assets, and environmental uncertainty.

Artz and Brush (2000, p.356) conclude 'first, in support of the traditional TCE research, we find that both OEM asset specificity and environment uncertainty directly increase the cost of conducting interfirm exchange... Second, the study finds that all the relational norms, i.e. collaboration, continuity expectations, and noncoercive communications, effectively reduced the impact of OEM assets specificity on OEM negotiation costs'.

The first concluding point supports Williamson's framework, and the second suggests relational contracting as the appropriate approach for bilateral exchange, under the specified conditions. Poppo and Zenger (2002), however, undertook a study which aimed to extend TCE towards a different direction.

Poppo and Zenger (2002) suggest that relational contracting can be combined with formal contracting to provide a more effective and efficient form of bilateral exchange. Poppo and Zenger (2002, p.708) define formal contracts as 'the more complex is the contract, the greater is the specification of promises, obligations, and processes for dispute resolution'. Poppo and Zenger (2002, p.710) explain 'for such relationally-governed exchanges, the enforcement of obligations, promises, and expectations occur through social processes that promote norms of flexibility, solidarity, and information exchange'.

They build their hypothesis by suggesting that increases in exchange hazards encourage complex contracts, and relational governance. They hypothesise the use of both relational and complex contracting complementarily will enhance exchange performance. The survey supports their hypothesis by indicating that relational governance complements complex contracting.

Poppo and Zenger (2002) report their findings as showing relational governance complimenting complex contract formulation, from the survey. There are, however, some challenges I wish to outline to their concept.

Firstly, they do not discuss the actions taken by the purchaser under situations where supplier performance is low or/and the contract has been breached. The use of relational governance and contract complexity has diverging consequences for this situation. Under relational governance the purchaser would be inclined to resolve such situations through soft relation-specific mechanisms such as communication or joint problem-solving, to agree a resolution in support of the long-term relationship.

Whereas if complex contracting is available, the cost of the low quality performance and/or breach of contract can be recouped more easily (and without additional costs) using more coercive means such as litigation/arbitration.

Poppo and Zenger (2002) argue that the combination of these two contracting methods would still be able to deal with such disputes in harmony and more satisfactorily. If so, the second challenge is, why have they not discussed the costs associated with each form of contracting, and how this would be affected in a combined situation?

Relational contracting is an attractive mechanism under bilateral governance, due to the transaction cost economising which can be gained through adaptability, as shown by Artz and Brush (2000). If complex contracting is added to the transaction then adaptability is lost and precedence is given to the contract rather than the relationship.

4.3.3 Governance, Performance and Organisational Form

Masten (1993) approaches governance in a more general manner, in which he develops the idea that the governance structure is aligned to strategic orientation. He suggests that the selection of governance arrangements needs to be appreciated in terms of the performance expectations of such a choice.

Masten (1993, p. 119-120) states 'a central message of this article is that the relation between governance and performance cannot be accurately assessed without an appreciation of the factors that lead transactors to adopt one form of organisation over another. What is needed, therefore, is an approach that combines transaction-cost economics' insight regarding the selection of governance arrangements with strategy's orientation towards performance'.

TCE, in Masten's view, has attempted to influence decision-making in business strategy, as well as public policies. Masten (1993, p.120) argues that TCE is focused on observed behaviour, 'if managers are mistaken or ill-informed, investigations into the determinants of observed behaviour will say little about a variable's actual influence on performance'.

Masten (1993, p.120) suggests 'observed behaviour reflects the belief and judgement of decision makers and will reflect true performance relations only to the extent that those beliefs are accurate'. He contends that if they continue to underperform managers will be removed due to market forces, but suggests such action is a slow process.

Masten (1993, p.124) attempts to provide a link between governance and organisational form by assuming 'since the problem with estimating the effects of governance on performance derives from the systematic selection of organisational form, two ways of overcoming this problem suggest themselves. The first is to defeat the selection process somehow, and the second is to control for it'.

Masten (1993) suggests that to defeat the selection process a controlled laboratory experiment is less prohibitive than real-world experiments. However, laboratory experiments are unlikely to capture the complexity of the problems with organisational choices. Instead, he suggests that the second option would be to control the selection process.

Masten (1993) identifies externalities which create a controlled selection process as regulation or a court. A comparison of the controlled situation and an example of a free selection process would provide the link between organisational form and governance (Masten 1993, p.124). Masten (1993) provides a number of studies on the relationship between governance and organisational form.

Collectively, the studies described above, though limited in number and scope, suggest that savings of 10-20% from choosing organisational arrangements discriminately are not unrealistic. Of course, the potential gains from choosing the correct organisational form will depend on the nature of the transaction; potential savings for 'close calls' (transactions for which the costs of organising under alternative arrangements are similar) will obviously be smaller. Nevertheless, managers stand to benefit from a framework that can help identify situations where the allocation of managerial attention and resources to refining organisational choices is warranted.

Masten (1993, p.126-127)

There is a valid contribution to TCE theory in relating it to performance. It is recognised that TCE needs to advance towards a view of how an appreciation for transaction costs can improve the performance of managers. This strategic view of TCE has become more important as TCE theory has become more established. Williamson responds to these developments in TCE theory and empirical research by identifying TCE as part of a New Institutional Economics.

4.3.4 The New Institutional Economics

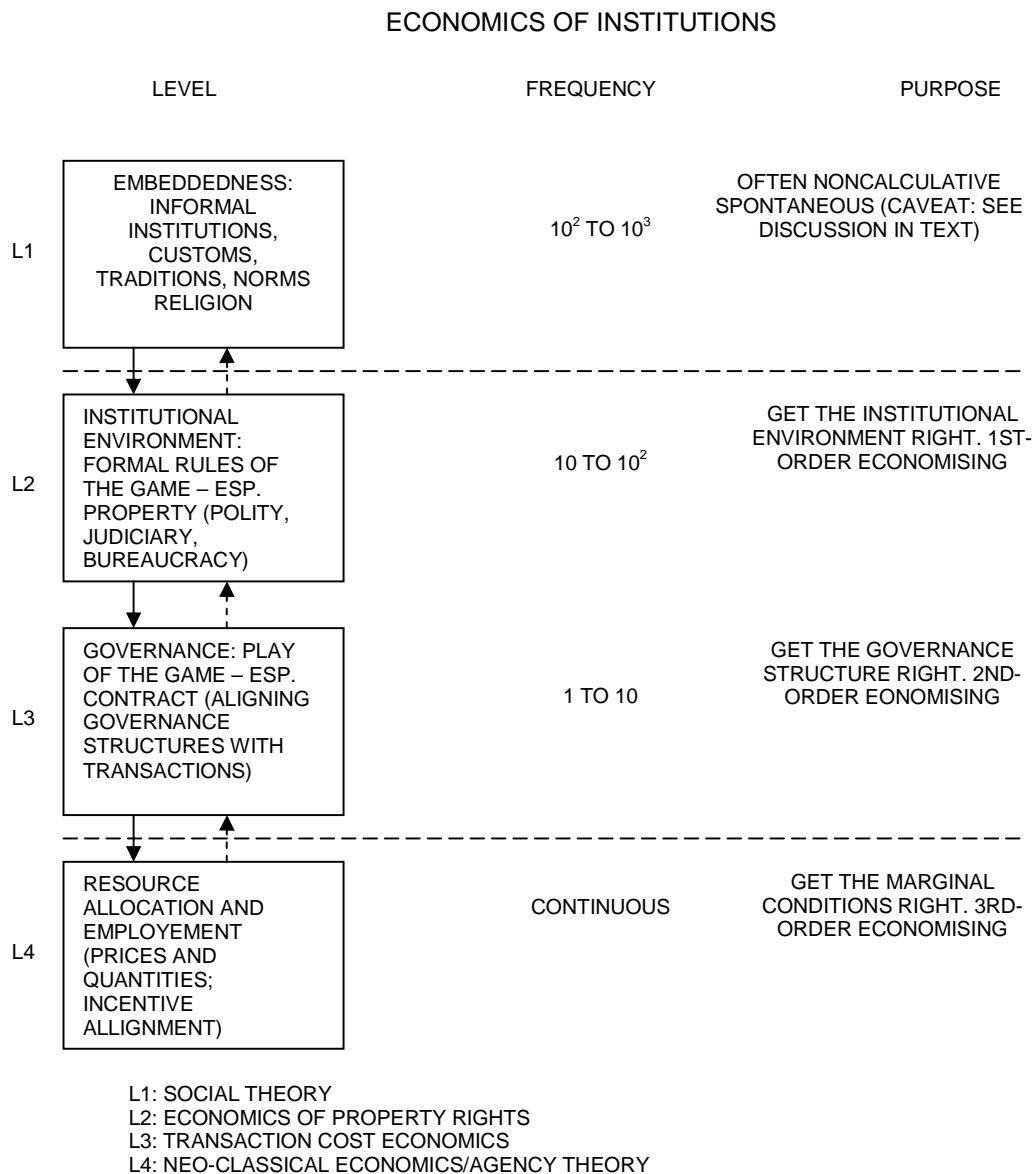
Williamson has continued to develop his ideas on TCE and has in his most recent work placed it as part of the 'new institutional economics' (NIE). The NIE proposes four levels of social analysis (shown in Figure 4.4), of which TCE is most pronounced in Level 3.

Williamson (1998, p.29) explains 'transaction costs economics operates at Level 3. Taking the rules of the game at Level 2 as shift parameters, Level 3 deals with the play of the game. Alternative modes of organisation are described as syndromes of attributes that differ in discrete structural ways. Second-order economising applies: get the governance structures – markets, hybrids, firms, bureaus – right. The period over which such decisions come up for consideration is of the order of a year to a decade'.

Williamson (1998, p.25-26) explains 'the solid arrows that connect a higher with a lower level signal that the higher level imposes constraints on the level immediately below. The

reverse arrows that connect lower with higher levels are dashed and signal feedback. Although, in the fullness of time, the system is fully interconnected, for my purpose here, these feedbacks are largely neglected. The NIE has mainly concentrated on action at level 2 and 3'. Each level is allocated a theory(ies) which Williamson suggests represent the functions of the level.

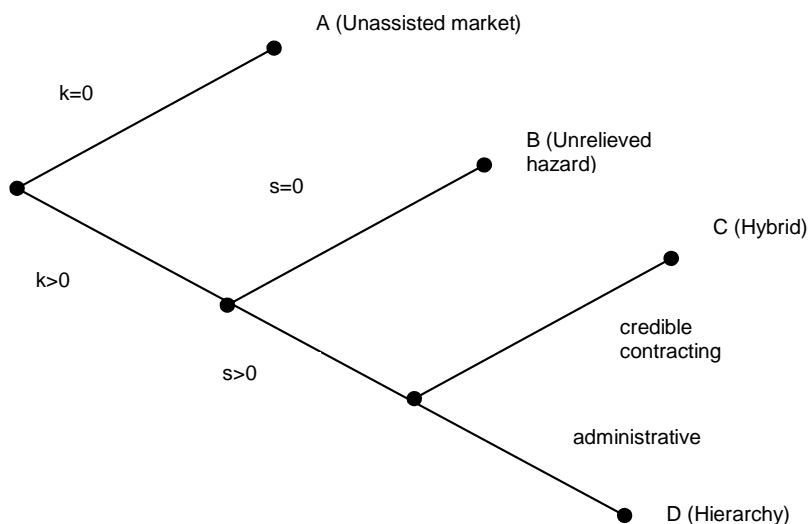
Figure 4.4: 'Economics of Institutions' (Williamson 1998, f.1, p.26)



My interest and that of Williamson is specifically at the third level, the economic *governance* of institutions. Williamson (1998, p.28) explains ‘the third level is where the institutions of governance are located. Although property remains important, a perfectly functioning legal system in order to enforce contracts is not contemplated. Instead of costless court ordering, a comparison of costly court enforcement with costly private ordering is needed. Much of the relevant governance actions moves to the latter’.

Williamson goes on to discuss the ideas of TCE, which have already been explored in length, in the context of its place in the ‘economics of institutions’. However, the interesting development is the creation of a ‘simple contract schema’ which Williamson (1998; 1999a; 1999b; 2000, 2002, 2005) uses to frame the alternative modes of governance.

Figure 4.5: ‘The Simple Contractual Schema’ (Williamson 2005, f.1, p.12)



The 'simple contracting schema' is a kind of decision tree in which a governance mode is path dependent. Within this decision tree there are two variables, transaction specific assets or asset specificity (denoted k) and contract safeguards (denoted s). In Williamson (2000, f.2, p.602) k is reassigned as h which represents contractual hazards. This in effect is the same as describing asset specificity, in that investment in transaction-specific assets creates the 'lock-in' hazard.

Williamson is also fluid with his terms of the points (A, B, C and D) in the schema; this however does not change the meaning of each point. Figure 4.5 represents his latest representation of the 'simple contracting schema'.

Williamson (2005, p.11-12) suggests 'assume that a firm can make or buy a component and assume further that the component can be supplied by either a general-purpose or a special-purpose technology, where k is a measure of asset specificity... Let s denote the magnitude of any such safeguards, which include penalties, information disclosure and verification procedures, specialised dispute resolution (such as arbitration), and in the limit, integration of the two stages under unified ownership'.

Williamson has always argued the key to TCE lies in its application of asset specificity. In Figure 4.5, he represents the way in which asset specificity plays an important role in determining the contractual governance of a transaction. Williamson (2000, p.602)

explains 'because each generic mode of governance possesses distinctive strengths and weaknesses, there is a place for each yet each needs to be kept in its place'.

Having addressed the positioning and elaboration to TCE which Williamson represents in Figures 4.4 and 4.5., it is appropriate to look at some other substantial discussions. Firstly, it is important to look at Williamson's (1999a, pp. 1103-1105) comments on 'learning'. This is of interest as it delivers on what I perceive to be a lack of discussion on learning in TCE. Then I shall review his recent papers on *Public and Private Bureaucracies* (Williamson, 1999b) which argues that the public bureaucracy is a legitimate governance choice, and should not be disregarded as many do.

Learning has been discussed fleetingly by Williamson; it was Winch (2001) who first brings it into the TCE framework. However, a focused discussion and empirical research on the effects of learning on transaction costs has yet to be realised.

Williamson (1999a, p.1103) acknowledges this. 'Although transaction cost economics made early provision for the difference between explicit and tacit knowledge (Williamson, 1971) and thereafter developed the contractual/organisational ramifications of firm-specific human capital, in that both worker and firm have incentives to craft added contractual safeguards as human asset specificity builds up (Williamson, 1975, Chap. 4), it makes only limited contact with the subject of learning. Learning being a large subject, it is not possible to relieve this lapse here'.

The discussion of learning in the paper is placed in the overall discussion of TCE and strategy. Even though Williamson (1999a) briefly addresses the question of learning, it provides an indication of how he sees it in a transaction cost perspective. Learning provides the basis for the firm to 'learn from experience' and put in safeguards for future transactions (Williamson, 1999a, p.1104). This demonstrates the *ex post* nature of learning in transactions.

As for the *ex ante* nature of learning, this comes in the form of the decision to make or buy. Williamson (1999b, p.1104) addresses the case '...where both the firm and its suppliers have pre-existing strengths and weaknesses for producing a good or service. Assume, in particular, that the firm has not yet made the requisite specialised investments itself and that outside suppliers are partly qualified in this respect. Out of considerations of timeliness and the costs of self-learning, the firm decides to procure from one of these outsiders. A contract of medium duration is agreed to'.

What results, Williamson (1999b) explains is that the firms will learn about the contractual hazards evident in the transaction and also the nature of the specialised investments required. This will thus affect the contract renewal decision. It has been suggested by Winch (2001) that the frequency of the transaction will determine the learning gained.

Williamson (1999b, p.1104-1105) states TCE has a bearing on studies which have shown 'biased learning.unsurprisingly, these learning mechanisms come at a cost, of which

myopia is salient. Three myopic tendencies are distinguished: (1) ignore the long run, (2) ignore the larger picture, and (3) overlook failures'. However, 'the upshot is that while competence research on learning and path dependency is especially good at uncovering biases, the lens of transaction cost economics (with special emphasis on the remediableness criterion) affords comparative institutional perspectives. Both are needed'.

Williamson (1999b) discusses the public and private bureaucracy using a TCE perspective. Williamson (1999b, p.307) comments 'transaction cost economics views the public agency as a candidate mode of governance that is well-suited for some purposes, poorly suited for others. For which transactions is the public agency well-suited and why? Where does the public agency fit into the overall scheme of economic organisations?'

The criterion used to answer these questions is the remediableness criterion. Williamson (1999b, p.316) explains 'the remediableness criterion holds that an extant mode of organisation for which no superior *feasible* alternative can be described and *implemented* with expected net gains is *presumed* to be efficient. Although some may believe an extant mode enjoys an undeserved advantage by this presumption of efficiency, such presumption is favoured by the rough-and-ready test that an extant mode has survived a comparative institutional competition'.

There are some cases in which competition can be defective and render the competition null. Under such conditions the efficiency presumption can be rebutted (i.e. under conditions of corruption, totalitarian regimes etc). Williamson (1999b) explains '*contingent* practices that have the purpose and effect of defeating or deterring actual and potential rivals but do not confer benefits more generally are, at the very least, troublesome and may warrant withdrawing the presumption of efficiency'.

In applying the remediableness criterion, in which alternative governance is chosen, Williamson warns of rash judgements. Williamson (1999b, p.318) explains 'to denounce public agencies because they have lower-powered incentives, more rules and regulations, and greater job security than are associated with a counterpart private bureau completely misses the point if those features have been *deliberately crafted* into the public bureau, thereby mitigating contractual hazards, albeit at a cost'.

Williamson (1999b, p.322) goes on to discuss how the public transaction differs to the private. In so doing, he brings up the example of the foreign services which he suggests as a public bureaucracy contains 'considerable specificity' in human assets. He also suggests that probity ('loyalty and rectitude') plays an important role in distinguishing the public bureaucracy to the private.

Williamson (1999b, p.322) states 'one could argue, correctly, that probity is important for all transactions, public and private alike. That it has not hitherto "surfaced" is, I

conjuncture, because the importance of differential probity becomes evident only in conjunction with extreme instances (of which sovereign transactions/foreign affairs is one) and because probity is delivered through leadership and management attributes of governance that have hitherto been outside the ambit of comparative contractual analysis...’.

Williamson (1999b) argues the case that public bureaucracies can in some cases be justified, where transaction cost arguments are put. He uses the transaction specific investments made in human assets and the expectation of an extremely high probity as reasons why public bureaucracies are preferred and can be justified. There can, as has been seen in the past and present be a reason for privatising public bureaucracies. However, it seems that there are some special cases for which the argument is firmly on the public bureaucracy side (e.g. the foreign office).

4.4 Critique of Transaction Cost Economics

4.4.1 Critics of the Transaction Cost Approach

Granovetter (1985) focuses his critique on Williamsons (1975) work *Markets and Hierarchies* (discussed at length in 4.2.2). The article is concerned with understanding how economic behaviour is embedded in structures of social relations. Granovetter (1985, pp.482-483) explains ‘I assert that the level of embeddedness of economic behaviour is lower in nonmarket societies than is claimed by substantivists and development theorists,

and it has changed less with “modernization” than they believe; but I argue also that this level has always been and continues to be more substantial than is allowed for by formalists and economists’.

Williamson (1998, pp.26-27) highlights the social embeddedness level in his *economic of institutions* framework (shown in Figure 4.4) and his comment of it is that ‘...it is taken as given by most economists’. As such, this is the view which Granovetter (1985) argues against and instead see’s social embeddedness as more substantial than Williamson’s (1998) description.

There is, in Granovetter’s view, a skewed understanding of economic action and social structure, in the extremes of ‘undersocialized’ and ‘oversocialized’ accounts. In the former, proponents disallow theoretical arguments by hypothesis any impact of social structure and social relations on economic actions. Whereas, the latter suggests that social constructs have been dictated to provide consensual systems of norms and values embedded through ‘socialization’ to an extent where ‘obedience is not perceived as a burden’ (Granovetter 1985, pp.483-483).

The NIE provides an undersocialized account of human action, in that it argues for social institutions and arrangements to be viewed as efficient solutions to certain economic problems rather than being a result of legal, historical, social or political forces (Granovetter 1985, p.483). Granovetter (1985) argues that Williamson (1975) in his

explanation of the organisational failures framework fails to appropriate enough importance to social constructs, such as trust, and instead substitute these for effective use of institutional arrangements.

Granovetter (1985) critique of Williamson (1975) is that the hierarchal power within the firm is oversocialized and the trust and reputation in the market is ignored and as such undersocialized. The social nature of the market is evident in everyday business life and as such trust, reputation and expected behaviour play a major role in the way the market functions. Thus, he believes the role of governance mechanisms to lower opportunistic tendencies in transactions is overemphasised, at the expense of social constructs (Granovetter 1985, pp.494-497).

As for hierarchical power, Granovetter (1985, pp.500-501) claims 'thus, the oversocialized view that orders within a hierarchy elicit easy obedience and that employees internalized the interests of the firm, suppressing any conflict with their own, cannot stand scrutiny against these empirical studies [Dalton 1959; Eccles 1983] (or, for that matter, against the experience of many of us in actual organizations)'.

Furthermore, Granovetter (1985, p.505) rejects any sense of TCE being an approach that addresses the negation of institutional and transactional issues in neoclassical economics and thus appearing closer to the sociological perspective. 'But the main thrust of the "new institutional economist" is to deflect the analysis of institutions from sociological,

historical, and legal argumentation and show instead that they arise as the efficient solution to economic problems. This mission and the pervasive functionalism it implies discourage the detailed analysis of social structure that I argue here is the key to understanding how existing institutions arrived at their present state’.

Madhok (2002) aim is to provide the view of ‘the nature of the firm’ as being a compliment of the transaction-cost approach and resource-based theory by hypothesising a triangular alignment of transaction particular, governance structure particulars and resource particulars. His critique is that the transaction cost approach, which he mainly attributes to Coase, needs to be aligned with the resource-based perspective of the firm to result in a more wholesome understanding of the firm.

Madhok (2002, p.537) state ‘there are two principal questions with respect to the organization of economic activity. The first is ‘Why is an activity organized within firms and not purchased through the market?’ The other, equally important question is ‘Why is an activity organized within a particular firm (or firms) and not any other?’ That is, how is economic activity distributed among firms?’ The first question refers to the transaction cost approach and the second is a resource-based perspective.

Williamson (1998, p.47) clearly outlines his views on a group of theories – competitive forces, strategic conflict, the resource-based perspective, and dynamic capabilities. ‘Much of this literature is preoccupied with *ex post* rationalizations of ‘successes’ (the object

being to uncover what explains 'excellence'). Although this can be informative, efforts to *predict* success are rarely made. Empirical work on success management rarely gets beyond cases and anecdotes'.

However, Williamson (1998, p.48) does not dismiss the importance of the second question. Rather he states that TCE has to provide a solution to questions such as 'How should firm A – which has pre-existing strengths *and* weaknesses (core competencies and disabilities) – organize X' and 'How does firm A compare with extant and potential rivals with reference to the market niche (X) in question?' Williamson (1998) develops a generic level (of governance choice) and resource-based levels (of which there are three firm-specific choices) to emphasise a strategic approach to TCE to respond to firm-specific transaction considerations.

Madhok (2002, p.547) concludes 'while TC [Transaction Cost] economics has undoubtedly made important contributions to strategic management theory, particularly in the realm of economic organization, it is nevertheless only a partial solution since it provides, at best, a tenuous link with competitive advantage, arguably *the* key issue of concern for strategy... the triangular alignment hypothesis offers scope for a more comprehensive theoretical solution'. However, it would seem Williamson has other ideas – instead he sketches his own view on the resource-based perspective, as a way to align TCE with strategic management thinking.

4.4.2 Critics of Uncertainty and Opportunism

Slater and Spencer (2000, p.61) focus their criticism of TCE on a dimensional level. They suggest 'the founding figures of transaction cost economics, Ronald Coase and Oliver Williamson, have steered away from offering a detailed explanation of the nature and origins of uncertainty... Williamson's approach places great emphasis on bounded rationality, creating problems in distinguishing uncertainty from complexity'. Thus, the paper is based on the flaws and insufficiencies of, what the authors view is, the TCE approach to uncertainty.

In my view, Williamson (1975) provides a clear distinction between complexity and uncertainty. In his example of the complexity of a chess game, Williamson (1975, pp.23-24) provides a clear indication that complexity is an issue of limits on knowledge due to the extreme level of understanding required which goes beyond (current) human capability e.g. computational or mathematical knowledge. Whereas, the conditions of uncertainty differ in that it is not a question of understanding rather it is a matter of unforeseen contingencies (unknowns), whether that be due to reasons of foresight (future vision) or probability (statistical variations).

The presence of uncertainty and/or complexity becomes important at the point where bounded rationality exists for the human decision-maker. If it were not for the limits of rationality, on the part of the human decision-maker, the choices of organisation would be uninteresting as there would be a clear group of contingencies in place to deal with

complexity and uncertainty. Instead, the realistic situation is that decisions are made under conditions of bounded rationality with uncertainty/complexity present, and thus the TCE governance trade-off takes centre place (Williamson 1975, pp.22-23).

Slater and Spencer (2000, p.69) put forward to questions: 'first, how are boundedly rational agents able to devise and implement the efficient, transactions costs minimizing governance structure for all transactions? And following on this, how can agents know what they have selected the most efficient governance structure when they confront calculating limits?' and 'the question remains how it is in Williamson's theory that governance structures associated with lower transaction costs come to dominate in the absence of complete knowledge'.

In response to the first question, I would argue that the decision-maker makes a choice on specific transactions, not all transactions, or at least its primary transaction (its core product). In so doing, the question, therefore, of how a boundedly rational agent makes the governance choice becomes a transaction-specific question. In this, Williamson (1975; 1979) has talked of the importance of the asset specificity dimension. The agent accepts that s/he is boundedly rational, s/he cannot change this fact.

The agent can, however, reduce uncertainty/complexity through an investment with its transacting partner i.e. relation-specific investments, to reduce the effects of uncertainty/complexity on the boundedly rational decisions s/he will make. The agent will

have to make decisions, according to the uncertainty/complexity, asset specificity, frequency of the transaction, having taken to account issues of bounded rationality and any opportunistic behaviours that may occur, to seek appropriate transaction governance. Thus, the agent has at its disposal a number of factors in the transaction to consider in making the governance choice.

Of the second question, Slater and Spencer (2000, p.70) elaborate further their query by stating 'thus, Williamson seemingly attempts to uphold two incompatible positions. On the one hand, there is uncertainty and complexity; on the other, apparent certainty about the hazards that uncertainty may give rise to. This allows problems to be pre-empted and for governance structures to be devised that are *pre-adapted* to disturbances'.

A choice of governance structure is not one which will bring the agent certain success against issues of uncertainty/complexity rather it is the best alternative to deal with the existence of such conditions. Similarly, choosing a specific transaction-governance does not mean that the problems of opportunism are removed rather it puts in place a mechanism to resolve it, if it occurs. Thus, it is not a matter of certainty in the face of uncertainty, more resilience under conditions of uncertainty/complexity.

Slater and Spencer (2000, p.77-78) put forward an interesting discussion of the future nature of uncertainty, in that they suggest 'reality is transmutable, yet its actual path of development remains uncertain, in a radical sense. The future is understood as a *created*

process, rather than an endpoint in an otherwise preordained world'. They suggest that the future is dependent on the actions of human beings. 'Determining the world of tomorrow is the intricate amalgam of social interactions that fuse human society'.

Their approach takes on the 'socialization' perspective of Granovetter (1985); as such they suggest that Williamson has *undersocialized* uncertainty. However, I find it questionable that humans *make* the future, the future by its nature is undetermined. While the future may be affected by our choices, at present, the future is changeable and, unconsidered and unforeseen events may occur. Therefore, humans are boundedly rational in understanding the future because the future is uncertain! However, we can make certain choices, in the present, to influence the future such as the choice of transaction governance.

Slater and Spencer (2000, p.82) conclude 'imposing closure on reality in this way promotes fatalism such that history appears to occur by a (certain) logic of unavoidable necessity. By adopting a closed-system approach, transaction cost economics sidesteps radical uncertainty and opts instead for a form of conservative certitude wherein there exists no possibility for fundamental change under existing (capitalist) institutions'.

Firms are dynamic or they can not survive as entities in a dynamic nature, they must react to the conditions within which they transact. Therefore, there are no certainties in decision-making only best of the alternatives. If situations change then the firm will have

to change the way they undertake their transaction or organisational failure may result. Thus, TCE does not create a static situation for transactions, but rather a situation which best fits the transaction until the point where it no longer achieves the desired outcome, and then change is required.

Hill's (1990) criticism is levelled at TCE use of contractual governance to protect from opportunistic behaviour of prospective exchange partners. His main argument is against the tendency to move towards hierarchical governance under high asset specificity, which he views as an unnecessary move.

Hill (1990) argues that the invisible hand of the market protects transactions from opportunistic behaviour from either/both exchange partners, due to the mechanism of firm reputation. Reputation plays an important role in mitigating opportunistic behaviour within the market suggests Hill (1990) and where the bureaucratic costs of internalisation are unreasonable, markets should be chosen.

Hill (1990, p.503) states 'thus, the invisible hand of the market mechanism selects organisations on the basis of their repertoires of behaviour, suggesting that the distribution of cooperative and opportunistic actors is not exogenous to the economic system.'

Hill (1990) accepts the TCE theorists' view of the market; while there may be actors who are trustworthy and collaborative in the market, finding those who behave opportunistically can be difficult in the first instance. His argument is that these firms will ultimately be recognised over time, and their tendency towards opportunism will become an integral part of the firms' reputation.

Firms who behave opportunistically find that their reputation is sullied and thus due to social networks in markets their future business will be threatened. Furthermore, for those who want to diversify their businesses to other areas of the market will find the capitalist markets difficult to navigate with a bad reputation. Therefore, his point is that due to the impact of the negative repertoire firms are unlikely to behave opportunistically, and as such the TCE make-or-buy choice should not focus on asset specificity and opportunism.

Hill (1990, p.508) comments 'it is also important to note that the use of hierarchy, as a response to the threat of opportunism, also dissipates some of the composite quasi rent that is inherent in the exchange'. While, relational governance may be supported by reputation safeguards, unitary governance is not a response to opportunism threats.

Hill's (1990) argument on the effects of repertoire is reasonable, but rather redundant in the TCE perspective. The main argument is on the consequences of high or mixed transaction specific investments on governance structure. Bilateral exchange occurs under

conditions which foster relational contracting. Relational contracting would have repertoire as a central part of its governance. The reputation of a firm will provide an indication of the potential success of relational governance, where trust and collaboration is being sought.

Williamson (1985) describes unitary governance as being preferable when the transaction becomes idiosyncratic, and removing it from the market becomes advantageous due to dissipating costs of inter-firm organisation. Thus, the decision of internalising or vertically integrating is made due to transaction cost saving considerations, rather than purely to mitigate opportunistic behaviour – this is a second-order effect.

The main advantage for relational governance is that the transacting parties can save on transaction costs (negotiation, control and monitoring) due to the trust and collaborative nature (as well as savings on writing complex contracts) in the relationship. The most effective mechanism to mitigate opportunistic behaviour in relational governance is the possible loss of reputation. The consequences of acting opportunistically can be detrimental to both parties, who are engaged in frequent transactions using the market mechanism.

The reduction in opportunistic behaviour is a consequence of firm structure, in which it is argued such behaviour can be better monitored and controlled; it is an *ex ante* factor. If

opportunistic behaviour was the main concern then we expect the invisible hand to play its role in relational governance as Hill (1990) has argued.

Hill (1990) has not, therefore, provided an alternative thinking to TCE. In fact, his criticism provides an explanation for relational governance in terms of the invisible hand and provides an effective distinction for why relational contracting may be a good contract choice for market transactions.

Even though switching cost might be high in a high asset specific relationship, creating a lock in effect, this does not necessarily mean that the parties will automatically become opportunistic. As well as the reputation, the cost of contract termination to the supplier will be high, and maybe damaging, due to the transaction specific investment made. The lock-in effect is bilateral, both parties are mutually dependent and this is the reason why relational governance may be preferred.

There may also be examples where firms believe that they can control the opportunistic behaviour of their supplier(s) and continue the transaction due to the supplier's ability to deliver at favourable prices. In this case the buyer will find that the cost of creating contractual safeguards in order to protect and monitor from opportunistic behaviour will gradually dissipate the gains of the favourable prices. The supplier will also find itself with a reputation for poor behaviour and may find it difficult to gain contracts with other buyers.

Ghoshal and Moran (1996) make an uncompromising critique of Williamson's TCE theory in their paper. They base their critique heavily on Williamson's use of opportunism (interest seeking, with guile). They state that opportunism has been given greater attention than it deserves. This means, they suppose that the explanation for the firm as a boundary choice in TCE is misrepresented.

Opportunism, they suggest, plays an important role in internalising the transaction. In their critique of opportunism as a behavioural assumption and what they view as its role in the internalisation decision, they argue that TCE is 'bad for practice' due to what they see as 'misleading' managers in boundary choice decision.

Ghoshal and Moran (1996, p.17-18) explain 'without specifying the mechanisms through which opportunism is created or is reduced, Williamson assumes human nature to be its sole cause. By attributing opportunism solely to the "human condition" rather than to technology or to the institutions themselves, and the control of opportunism solely to imposed safeguards, Williamson turns a relatively common yet unexplained phenomenon into a behavioural assumption that has been described as an "extreme caricature," even by those who have made important contributions to advance the cause of TCE'.

Opportunism is a behavioural condition specific to the human condition, it is a moral hazard faced by the decision maker (Williamson, 1975). The technology or institution in a transaction can not be described as opportunistic, as Ghoshal and Moran (1996) intimate,

as they are inanimate objects or human constructs, it is the decision makers within the transaction who are effected by or behave with opportunism.

They suggest that Williamson saw opportunism through two lenses, one as 'opportunistic attitudes' and the other as a 'type of behaviour'. They argue that Williamson does not discuss the distinction between the two aspects of opportunism in his formal theorising, and it is due to the absence of explanation that opportunism is allowed to continue its validity in the theory (Ghoshal and Moran, 1996, p.18).

The purpose of this argument is to suggest that while behavioural opportunism is seen as a variable changing depending on asset specificity, or the sanctions assigned in the governance mechanism, attitudinal opportunism is not defined distinctively. Thus, they assume that attitude is either a 'fixed trait' or 'a single construct' with behaviour.

Williamson (1996b, p.50) responds to Ghoshal and Moran by stating 'the main purpose served by invoking opportunism are these: (a) it avoids the contractual naivety that arises when contract as mere promise (unsupported by credible commitments) is invoked and (b) it invited the identification, explication, and mitigation of hazards that have their origins in opportunism'.

He argues that the purpose of opportunism is not to say that there are those who have the mentality of 'Machiavellian grabbing or Get them before they get us' attitude. It is

instead that decision makers should be aware of the hazards of opportunism and should look to 'give and receive credible commitment' (Williamson 1996, p.50).

Yet, Moran and Ghoshal (1996, p.59) continue to argue Williamson ignores the positive nature of human behaviour. '...how he believes that either balance or realism is achieved by augmenting self-interest with opportunism while at the same time choosing to ignore those qualities that justify esteem and confidence! We suggest that the view of human nature that stems from this approach is neither balanced nor realistic'.

As for opportunism being an extreme caricature, even if that is true it still highlights its existence. However, its extremity is exaggerated especially in an economic system which promotes self interest seeking (i.e. capitalism). In such a system, one would expect that self interest seeking, with guile, would be a common occurrence with managers under intense pressures to perform. The authors concentrate their criticism in what they view as an unclear definition of opportunism by Williamson, its description as an attitude and behaviour.

It is quite clear to me, as it is to them in their discussions, that attitude is not the same variable as behaviour. The wording they use to describe attitude 'proclivity, inclination, propensity' demonstrates intention based conditions, whereas behavioural opportunism are their manifestations. Their argument centres on the idea that a separate understanding of attitudinal opportunism can not be found by viewing it as either a fixed

trait or a single construct, however they do not suggest a separate more accurate view of attitudinal opportunism.

Do they suggest it does not exist at all? It is evident in using attitudinal and behavioural opportunism; Williamson is trying to distinguish between opportunism before and after the transaction has been negotiated. *Ex ante* to the transaction, opportunism takes on an attitudinal form, parties to the transaction must be aware that in certain circumstances attitudinal opportunism will be present in varying degrees.

In order to reduce the *ex post* opportunism, the behavioural manifestation, governance choices must be made. Thus, attitudinal opportunism can not be 'controlled or sanctioned' by the transacting parties due to the fact that it is beyond their control. An attempt can be made using governance mechanisms to 'control or sanction' the manifestation of these attitudes in the behaviour of the transacting parties. It is due to this capability of influencing behavioural opportunism that Williamson puts a greater emphasis in describing it in the construction of his theory.

The attitudinal and behavioural opportunism have an important element of temporality, which makes the arguments of Ghoshal and Moran (1996) limited, in my view. It is due to the *ex post* manifestation of behavioural opportunism which makes it an important behavioural assumption in boundary choice decisions.

It is quite clear that Williamson has built on the ideas of Ronald Coase's Nature of the Firm, to distinguish the institutional characteristics of the firm and market, and through this has constructed the TCE theory which provides decision makers with clear boundary choices. They have not outlined any new requirements of an institutional theory which, in my view, TCE has not already addressed.

Williamson (1996b) argues the question of opportunism is not one which suggests that decision-makers should respond in kind. Rather, that the decision maker should be aware of the opportunism hazard and mitigate for it with contractual safeguards. He argues that internalising may become a necessary move, where transaction-specific investment can be pursued and in dealing with moral and cognitive hazards.

Moran and Ghoshal (1996) explain 'our argument in "Bad for Practice" is grounded in the assumption that human behaviour is shaped by both disposition ("prior conditioning") and situation ("feeling for the entity"). We believe that in social organisations, disposition and situation evolve interdependently in an iterative manner, each influencing and being influenced by the other'.

Beyond the criticisms they present on the definition of opportunism as attitudinal or behavioural, they discuss the use of social controls in mitigating opportunism. Ghoshal and Moran (1996, p.27) suggest '... TCE cannot account for the efficacy of social controls in

most realistic settings, managers guided by TCE are likely to avoid their use and, consequently, forego their potential for enhancing efficiency’.

Trust and collaboration have, especially, received a lot of attention in the role they play in the relational contracting and bilateral governance structure. Ghoshal and Moran (1996, p.33) go on to say ‘although Williamson recognised the role of coordination in organisational adaptation [Williamson 1996b], he failed to recognise the role of shared purpose in inducing such coordination’. Williamson (1996b) addresses the question of organisational adaptation.

Because transactions differ in the degree to which they require coordinated adaptation, the alignment of governance structures with transactions in a discriminating way has economising consequences. Specifically, because generic transactions have little need for coordinated adaptation, yet would incur bureaucratic costs if removed from the market and organised internally, such transactions are better managed by markets. Transactions, by contrast, where parties bear a strong bilateral dependency relation to each other are ones for which coordinated adaptation yields real gains. The bureaucratic costs of internal organisation notwithstanding, the (coordinated) benefits of hierarchy here may well exceed the added (bureaucratic) costs.

(Williamson 1996b, p.51-52)

Moran and Ghoshal (1996, p.64) instead exclaim ‘we, in contrast, view the organisation as creating the environment that fosters a sense of mutual dependency on and between its members in the sense that they are attracted to its unique incentive context, the organisation effectively transforms the market context, which favours certain activities over others, into an alternative context that (explicitly or implicitly) favours economic

activities that are disfavoured by the market and other institutions and that would be unproductive and inefficient if carried out in those institutions’.

Moran and Ghoshal (1996) recognise that an alternative organisational theory is required if they are found to be, somehow, correct in their views of TCE being ‘bad for practice’. Williamson (1996b, p.52) criticises them for not providing an explanation for their ‘concept of inefficiency’.

Moran and Ghoshal (1996, p.64) are defiant and state ‘however, to demand a definition of inefficiency as a precondition for challenging Professor Williamson’s assertion that “economising is all” is to make that challenge a prisoner of his framework. Despite the altar on which it has been placed, the concept of efficiency, as used by Professor Williamson, is a weak one. It rests on an act of faith that inefficient organisational forms will be selected out over time by more efficient ones’.

They admit not to have an alternative theory, but explain how such a theory should be constructed. Ghoshal and Moran (1996, p.32) explain ‘to explicate the potential advantages of organisations over markets, therefore, it is necessary to understand the differences in the institutional logics of firms and markets and how those differences influence the ways in which each can pursue the objectives of efficiency and adaptation. Any normative prescriptions to managers of firms can only follow this understanding...’.

Williamson (1996b, p.55) exclaims 'transaction cost economics is an empirical success story. Ghoshal and Moran should come to terms with that'. This does not, however convince them. Moran and Ghoshal (1996, p.66) instead suggest 'we argue that the state of this body of empirical research is such that even though it may be "broadly corroborative" (i.e. not disconfirming) of TCE's predictions, it also does not disconfirm either our criticisms of TCE or the alternative logic we propose'.

4.4.3 Reviews of Transaction Cost Economics

The question of the 'empirical success of TCE' has been addressed by three studies, which review the empirical body of work on TCE and its associated variables. David and Han (2004) provide a focussed and detailed account of empirical research into TCE using a sample of 63 studies. Carter and Hodgson (2006) specify their review on what they identify as the most influential and highly cited studies, giving a sample of 27 studies. Macher and Richman (2008) instead undertook a more comprehensive review of empirical studies in TCE, choosing to include both published articles and book chapters, creating a sample size of approximately 900 articles.

David and Han (2004, p.39) begin by commenting on the debate between Ghoshal and Moran, and Williamson by stating 'what is intriguing about this debate is that neither side brings much solid evidence to bear regarding the actual empirical support for TCE'.

Therefore, the purpose of their review becomes quite clear to the reader, which is to assess the support, or not, for TCE theory.

The method David and Han (2004) use to review TCE is a systematic search for empirical research into TCE. They employ a number of search techniques, of which includes choosing only published journal articles from ABI/Inform Global and EconLit database and choosing keywords in to search the articles in the database. The concluding sample of 63 articles were chosen to represent the empirical tests of TCE and its associated variables (David and Han 2004, pp.42-44).

David and Han (2004, p.44) report the results: 'The 63 articles thus selected for analysis is contained 308 statistical test of core TCE relationships. These statistical tests are our 'units of analysis.' Overall, of the 308 tests of core TCE, 144 (47%) were statistically supported, 133 (43%) produced statistically nonsignificant results, and 31 (10%) were statistically significant in the opposite direction to the theory'.

The authors provide a break down of the findings by grouping the tests into independent variables, dependent variables, independent-dependent variable pairs, journals and years (David and Han 2004, p.44). This break down provides some interesting insight into empirical tests of TCE variables.

Empirical tests of Uncertainty as an independent variable was the second most analysed, with 87 statistical tests. Of these tests the only 24 percent supported the TCE view of Uncertainty and 16 percent rejected, thus the majority of the empirical tests were inconclusive.

David and Han (2004, p.45) argue that these test were counter to the complete view of TCE, which specifies that it is in the presence of asset specificity that uncertainty affects governance form. Such ignorance of this relationship leads to misinterpretation of the kind seen in Slater and Spencer (2000) view of uncertainty. Where there are studies of uncertainty in conjunctions with asset specificity, the success rate increases to 13 supporting results out of the 30 tests.

Another interesting break down of the results was the independent-dependent variable pairs. Thus, 21 tests were undertaken of the interaction between uncertainty and asset specificity on the market-hierarchy choice (the classical make-or-buy dilemma) of which 52 percent were supportive.

The interesting part of this independent-dependent variable pair was, however, on the nonexistence of studies on applying it to a hierarchy-hybrid or hybrid-market. There seems to be a gap in research seeking to see how uncertainty and asset specificity may lead towards a hybrid governance form, from a transition from hierarchy or market position.

David and Han (2004, p.51) comment on the significance of year publication 'thus, while the theory has become increasingly influential over time, there has been no convergence of empirical finding that would indicate agreement on baseline relationships'. This might indicate the persuasive nature of TCE as a theory, which has yet to be matched with empirical findings of the theory. As such, David and Han (2004) hesitate to agree with Williamson (1996) on the empirical success of TCE theory due to their mixed findings.

Carter and Hodgson (2006, p.462) state 'here we adopt a different methodology and focus on a smaller number of the most influential and highly cited studies. This permits a slightly more detailed discussion of the empirical tests and their interpretation. We concur with the 'mixed' verdict of David and Han, but we go further and argue that the results of test of the role of asset specificity, which seem to be among the more successful for TCE in empirical terms, are also consistent with the competence approach'.

The focus of the review is the application of Williamson's framework regarding the nature of the firm debate. The review uses citations as a means of identifying the significance of a study on the empirical tests of TCE. 27 studies were chosen using these criteria, of which 12 dealt with vertical integration research and 15 with 'hybrid relationships' (Carter and Hodgson 2006, pp.463-464).

All 12 studies looking at vertical integration found support for TCE, with 9 of the studies identifying human asset specificity as the key component. The results for the empirical

test into hybrid relationships are less convincing, and highlight some gaps in the understanding of the hybrid governance form in TCE (Carter and Hodgson 2006, pp.464-468).

Carter and Hodgson (2006) test the consistency of the findings with TCE principles classifying them as *fully consistent*, *partly consistent*, *partly consistent and partly inconsistent*, *inconsistent*, and *inconclusive* to TCE theory (Carter and Hodgson 2006, pp.467-468). Table 4.1 provides a break down of the results for these consistency tests with respect to vertical integration and hybrid relationships.

Table 4.1: Consistency of Empirical Tests with TCE theory (compiled from Carter and Hodgson (2006, pp.464-472))

	Fully Consistent	Partly Consistent	Partly Consistent and Partly Inconsistent	Inconsistent	Inconclusive
Vertical Integration	0	5	6	0	1
Hybrid Relationships	0	3	2	0	10

The empirical tests in the 27 studies, selected by Carter and Hodgson (2006), of TCE theory, regarding vertical integration and hybrid relationships are neither fully consistent nor inconsistent with TCE theory. The lack of consistency with TCE theory is identified as being mainly due to the fact that the researchers ignored the frequency dimension of the transaction.

This is inconsistent with Williamson's theory of TCE, which makes the recurrent feature of the transaction as important to the vertical integration decision. However, the fact that none of the studies are inconsistent with TCE theory demonstrates that tests of other transaction dimensions were supportive (mainly for vertical integration).

Of significance in Table 4.1 is the higher rate of inconclusive results for TCE empirical tests for hybrid relationships. Carter and Hodgson (2006, p.468) explain 'compared with vertical integration, there is less of a consensus over the nature and causes of hybrid relationships. Many empirical researchers regard the understanding of hybrid relationships as a major challenge, and propose that Williamson's TCE framework is inadequate to this task'.

I disagree with this view of hybrid governance; I am of the view that it is *not* a matter of TCE providing an understanding for hybrids, rather that it is up to further research to provide classifications and identifications for the hybrid form. TCE provides a clear basis for the hybrid form; it is in essence the compromise between the market or vertical integration positions.

The hybrid form is one where alliances between firms which are frequent transactors, with medium asset specificity can use third party arbitration to provide trilateral governance under conditions of uncertainty/complexity.

At the time Williamson was formulating TCE theory, in the early 70s, the hybrid form was less prevalent in the organisational context, therefore while theoretically it was justifiable it was yet to be popular in practice. However, there are a number of joint ventures and such alliances between firms nowadays which may provide richer empirical tests (e.g. SonyEricsson, Nokia Siemens and many others).

Two-thirds of the studies prove to be inconclusive for finding the hybrid relationship as theorised by TCE. Carter and Hodgson (2006, pp.470-471) explain that this is because 'a common feature of many of these studies is that they test a governance mechanism that does not fit within Williamson's classification of governance forms'.

Even where the results corroborate with TCE theory, it is possible to reinterpret the findings with the competence approach, argue Carter and Hodgson (2006, p.473). They suggest that the human asset specificity findings of the vertical integration studies can be viewed using resource-based theories, and that empirical research in TCE should seek to distinguish or align with the competence approach.

Marcher and Richman (2008, p.2) approach the review of TCE empirical studies differently:

First, while prior reviews focus on a limited number of published articles, our data collection approach is more comprehensive and includes both published articles and book chapters. Second, the earlier reviews focus mainly on empirical applications that test the main tenets of TCE... Third, most of the reviews limit their analyses to "well-regarded journals known to publish TCE research" (David and Han 2004: 44)... Fourth, most but not all of the previous reviews limit their analysis to quantitative studies, whereas we include both quantitative studies, as well as qualitative (so called descriptive) studies.

Marcher and Richman (2008) provide a break down of TCE empirical studies on a subject basis. Table 4.2 provides a brief description of the research, which is undertaken in this diverse business and non-business subjects. The varied subject area of TCE empirical studies provides support for the theory, due to the wider acceptance of TCE as a valid theory.

Table 4.2: Subject areas for TCE Empirical Research (compiled from Marcher and Richman (2008, pp.12-38))

Subject Area	Empirical Studies
Economics	Practices providing efficiency benefits, make-or-buy decision, vertical integration, and long term contracting.
Marketing	Distribution and product exchange.
Accounting	Cost containment, relationships between accounting policy and contract behaviour.
Finance	Role of governance structures in diversifying or reducing financial risk, the choice of debt versus equity financing.
Organisation Theory	Efficiency considerations, institutional theory, strategic alliances between firms, and population ecology.
International Business	How firms organise enter into new international markets.
Strategy (narrowly defined)	Performance implications for relation-specific investments and organisational form.
Non-Business Areas	
Law and Public Policy	Response to natural monopoly rationales for regulation, particularly with respect to public utilities; rationale for and implications of various modes of organising government agencies and legislatures and; development and reform.
Health Economics and Policy	Research into recent dramatic organisational changes affecting the health care industry.
Agricultural Economics and Policy	Long-term contracting in agriculture, downstream food markets, forestry and environmental taxes.

Some subject areas have more empirical research into TCE (e.g. Economics, Marketing, Finance, Organisational Theory, Strategy and, Law and Public Policy), whereas in other subjects the body of work is new and growing. The reason Marcher and Richman (2008) have narrowly defined Strategy is to differentiate it from the other business subjects,

which can also be viewed as strategic management, in a wider context, when applying the TCE approach.

My own research fits in with this narrow definition of strategy. As my focus is on performance in terms of value for money and how that affects the organisational choices in the UK defence industry.

Taken together, the papers surveyed provide considerable support for the main propositions derived from transaction cost economic theory... There is also considerable support for many of the specific transaction-level factors identified in the theory as influencing contracting costs... The critical dimensions along which governance structures differ are also elucidated in the empirical literature surveyed... Like earlier surveys of TCE research, our review of the articles finds a strong convergence between the theoretical predictions of TCE and the results of empirical applications within several social science fields and in a variety of applications.

(Marcher and Richman 2008, p.38)

This outcome is a much more positive one for TCE, as compared to the previous two reviews presented here. Marcher and Richman (2008) seem to be satisfied by the focus of the empirical studies into TCE, and the multidisciplinary nature of the TCE empirical body of work. Their review provides a more comprehensive approach rather than the systematic and focussed reviews of David and Han (2004) and Carter and Hodgson (2006).

Marcher and Richman (2008, p.41) point out some issues, which require attention in TCE. 'In addition to the problems associated with the use and measurement of transaction cost proxies, a second important gap in the existing empirical literature concerns the endogeneity of transaction cost variables, most notably asset specificity. Virtually all of the studies examined in this survey treat the specificity of assets and the level of firm's

investment in those assets as exogenous... Firms' make decisions regarding whether or not to invest in specialized assets and the scale of those investments. Strictly speaking, these variables should therefore be treated as endogenous'.

The complexity of assigning proxies to TCE has already been acknowledged, in the previous chapter, with respect to studies by Humphries and Wilding (2001) and Angelis et al. (2009).

Marcher and Richman (2008, p.42) make an insightful comment regarding the most criticised aspects of TCE, the formality of the dimensions. It is in the lack of formal definitions that a number of critical attacks have been directed towards TCE theory (e.g. Ghoshal and Moran 2006; Slater and Spencer 2000).

They state 'finally, empirical TCE research would benefit greatly from additional effort to formalize its theoretical foundation... Among the principle advantage of a more formal theory is that it forces researchers to define with greater precision the concepts that are central to the empirical analysis. Currently, a handful of core ideas in TCE suffer from multiple and, at times, competing definitions'.

Uncertainty/complexity requires a broader definition to allow for the diverse forms in which it appears in differing transaction environments. It is also difficult to formalise the human behavioural assumption of opportunism, which is a highly psychological aspect

within the transaction. Williamson has identified the motives behind opportunism; it is however more challenging to identify opportunistic behaviour in empirical studies due to its subjective nature.

The reviews presented in this section provide a differing approach to the question of empirical success of TCE theory. David and Han (2004) and Carter and Hodgson (2006) agree that support for TCE is mixed, Macher and Richman (2008) argue there is support for TCE theory and it is strengthened by the multidisciplinary aspect of TCE empirical studies.

The reviews point out some important flaws in TCE empirical studies. David and Han (2004) point out that more studies reject, than support, uncertainty as a dependent variable in transactions due to a lack of proper appreciation of the TCE point of view of uncertainty, and they also point to a lack of research in hybrid governance choice.

Carter and Hodgson (2006) focus on the nature of the firm and find that no studies in their review include frequency when testing TCE hypothesis resulting in, at best, partially consistent findings with TCE theory. They find that a majority of the studies looking at hybrid governance are inconclusive.

Macher and Richman (2008) find that empirical studies of TCE are on the whole consistent with the theoretical perspective and cover a multidisciplinary area in business and non-

business subjects. The authors cover a more comprehensive study than the previous two, but with less rigour than the other two reviews.

Williamson, based on these reviews, is justified as the father of TCE, to argue forcibly of its empirical success! However, critics of TCE are justified in questioning gaps within the empirical body of research. This should galvanise, rather than discourage, TCE theorists to put greater effort to illuminate those parts of TCE which require greater focus. I am of no doubt of the merits of TCE as a theory, and find it even more powerful as an explanatory tool.

4.5 Summary

Williamson has convincingly argued for nearly five decades that the transaction cost approach to understanding the economic problem defines a new way of thinking in institutional economics. He argues that a transaction involves a number of complex factors connected with environmental considerations and human behavioural assumptions.

Williamson uses Coase (1937) description of the 'Nature of the Firm', the supersession of the price mechanism and the alternative (to the market) coordination of goods/services, to discuss the economic problem of 'make-or-buy'. This economic problem hinges on the

transaction cost elements, which will make the exchange of goods/services dependent on a number of explainable variables.

Williamson goes on to discuss the variables which affect the make-or-buy choice, and which ultimately will result in the failure of an organisational framework, in favour of an alternative governance structure. This is the remediable criterion in which there will be a feasible alternative to governance in favour of an efficient transaction.

The environmental factors *uncertainty, frequency and asset specificity*, are developed as the main factors affecting organisational failure. These environmental factors are troublesome in combination, and are intensified when joined by the behavioural assumptions, *opportunism and bounded rationality*, affecting decision makers.

These behavioural assumptions are human limitations in a neurophysiologic and a moral hazard sense. The combination of the environmental and behavioural factors creates frictions in the transaction, in which managers and decision makers must seek to mitigate these contractual hazards by creating safeguards.

Williamson discusses the contracting methods as being *classical, neoclassical and relational* contracting, which create a set of governance structures ranging from *market governance* to *unified governance*. The governance mode will be a function of the

safeguards and the transaction specific investments. The parties in the transaction will decide the appropriate transaction according to these factors.

A number of authors have sought to contribute to TCE by elaborating, empirically testing and applying the theory. Winch (1989; 2001) has contributed to TCE theory by incorporating *learning* to the organisational failures framework. Learning can combine with frequency in a transaction, in the sense that with recurring transactions the capacity to gain transaction-specific learning increases.

This addition to the behavioural assumption is valuable and provides strength to the TCE perspective. Williamson (1999a) has discussed the role that learning plays in the transaction, but has admitted there has been a lack of proper analysis of learning. Empirical work on transaction-specific learning is required to support Winch's contribution to TCE.

Lyons (1995), and Maher (1997), both provide interesting discussions on the make-or-buy choice. They concentrate on asset specificity and opportunism as the key factors for the decision. As is to be expected, when discussing the boundary choice using TCE factors in isolation there are bound to be some arguably fraught ideas.

Williamson has emphasised that the factors characterising the TCE perspective are to be viewed in combination, therefore it makes little sense to discuss these factors in isolation

and ignorant of their counterparts. I therefore presented my objections to some of the conclusions made by Lyons (1995), and Maher (1997).

Further developments in TCE have been identified in transaction governance. Relational contracting is an important part of the discussion on alternative modes of governance choice. Other governance structures have been less interesting because of their developed stage in law, economic and organisation literatures. Relational contracting is an underdeveloped area of contracting. Pilling *et al.* (1994), Artz and Brush (2000) and, Poppo and Zenger (2002) have contributed to this area of the TCE framework.

Masten (1993) discusses the idea of aligning TCE to strategic decision making for alternative governance arrangements. He develops a relationship between governance and performance as the way to make the alternative governance choice. Whilst he acknowledges governance choice will be determined by the transactional considerations. He states that performance and organisational choice will determine governance where there is a close call and the transactional considerations are of a similar kind.

Williamson has responded to developments in TCE research by emphasising its position as part of a New Institutional Economics perspective. He places TCE on the third level of the analytical framework for economics, in which the governance of an institution becomes the focus.

The governance of an institution becomes a set of alternative modes which prove to be efficient for certain transactions, and not so for others. Williamson has explained, with the aid of his 'simple contractual schema' how alternative choices of governance can be made. The focus is on two aspects of the transaction: the asset specificity of the transaction and the contractual safeguards designed to mitigate the negative effects of uncertainty, bounded rationality and opportunism.

Williamson has also recently discussed public bureaucracy governance, in order to dispel the widespread discredit of such institutions. He argues using a transaction cost approach, there are cases where public bureaucracy is an effective and necessary mode of governance. This means that the government will be right to, in some cases, internalise its transactions (i.e. nationalise). Williamson gives the US Foreign Service as an example of an appropriate public bureaucracy. He explains that in public bureaucracies there are high human asset specificities and probity, which make it more attractive as a governance form.

A critique of TCE theory is presented in the third section of the chapter. The views of authors who are more critical of TCE are discussed. I presented my response to these criticisms of TCE and offer some points of defence.

Granovetter (1985) and Madhok (2002) see weaknesses in the transaction cost approach. While, Granovetter (1985) believes that TCE approaches social constructs in an

oversocialized and undersocialized manner. Madhok (2002) argues that TCE is not sufficient, on its own, to provide answers on the nature of the firm and as such suggests that it is combined with resource-based theory. Other authors have attacked the dimensions of TCE theory, specifically uncertainty (Slater and Spence, 2000) and opportunism (Hill, 1990; Ghoshal and Moran, 1996).

Slater and Spencer (2000) question the definition of Uncertainty, and the role it plays with respect to Complexity and Bounded Rationality. While Hill (1990) attempts to use reputation as a reason to why opportunism is unimportant; Ghoshal and Moran (1996) suggest Williamson's definition of opportunism is erroneous. Williamson (1996) defends his use of opportunism and the empirical strength of TCE. He makes a bold statement that "it is an empirical success". This statement is tested through a number of reviews on empirical research on TCE.

Three reviews of TCE empirical research is discussed (David and Han, 2004; Carter and Hodgson, 2006; Macher and Richman, 2008) providing an analysis of the strengths and weaknesses of TCE. The overall findings are that the success of TCE empirical research is mixed and there are some gaps in research which need to be filled. There is a gap in TCE research for an understanding of the role played by frequency in transaction costs, the governance choice of hybrid governance from a market or hierarchy position, and the operationalisation of TCE dimensions.

However, as argued by Williamson and shown by Macher and Richman (2008) TCE is an established and multidisciplinary theory. TCE demonstrates a versatile yet testable theory, which can be applied in hindsight for economic forensics or used to design present or future transactions. In 2011 it shows as much applicability to real life situations as it did in 1975.

There is space for a new crop of TCE theorists to provide an explanation to our current economic problems, and to provide possible solutions to the current regulatory crisis. There is an opportunity for researchers to look at the lessons to be learnt from the sub-prime mortgages fiasco and see what regulatory frameworks could be designed to reduce opportunistic behaviours having such damaging effects in the future. It is time to take the scalpel to the banking sector.

5 Major Projects Reports

5.1 Chapter Overview

The National Audit Office (NAO) prepares the Major Projects Report under Section 6 of the National Audit Act 1983. The Report is produced and submitted to Parliament annually by the Comptroller and Auditor General of the NAO. This chapter will analyse the Major Projects Reports in order to ascertain the developments in defence acquisition in the last two decades. The research question posed is, thus: what are the main themes in the delivery of major defence projects?

Whilst the previous chapters focused on theoretical and historical literature, this chapter will highlight documented defence acquisition practice using previous and current defence projects. The aim of this chapter is to provide an understanding of the state of defence acquisition to frame the issues facing defence acquisition today.

The Major Projects Reports have been chosen from the publication period of 1993 to 2010. The *Major Projects Report 1993* (MPR1993) was the first to use a report structure, as previous analysis of defence projects were presented as a *Major Projects Statement*. It is therefore appropriate to start with the 1993 publication.

This chapter will focus on three areas of analysis of the reports. Firstly, the focus will be on the *Reporting Structure*. The reporting structure will explore the selection of projects appearing in the reports; the procurement route taken for the projects; and the measures adopted for assessing project performance.

The second section of the chapter will assess the overall *Project Performance* in each report with the aim of identifying any trends in performance over the years. Most reports assess project performance at two stages: the initial phase of the project and the midlife stage of the project. This section will be separated into two: the first will look at the performance of the major projects during the 1993 to 1999 reports and the second on the 2000 to 2010 reports. The separation is due to changes in reporting structure, as a result of procurement policy changes in the form of the Smart Procurement Initiative.

The third section will look at the *Project Assessment and Capability* of major projects. The assessment phase is discussed in the second part of the reports, and was first included for discussion in MPR2000. The second part of this section will be on capability; it is the focus of discussions in nearly all the projects. The consequences on the Armed Forces defence capability under conditions of project slippage will be addressed.

5.2 Reporting Structure

5.2.1 Project Selection and Performance Criteria

The earliest of the reports, MPR1993, was the first to be presented in a report format. Previous defence audits were delivered in a statement format and were thus known as a Major Projects Statement. Defence statements/reports came about due to the Committee of Public Accounts in their 9th Report, Session 1981-82, highlighting the requirement for more information on defence projects - in order to develop a format in which the Department would be obliged to inform Parliament about the cost of major defence projects (NAO 1993, p1).

The National Audit Act 1983 was soon to follow to enforce the delivery of the Major Projects Statement to a Parliamentary Committee and following that the MPR was initiated in 1993. NAO (1993, p1) explains 'the National Audit Office report on the 1991 Major Projects Statement might be improved to provide a more meaningful analysis of cost overruns and time slippage and suggested fundamental changes to its structure'.

MPR1993 provided a more extensive discussion of defence projects with a few restrictions due to commercially sensitive information. The reporting structure made a few changes to the project selection process. MPR1993 is based on 25 of the largest projects, in terms of expenditure, whereas previous statements included all projects with Treasury approval for expenditure in excess of £250 million (NAO 1993, p.4).

With the introduction of a comprehensive report there were limitations on the number of projects included due to limits on the size of the report. NAO (1993, p.4) specifies 'projects are chosen for inclusion within the Major Projects Report according to their budgeted spends over the next ten years. However, the budgets or the overall expected project costs are not disclosed within the project summary sheets and cannot, in most instances, be discerned from other data in the sheets. The Department do so because disclosure may encourage tenderers to quote a higher price than would otherwise be the case'. This demonstrates that the level of transparency by the Department is reflected by the adversarial nature of defence negotiations at the time, as discussed in chapter two.

The selection criteria for projects were slightly altered for MPR1995, in which it was stated that at least £10 million had to have already been spent for a project to be included. Five of the projects in MPR1994 were replaced with five which satisfied this new requirement (NAO 1995, p.1).

This change remained for five reports (MPR1995 – MPR1999) and was replaced by new project selection criteria in MPR2000. In MPR2000, the project population was changed to the largest 30 projects. From these 30 projects, 20 projects had already gone through the main investment decision (post-Main Gate) and the remaining 10 are in their Assessment Phase (pre-Main Gate).

This change reflected the implementation of the Smart Procurement Initiative, which was introduced in 1998 and first implemented for projects in MPR2000. The Smart Procurement Initiative, which has been discussed at length in chapter two, introduced a new project lifecycle for defence projects, CADMID, to replace the Downey Cycle. Previous to MPR2000, the projects which were included in the reports were analysed together in one section of the report.

MPR2000 distinguishes between the pre-Main Gate and post-Main Gate projects in order to highlight the different nature of spending and project management during the two acquisition periods. In the MPR2001, Smart Procurement Initiative was renamed Smart Acquisition Principles to emphasise the entire acquisition life-cycle and introduced a number of principles aimed at improving defence acquisition.

As well as the changes implemented in acquisition policy during the reporting under the 1990s and 2000s; projects can also be differentiated in terms of their procurement route. In the 1990s, the reports analyse project performance by differentiating between the non-competitive and competitive based contracts. This distinction is less important in the 2000s reports as most, if not all, projects are based on competition.

The various changes to project selection and procurement in the reports are mirrored by changes to project performance indicators. Project performance criteria were highlighted in the new reporting structure as, NAO (p.5, 1993) explains, 'the new format contains a

wealth of information on the cost and time position of projects which was not previously made available. It also contains useful ancillary information on the nature of the contract, the procurement route and quantities to be purchased’.

Performance criteria were based on two specific measures, cost and time variations. Cost and time variations are explained under a number of categories, these categories are presented in Table 5.1. The categories provided the explanation for the changes in the estimated cost and time from the budget and schedule assessments. NAO has revised its categories to reflect changes in the way it assessed the projects in the reports.

Table 5.1: NAO Cost and Time Variance Categories (NAO 1993; 1995; 2000)

Cost Variance			Time Variance		
1993	1995	2000	1993	1995	2000
Price variations	Contract pricing	Contracting process	Technical difficulties	Technical difficulties	Technical factors
Poor cost estimation	Under/over-estimates	Change in associated projects	Procurement delays	Collaborative process	Procurement strategy
Volume variations	Quantity variations	Changes budgetary priorities	Budgetary constraints	Budgetary constraints	Changed budgetary priorities
Programme delays	Programme changes	Procurement strategy	Project definition	Project definition	Redefinitions
Specification changes	Specification or requirement changes	Changed requirements	Reliability problems	Delays in associate projects	Change in associated projects
Technical problems	Collaborative process	Technical factors	Other	Other	Changed requirements
other	Accounting changes	Accounting adjustment		Contract negotiation	Contracting process
	Inflation adjustment	Inflation			
	Exchange rates	Exchange rates			

The inclusion of the time and cost variation categories was an addition to the MPR1993. NAO (1993) suggested the headings previously used in the Major Projects statement did not provide 'meaningful information'.

The NAO consulted the Department on changes to be made to the categories in order to improve the clarity of the information. However, NAO (1994b, p.8) was still not satisfied with the adapted categories as 'some explanations for cost variations still do not convey adequately the nature of the factor leading to variance... '.

Changes were made to the category names and new categories were added, for MPR1995 and consequently MPR2000. Whilst the reports state that the categories are not analogous, there does not seem to be too great of a departure from previous categories. As Table 5.1 shows, some categories have been slightly changed in name but they infer the same analyses.

However, there were additional categories in MPR1995 – for cost variance the categories went from seven to nine, and six to seven in time variance. The new categories were a response to the changes in monetary value (in terms of inflation and exchange rate) which were affecting major projects. Some of the new categories were also due to internal financial changes, such as the accounting adjustment category. The new categories in time variance were a result of better understanding of what was creating delays.

In MPR2001 a new category 'risk differential' was added to cost variance. This was brought in specifically, and only, to apply to 'Smart projects' (NAO 2001, p.5). Similarly a new category was added for time variance to reflect the change in procurement strategy, 'risk provisions' (NAO 2001, p.12) was added to the list.

A third type of performance indicator, Key User Requirements, was introduced as part of the Smart Procurement Initiative in MPR2000 to assess the Departments ability to meet the military customers' requirements.

NAO (2000, p.11) explains 'under Smart Procurement, Key User Requirements are agreed at Main Gate and form a contract between the Integrated Project Team and the equipment capability customer. The new format of the post-Main Gate project Summary Sheets in the 2000 Major Projects Report includes, for the first time, a section on technical performance which reports whether projects currently expect to meet Key User Requirements specified by the military customer'.

In MPR2004 the focus changed from reporting the cost and time variance in detail to an in-depth analysis of the implementation of Smart Acquisition Principles and its affect on defence projects.

NAO (2004a, p.12) comments 'where the Department has not fully applied sensible acquisition principles, cost increases and delays have often resulted. The aim of the

Assessment Phase is to spend the right amount of time and money before the main investment decision to reduce project risks to an acceptable level. In practice, the right proportion to be spent will be determined by factors such as the nature of the equipment (such as an upgrade or a completely new capability), the maturity of the technology involved, the scale and length of production, and the likely procurement strategy (collaborative, non-competitive or off-the-shelf, Private Finance Initiative or Public Private Partnership)'.

However, the Report emphasised that Smart Acquisition principles are effective where applied rigorously. MPR2005 returned to discussions on cost and time variations and the reasons behind them.

5.2.2 Smart Acquisition Projects

The introduction of projects in their Assessment Phase in MPR2000 brought about some major changes to the report structure. In its first analysis of the Assessment Phase NAO (2000) had to equate the Initial Gate approval point in the CADMID cycle to an approximation of the Downey cycle, due to the fact that all ten projects in the MPR2000 were conceived prior to the introduction of the Smart Procurement Initiative (NAO 2000, p.13).

In MPR2001 assessment measures for projects were first reported. Three-point cost estimates introduced by the MoD were first reported by the NAO (1994b, p.5) for the purpose of ‘... a reduction in overly optimistic estimates by translating the identified risks into upper and lower costs (with confidence limits) about an expected figure. The tolerance band will provide an indication of the uncertainty present in the estimate of future costs’. They measure the level of risk affecting cost and timing of projects and became mandatory under Smart Acquisition in 2001 (NAO 2001, p.15).

NAO (2001, p.16) states ‘under Smart Acquisition, the range of cost and time covered by three-point estimates is expected to narrow between Initial Gate and Main Gate as risks are reduced. It is not clear to what extent the range is expected to narrow during the Assessment Phase or how wide a range is acceptable for a project to proceed through Main Gate. These parameters are unlikely to be standard across projects. They will depend on factors such as the nature and complexity of individual projects, which affect the risks involved and because of this the Equipment Approvals Committee review each project on a case by case basis’.

There is a great amount of uncertainty during the initial phase of projects creating risks on cost and time controls. The Department, in the earlier years of reporting on the Assessment Phase, were unable to provide much guidance on how to deal with the risk. The Department investigated the possible introduction of Technology Readiness Levels to address technological risks.

NAO (2001, p.17) explains 'Technology Readiness Levels have the potential to better support and give added confidence to the Department's decision making during the Assessment Phase and at Main Gate. Used in conjunction with the narrowing of the cost and time ranges covered by three-point estimates, Technology Readiness Levels would enable the amount of risk reduction achieved and the risk remaining before reaching an acceptable level to be better quantified'.

Technology Readiness Levels use a quantified scale – from basic concept technology at Level 1 to mature and proven technology at Level 9 – as a measure of technical maturity and to target risk-reduction activity before Main Gate. This was made mandatory for the Assessment Phase as part of an essential part of the 'Main Gate Business Cases' (NAO 2002b, p.23-4).

Thus, in MPR2002, nine pre-Main Gate projects had full three-point risk estimates for cost and time (the Future Strategic Tanker Aircraft only has cost estimates) and eight were using Technology Readiness Levels (Bowman and Skynet were approved before the mandate).

These measures are in place in order to ensure the most effective and efficient decisions are made in the Assessment Phase. NAO (2002b, p.24) explains 'the objective of the Assessment Phase is to spend the right amount of time and money to reduce risks to an acceptable level for Main Gate approval... Under Smart Acquisition, spending more money

in the Assessment phase and postponing Main Gate may, in some circumstances, be the right thing to do if it reduces risk to an acceptable level for Main Gate. However, there is also a requirement to be more accurate with time estimates of the Assessment Phase to avoid any unplanned capability shortfalls that may result in the long run'.

A guide of 15 per cent of the total procurement costs is suggested, before Main Gate approval, but it may depend on the circumstances and the risk involved in individual projects. In terms of Technology Readiness Levels, the Investment Approvals Board expects projects to reach Level three at Initial Gate and Level seven at Main Gate (this was not mandatory: NAO 2003, p.22).

In MPR2003 the Department investigated the possibility of using System Readiness Levels, to measure the maturity of complete systems including the integration of all components. System Readiness Levels were to assess the readiness of the design, development and testing regimes of systems or sub-systems to represent the risk to timely integration, these levels were to have the same scales as the Technology Readiness Levels (NAO 2003, p.22).

There was scant mention of Technology Readiness Levels and System Readiness Levels, nor were any figures given, in MPR2004. The focus in that report was assessing how Smart Acquisition principles can be more effectively implemented.

In MPR2005, the report discussed the importance of the Technology Readiness levels on a project basis, making the point that legacy projects would not have passed most of the assessments were they assessed retrospectively. There was no mention of overall performance in terms of these indicators.

NAO (2005b, p.20) did, however, comment 'from the start to the end of the Assessment Phase, the department expects a project's technology readiness to progress from around level three to level seven and its system readiness to progress from level one to four. From next year, there is potential for the Major Projects Report to track technology and system readiness levels'. This was not to be.

The Assessment Phase in MPR2006 onwards has been relegated to a one page summary, with a table presenting the 'current forecast costs of Assessment Phase projects' in the Appendix. In-depth analyses provided in previous reports have been negated. The information provided in the Appendix provides, compared to previous arrangements, minimal performance indications.

The explanation offered by NAO (2006b, p.18) of this change is: 'The Department has changed the format of the Pre-Main Gate Project Summary Sheets to bring them into line with its policy on the release of information on equipment projects. Cost for the Demonstration and Manufacture phase and In-service dates are not set until the main investment decision is made at Main Gate Approval. Forecasts prior to this Approval are

for internal planning purposes only and publicly declaring these limits the Department's ability to make trade-offs and to conclude satisfactorily commercial arrangements'.

It is clear that the Department has changed its reporting structure over the years to reflect the changes made in the acquisition process; this has had a knock-on effect on the performance measures applied to the projects. The project population has encompassed a wider and varied group of projects to reflect the gradual implementation of Smart Acquisition. The performance indicators have evolved over the years for cost and time; a number of categories were used to explain the cost and time variations.

The introduction of post-Main Gate and Assessment Phase projects have provided greater insight into projects at these two crucial phases of the lifecycle. Another effect of the introduction of the Smart Procurement Initiative is the addition of Key User Requirement as a performance measure, alongside cost and time, in MPR2000.

In the Assessment Phase performance measures were introduced to improve the preparation for the demonstration and manufacturing stage. These measures include cost and time estimates, and technology and system readiness levels. However, reporting of projects in the Assessment Phase has become less detailed and more restrictive from MPR2006 onwards. The descriptive discussion of projects in the Assessment Phase, introduced in MPR2000, was replaced with a one page graphical summary of the costs of projects in their Assessment Phase.

5.3 Project Performance

5.3.1 Project Performance (1993-1999)

Table 5.2 records the in-year cost and time performance of the major projects in the reports of 1993 to 1999. The table records the progression of the major projects in terms of the 'cost change' and 'percentage cost change' for all projects and common projects in the population. NAO (1994, p.3) explains the values are given as '... the difference between the total of original cost estimates made at the first approval of each stage, and current cost estimate'. Each year this value is recalculated using the current cost estimates for each project. The in-year in-service date delay is presented for all projects and the common projects in the same report population.

Table 5.2: Cost and Time Variation 1993-1999

Year	Cost Variance on Yearly Costs				Average In-Service Date Delay	
	Yearly Value for all projects (NAO, 1993,..., 1999)		Yearly Value for common projects ¹ (NAO 1999, f.11, p.23)		Yearly Value (NAO 1999, f.14, p.29)	
	Cost (£m)	Percentage (%)	Cost (£m)	Percentage (%)	All projects (months)	Common projects (months)
1993	-1856	(6.0)	48	1	32 ²	31
1994	-1680	(5.3)	392	5	34	38
1995	-1650	(4.9)	843	9	31	44
1996	-694	(2.0)	990	11	37	50
1997	3084	9.1	1137	12	37	51
1998	2819	8.0	1147	12	43	58
1999	2731	7.8	1646	18	47 ²	64

¹ Excluding Eurofighter

² Based on 24 projects rather than the usually 25 projects in MPR

Cost Variance: MPR1993 is a good example of how exceptionally large and new projects can affect the overall result. MPR1993 reports an over spend of £1209m on 13 projects, nil variance on 3 projects, and under spend of £3605m on 9 projects (NAO 1993, p.6). If we were to exclude Eurofighter and Trident, which skew the results greatly, the net cost variance would be £158m under spend over 23 projects. Just over 90 per cent of the cost variation is attributable to the Trident and Eurofighter projects.

However, even with the skew in the total and percentage cost change, the total cost change indicates the ability of the Department to meet, or in these cases miss, its budget. The percentage cost changes for the yearly values is a mixed result. From 1993 to 1996 each MPR suggests the gap in missed budget targets as closing. During this period the Department were spending under the forecasted cost.

This is then dramatically changed to over spending in 1997 with a leap in 11.1 percentage points from the under spend value in 1996. Thus, not only has the Department started to overspend, its cost variance has grown dramatically. NAO (1997, p.3) explains 'the major factor in this difference is that the Trident programme no longer qualifies for inclusion in the Major Projects Report. At 31 March 1996, Trident had a forecast cost reduction of £3,498 million, which offset the variance on the other 24 projects'.

The MPR1997 figures are also affected by the large net forecast cost increase in the Eurofighter project (£1,595m), excluding that project the net percentage forecast cost

increase is 7.5 per cent which is favourable compared to the 8.7 per cent increase in MPR1996.

A better indication of the budgeting performance of the Department might be to look at the figures for the seven comparable major projects. Those figures compiled in Figure 11 of NAO (1999) report shows a gradual increase in the forecast cost since approval, for the seven major projects. There is a levelling in the transitions from MPR1997 to MPR1998, and then a large increase at MPR1999.

NAO (1999, p.23) explains ‘the major increase from 12 per cent in 1998 to 18 per cent in 1999 is largely attributable to a cost increase of £326 million on the Merlin Mark 1 project (£161 million of which results from an internal Ministry of Defence budgetary transfer) and the £189 million advanced expenditure on Bowman risk reduction’.

Price Variations and Poor Cost Estimation³ account, mainly, for cost increases and Volume Variations predominantly for cost reductions, in MPR1993. NAO (1993, p.13) explains ‘for the 23 projects, “price variation” taken with “[poor cost estimation]”, account for 56 per cent of total cost variance by value’.

Inflation Adjustment was introduced as a category for cost variance in MPR1994 and in each year since it was identified, constantly, as the second major reason for cost

³ Estimates Incorrect in MPR1994 and Under/Over Estimate thus forward

increases. Poor Cost Estimation was also a major contributor to cost increases in defence spending. It was in the top three reasons for cost variances until MPR1997.

Programme Changes was introduced as a category in MPR1996, to replace Programme Delays, most likely to increase the scope for the reason for cost variance related to the programme management. Since 1993 the overall affect of Programme Delays have steadily increased costs.

In MPR1996 to MPR1999 Programme Changes accounted for the primary reason for cost increases. Specification Changes accounted for a large portion of cost increases in defence spending throughout MPR1993 to MPR1999. The increases in cost variance of defence spend can therefore be attributed to four factors: Programme Changes, Inflation Adjustment, Under/Over Estimate and Specification Changes.

Time Variance: The 'average in-service date delay' over the MPR1993 to MPR1999 period shows a gradual increase in the delay of the average forecast dates for the yearly values. The reason for the drop in 1995 is due to the introduction of five new projects (NAO 1995, p.4). However, as is evident in the figures for the eight comparable major projects the average delay has increased year-on-year.

Table 5.3: Largest Causes for In-service Date Delays in MPRs 1993-1999

	1 st	2 nd	3 rd	4 th
Technical Difficulties	93-97 and 99	98	-	-
Procurement Delays / Collaborative Process	-	93-94	95-97	98-99
Budgeting Constraint	-	95-97	93-94 and 98-99	-
Project Re/Definition	98	99	-	93-97

The major categories causing time variance are: Technical Difficulties, Budgetary Constraints, Project Redefinition (renamed Project Definition in MPR1995 onwards) and Procurement Delays (emphasised as Collaborative Process in MPR1995 onwards). Table 5.3 provides a break down of the causes of in-service date delay, showing the years in which each factor was a major cause of delays ranking from 1st to 4th. The rank shows the top 4 reasons from a possible of 8 factors responsible for in-service date delays.

Technical Difficulties has consistently been the most troublesome in causing delays – there have been a few changes in the top four reasons for project delays as shown in Table 5.3. These delays are comparable in the magnitude of the delays and make up more than 80 per cent of the total delays each year.

There are a few interesting trends to gather from Table 5.3. Firstly, the reason for Project Definition jumping from being the fourth most common reason for project delay to the first and second in MPR1998 and MPR1999, respectively. The increase in in-service date

delay due to Project Definition in MPR1998 by 75 per cent from MPR1997 figures is largely attributed to the inclusion of the Air-Launched Anti-Armour Weapon (AAAW). The AAAW had been delayed by 118 months mainly due to the feasibility study finding the project to be ambitious but achievable with an extended project definition phase (NAO 1998, p.16-17).

The Procurement Delays category was a major contribution to delays in the earlier report. NAO (1995, p.15) comments 'the collaborative process continues to cause problems with some 16 per cent of slippage attributable to procurement delays caused by the collaborative process, for example protracted negotiations between partners on the COBRA project'. In MPR1999, it was the Common New Generation Frigate which was most affected by the Collaborative Process.

Budgeting Constraints has consistently been the second or third largest cause of in-service delay. NAO (1998, p.20) explains 'the delays reflect the effect on the projects of the re-profiling of the overall annual procurement budget to address the problems of over-programming which occurs when forecast annual procurement costs exceed the annual procurement budget. Over-programming may reflect pressures on the Department's budget as a whole or changes in the proportion of the Defence budget committed to procurement as well as overruns on projects, or over-optimistic initial estimates of the cost of programmes'.

Technical Difficulties has consistently been the major cause for in-service delay, bar MPR1998. NAO (1997, p.17) explains 'technical difficulties occur for a range of reasons, most of which relate to the specific nature of each project, and so it is not possible to identify any single underlying cause. The reasons for the decrease in delays between 1996 and 1997 Reports is that projects new to the 1997 Report have less slippage due to technical difficulties than the projects they replaced. It is too early to identify a trend but this is an encouraging development and demonstrates that the newer major projects are less prone to technical difficulties than the older one'. This does not seem to be the case since the slippage attributed to Technical Difficulties continued to grow in following years.

The trend in MPR1993 to MPR1999 represents an increase in terms of the cost and time variance for major defence projects. The Department realised there was a lack of control in cost and time targets and sought to change its acquisition practices. Smart Acquisition principles were introduced due to the poor cost and time performance and to create processes which would control estimates and project lifecycle management.

5.3.2 Project Performance (2000-2010)

Table 5.4: Cost and Time Variation 2000-2008 (NAO 2000,..., 2008)

Year	Cost Variance on Yearly Costs	
	In-year Monetary Value (£m)	Percentage Cost Variance (%)
2000	2400	5.7
2001	2630	6.6
2002	-200	(0.4)
2003	3000	6.1 ⁴
2004	6000	13.6 ⁵
2005	2700	10 ⁶
2006	2970	11
2007	3080	11
2008	3360	12

Cost Variance: The mixture of legacy and new projects in the Reports make it difficult to see the true nature of the advances made in project performance in the early stages of the 2000s. However, the trends in costing since the introduction of Smart Acquisition can be crudely identified in Table 5.4.

It has been difficult to track the performance of the in-service date delays for the 2000s due to inconsistent metric used in the Reports. I was therefore unable to provide a list of the in-service date slippages in Table 5.4. The NAO provide some comparative studies in

⁴ 18 projects - Landing Ship Dock (Auxiliary) and Support Vehicle (Cargo and Recovery) has been excluded from costs analysis due to commercial sensitivity.

⁵ 19 projects - Support Vehicle (Cargo and Recovery) has been excluded from costs analysis due to commercial sensitivity.

⁶ 19 projects – Typhoon has been excluded from costs analysis (in 2006-2008) due to commercial sensitivity.

MPR2002 and MPR2003 which I shall discuss. However, they do not provide a comparative case of common projects, as they did in MPR1999.

Table 5.4 presents the cost variance for defence costs from 2000 to 2008, similar to the exercise in Table 5.2. The trends in cost variance are difficult to identify due to the project mix. However, the table provides the in-year monetary value and percentage difference for the cost change each year.

Whilst Table 5.4 indicates an increase in forecast costs from MPR2000 to MPR2001, this negates the introduction of two new projects in MPR2001. The cost performance of the 18 common projects in these two years actually saw a reduction in total forecast costs – from a 6.23 per cent cost variance in MPR2000 to 5.73 per cent in MPR2001 (NAO 2001, p.5). NAO (2001, p.4) notes ‘over 90 per cent of the cost increases of £3.07 billion are accounted for by cost overruns on three programmes, Eurofighter, Merlin Mk.1 and Tornado Mid-Life Update’. This highlights the affect newer and exceptionally larger projects can have on the net cost variance.

The difficulty with making comparisons in reports purely on net cost forecast variance is that it does not take into account the constant change in project population. The nature of defence projects are that they can last a number of years, typically the longest being between 10 to 20 years.

While Smart Acquisition was implemented in 2001 its effectiveness is difficult to track in a mixed project population. There were a number of legacy and 'Smart projects' (projects approved under Smart Acquisition principles) during the earlier reports, it was not evident until the middle of the decade the affect of the new acquisition policy. The performances of the Smart projects were masked by the legacy projects.

The project population since 2001 has gradually seen the introduction of a number of Smart projects in the reports. There were three Smart projects in MPR2001, ten in MPR2002, and thirteen in MPR2003, which received Main Gate approval. The legacy projects were reported using Smart Acquisition processes, retrospectively, applied to them.

The result of MPR2002 shows a reduction in forecast costs against approval. With an equal balance of legacy and smart projects, it can be inferred from the figures given by NAO (2002b) that the Smart projects had improved the net forecast cost against approval. Of the ten legacy projects the net forecast cost was £959m beyond approval, this takes into account the £1,114m above approval of the Eurofighter project. The Smart projects were £1,348m within their forecast cost approval. A much better performance even if Eurofighter was discounted (£155m within approval) (NAO 2002b, p7).

The challenge for the following year for the Department was to ensure it could keep the newly introduced smart projects within time and cost approval. However, the

improvements seen in MPR2002 were radically reversed in MPR2003, where the net forecast cost against approval returned almost to the MPR2001 levels. NAO (2003a, p.5) reports 'the 16 projects common to both reports were £237 million over approval in 2002 and are £3.3 billion over approval in 2003. These figures suggest a reversal of the improvements in cost control indicated over the last few years'. This almost fourteen fold increase in cost is a major blow to the cost performance of the Department.

NAO (2003a, p.5) explains 'there has been a total cost increase of £3.1 billion on the 18 projects in the Major Projects Report 2003 in the last year. Of this, £2.7 billion relates to Legacy projects and is virtually all accounted for by the four Legacy projects [Astute, Advanced Air-Launched Anti-Armour Weapon, Nimrod and Typhoon]. Excluding the four Legacy projects from the analysis, the remaining 14 projects in the Major Projects Report 2003 are £839 million within approval and there has been a £382 million increase in cost on these projects in the last year'.

Comparing the results of MPR2002 and MPR2003, there are some stark differences which highlight the radical transition. Using NAO (2002, p.6-7, f.2 and f3) figures and comparing with the figures in NAO (2003a, p.8, f.5) it is clear there has been a major cost increase in smart and legacy projects. For example, the smart project Type 45 Destroyer has an in-year variation of £28m in 2002 and £124m in 2003. In terms of legacy projects Astute goes from an in-year variation of £9m in 2002 to £1003m in 2003. These cost increases are evident in nearly all the 16 common projects in MPR2002 and MPR2003.

The MPR2004 result was a more than double increase in the net forecast cost against approval to 13.6 per cent over budget. NAO (2004a, p.8) explains 'not all of the cost increases reflect extra payments to industry; some £530 million (31 per cent) of the in-year variation is an interest on capital charge which reflects the additional length of time for which money will be tied up because of delays or revised deliveries on projects. Some of these delays and revised deliveries may result from deliberate Departmental planning'.

In MPR2005, the results were more assuring for Smart Acquisition with forecast costs decreasing by £0.7 billion. NAO (2005b, p.9) states 'the implementation of Smart Acquisition is an ongoing process which the Department is actively trying to embed fully. The cost decreases reflect application of one of the key principles of Smart Acquisition, namely trading-off performance, time and cost, and greater realism on the part of the acquisition community'.

Whilst there was an improvement in cost this had come by trading off time and operational requirements; project delays increased by an average of two and a half months. The requirements trade-off meant that the customer requirements were being redefined. The requirement changes and in-service delays coupled to create a capability gap for the Armed Forces. This had to be filled by extending and upgrading existing capability, which created maintenance, support and upgrade costs. I will explore this situation further in the following section.

During MPR2005 to MPR2008, cost variance was constant at a level of 10 – 12 per cent overspend. That is a 2 percentage point difference in the three year period. This suggests that the cost increases of related projects, in this period, were constant. This is may be a result of the successful implementation of the trade-off policy, but is also a part of the Department's cost reallocation programme. Costs were reallocated from the DPA to other parts of the Department during MPR2006 and MPR2007. This was done in order to remove the pressure from the DPA budget and allocate cost to more appropriate areas in the MoD.

NAO (2006b, p.7) comments 'we recognise the rationale underpinning the resulting measure is sensible. A consequence is, however, that because of the basis upon which the Major Projects Report is compiled, some of these measures appear as a cost reduction to the individual project, but these costs will now be incurred elsewhere in the Department'.

Such accounting practices are common in most commercial businesses, which spread costs around their organisation to improve annual results; this may be seen as hiding the costs through clever accounting methods. Being a Government Ministry this option was always likely to be untenable for the Department. Whilst the NAO could recognise the financial sensibility in the Departments reallocation programme, the Committee of Public Accounts disagreed with the political consequence of the programme.

NAO (2008b, p.10) reports 'the Committee of Public Accounts, in its report on the Major Project Report 2007, criticised the Department for continuing to reallocate budgets and costs, as this reduces transparency to Parliament of the full picture of the cost of bringing equipment into service. The Department has not reallocated money outside the scope of the Major Projects Report 2007-08'. Whilst the NAO deemed cost reallocation a sensible policy, the PAC deemed it to be against the public interest due to the lack of transparency.

MPR2002 provides a comparative analysis of cost variation by factor during the three year period starting with MPR2000 (NAO 2002b, f.8, p.12). The bar chart highlights the percentage cost variance against approval across each factor, with separate bars for each report, identifying factors in which the Department had most influence, from left to right.

Three factors attributed more than one per cent cost variance against approval: Changed Requirements, Technical Factors, and Inflation (in order of most to least influence). Technical Factors demonstrates the largest of the cost variance; the bar shows just over 2 per cent cost variance in 2000, which increases to 3 per cent in 2001 and drops dramatically to just over 1 per cent in 2002.

Similarly, Changed Requirements and Inflation, percentage cost variance against approval increased from 2000 to 2001 and then dropped dramatically in 2002. In fact for Changed Requirement went from incurring costs in 2001 to cost savings in 2002 (NAO 2002b, f.8,

p.12). These transitions in cost variance provide an indication into the reason for the dramatic drop in net cost variance against approval in MPR2002.

In MPR2003 the same analysis was undertaken in comparing the 2002 and 2003 results according to each factor. A bar chart was presented, but in this case each bar differentiated between legacy and smart projects using colour coding (NAO 2003, f.9, p.13). The striking result of this bar chart was the large increase from MPR2002 to MPR2003 with respect to Technical Factors. There was a five fold jump from just over one per cent cost variance against approval to over 5 per cent.

Most of the factors were showing an increase from 2002 to 2003, which was mainly attributed to continuing cost increases in legacy projects. Receipts, Inflation and Exchange Rates were the only factors which showed a reduction in this period. This was not surprising as they were unlikely to vary greatly in a year. These categories represent factors where the Department has least influence. Whereas, the increased cost variance factors were those which, predominantly, the Department could influence.

The discussions in MPR2004 focused mainly on the failure to implement Smart Acquisition principles in the running of the projects. NAO (2004a, p.7) comments '...many so called Smart projects have failed to apply Smart Acquisition principles consistently, thus they have failed to deliver the expected benefits of Smart Acquisition'.

There were brief descriptions of where the cost variances originated from. The main reason for large cost overruns were attributed to Technical Factors in five of the twenty projects, Contracting Process in three, Changed Budgetary in three, Procurement Strategy in two and Exchange Rate in two. Of course, a single project can be affected by more than one factor. The influence the Department has on each factor varies. It has greater influence on Procurement Strategy, medium influence on Technical Factor and no influence on Exchange Rate.

NAO (2005b, p.9) explains the basis of the reduction in cost variance in MPR2005. 'The decreases in forecast cost this year were primarily due to reductions in the number or capability of the equipment driven by changed budgetary priorities and changed Customer requirements. These causes of cost variation are essentially measures the internal Customer can take to manage the portfolio of projects and they, along with exchange rates, were the largest causes of cost decrease in the last year. They also occurred on projects that, overall, had a net forecast cost increase'. This in effect was the implementation of a key principle in Smart Acquisition – tradeoffs!

The focus on how to control cost variances in MPR2006 was on cost reallocation. NAO (2006b, p.8) explains 'the Departmental Review process identified 18 occasions in seven projects, where activities included in the Equipment Plan allocations and worth £448 million, should be moved to other budgets within the Department where they can be

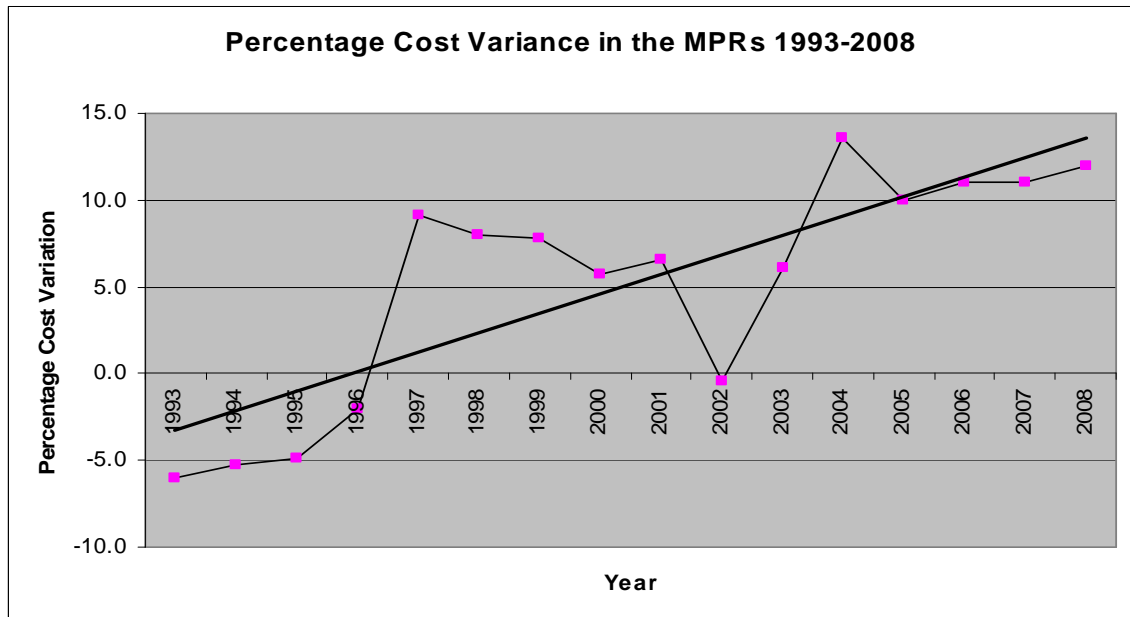
more effectively managed'. As mentioned above, these cost reduction methods were not sustainable for the Department.

Cost variance during MPR2006 to MPR2008 stayed within a two percentage point, this was in essence due to the more effective management of Technical Factors which created cost growth on the newer projects. MPR2007 was able to show that Technical Factors originated mainly from legacy projects (NAO 2007b, f.10, p.16).

MPR2008 highlighted the fact that cost growth due to Technical Factors was at its greatest during the second quarter of the project length. Such understanding has aided the Department in how it should target project investment. Specifically, there is a tacit understanding that early investment in the Assessment Phase can help control technical difficulties better.

Figure 5.1 represents the trend for percentage cost variance over the 1993 to 2008 period. The lowest absolute value being 0.4 per cent in MPR2002 and the highest is 13.6 per cent in MPR2004. These two points represent the Departments best and worst performance in meeting its budget, respectively. It is important to state that these figures represent differing calculations in terms of the project population in each report. However, it makes for interesting comparison in the Departments budgeting capability.

Figure 5.1: Percentage Cost Variance in the MPRs 1993-2008 (NAO 1993,....., 2008)



The trend line in the graph of Figure 5.1 shows the gradual transition from cost under-runs to cost overruns in the percentage cost variation. This graph brings together sixteen years of major project performance. The areas of interest in the graph are where the points migrate away from the trend line. The trend line represents the expected performance of each year by providing the expected progression once all the points are taken into account.

There are two areas of interests the first is the points of 1996 to 2001 and the second is the 2002 to 2005. These two areas can be explained using the information in the reports and with hindsight looking at the overall picture. The other points are close to or move closely to the trend line.

The stark rise in overall project performance from -£990m (2.0% under cost) to £1,137m (9.1% over cost) can be explained by the change in project population. This transition is mainly accounted for by the removal of Trident and the large net forecast cost increase in the Eurofighter project. The Trident project accounted for £3,498m forecast cost reduction in 1996 which accounted for the low cost variance. Its removal and the £1,489m forecast cost increase for Eurofighter accounts for the stark rise in the percentage cost variation in 1997.

The percentage cost variation thereafter, for 1998 to 2001, moves towards the trend line. Comparing the actual cost changes in MPR1998 and MPR1999 there is an improvement in cost variation. There are 16 projects which exceed their forecast cost in 1998 and only 9 in 1999, and 9 which meet or are below their forecast cost in 1998 and 12 in 1999 (NAO 1998, f.4, p.9; NAO 1999, f.7, p.13). This improvement is the reason for the points migrating towards the trend line. The results of 2001 and 2002 are closer to the trend line, providing evidence of the costs being closer to the projection.

The second area of interest is in the radical drop in percentage cost variation in 2002. This cost variation of -£200m (0.4% under cost) is a consequence of the introduction of 10 new smart projects (half the project population). Newer projects tend to exhibit less adverse time and cost variation against approval (NAO 2002, p.19). These newer projects had a major affect on the overall performance. NAO (2002) prematurely summarised that the performance was as a result of the Smart Acquisition policy. With hindsight it is possible

to dismiss this conclusion and attribute this anomaly result to the major change in project population.

If the conclusion that the Smart Acquisition policy impacted project performance was to stand, the results of 2003, 2004 and 2005 would have to have been much lower. Even if there were still cost increases in these years, a relatively lower level of cost increases would have forced the trend line down. Consequently, the cost increases in 2005, 2006, 2007 and 2008 are closer to the trend line and keeping it higher to nullify the effects of the 2002 result.

Time Variance: As with cost variance, time variance was mainly attributed to Technical Factors. A bar chart comparing time variance for the 2000-2002 periods (NAO 2002b, f.9, p.14) showed the bars representing Technical Factor towering way above the rest at almost three times the height of the nearest factor (Changed Budgetary Priority). However, the delays in months fell each year from 2000 to 2002, with a dramatic fall to a third in 2002 as compared to 2001.

The improvements made during the 2000 to 2002 period were reversed in MPR2003. There was a sharp increase in delays attributed to Technical Factors, the majority of which was a result of legacy projects (NAO 2003, f.12, p16). The increase due to Technical Factors has contributed to further delays in projects. NAO (2003a, p.7) reports 'the total

delay equates to an average of 18 months delay per project. This compares to an average of 9 months for projects in the Major Projects Report 2002'.

MPR2005 outlines the reasons for time increases in-year, in a three year (2003 to 2005) comparative bar chart. The results show Technical Factors and Contracting Process contributing significant proportions of project delays each year. Technical Factors contributed five times the amount of delays compared to the Contracting Process in MPR2003.

In the following years, 2004 and 2005, it was mainly Technical Factors which contributed to project delays. The net time increases had, however, decreased from 140 months in 2003 to between 40-50 months in 2004 and 2005. Even so, the majority of the time increases were attributable to Technical Factors (NAO 2005b, f.7, p.11).

NAO (2005b, p.10) comments 'these causes of variation relate to key areas that should be addressed during the Assessment Phase, such as technology maturity or commercial arrangements, and we would therefore expect them to become less prevalent although the occurrence of these factors should be seen against the backdrop of ongoing problems experienced by older projects'.

Similar to the cost results, time variations were stable during MPR2006 to MPR2008. The period had in-service date slippage at 34 – 36 per cent increase, since Main Gate approval.

Most of these time scale slippage were 'historic' (i.e. were due to delays previously reported).

Key User Requirement: Project performance trends in terms of meeting Key User Requirements is more challenging to identify. The Key User Requirement targets were first introduced in MPR2000, and the way they have been reported has changed since. NAO (2000, p.11) reported 'the department are forecasting that the equipment being procured will meet or exceed all of the minimum Key User Requirements specified by the equipment capability customer on 17 out of 20 post-Main Gate projects'.

In MPR2001 to MPR2003 the number of Key User Requirements 'to be met' was given in a more detailed manner: 169 out of 181 (93 per cent), 173 out of 176 (98 per cent) and 173 out of 174 (99.4 per cent), respectively. Thus, the Key User Requirements from MPR2001 to MPR2003 shows a positive movement, an increase from 93 per cent in 2001 to 98 per cent in 2003. The MPR2004 to MPR2008 results show the Department has met Key User Requirements in 18 out of 20 projects in MPR2004 and MPR2005; in 17 out of 20 project in MPR2006 and MPR2007; and a mere 15 out of 20 projects in MPR2008.

NAO (2008b, p.15) explains 'as reported previously, the Department does not expect to meet one Key User Requirement on the Sting Ray torpedo, one on the Typhoon aircraft, and three for Support Vehicle. Two additional projects are reporting this year that a Key User Requirement will not be met. The Advanced Jet Trainer project is not expected to

meet a Key User Requirement relating to the detection range of the radar on the training aircraft simulator, and the Watchkeeper project is not expected to meet a Key User Requirement relating to data exchange. In both cases, the original Key User Requirement has been redefined as the Department has assessed it is no longer necessary to meet the original high standard and performance at a lower standard is acceptable. Both projects are expecting to meet their revised Key User Requirements'.

The trend in meeting Key User Requirement targets for MPR2004 to MPR2008 shows a gradual decline. However, due to the inconsistencies in the reporting style it is difficult to ascertain how many Key User Requirements are being missed for these projects.

The explanation given for the poor performance in meeting requirements in MPR2008 is in the redefinition of the 'high standard' requirements. There is evidence of trade-offs being made in performance requirements, to meet cost and time targets. Thus, as there was a gradual improvement in the 2005MPR to 2008MPR results for time and cost, there was a gradual decline in Key User Requirements.

MPR2009/MPR2010: I will make brief comments on the most recent reports, MPR2009 and MPR2010. These Reports are analysed separately due to the major changes made to the reporting structure. The Reports included only fifteen largest equipment projects and five major commercial support contracts (NAO 2009, p.10). Comparisons will be made to

performance in previous years, however the population change should be kept in mind as large projects will have even more greater effects on the budget of a small sample.

The fifteen projects in MPR2009 are shown to have an in-year cost increase of £1.2bn. This figure, however, includes two of the largest projects in the population which are new to the report: the Future Strategic Tanker Aircraft and the Queen Elizabeth Class aircraft carriers. In-year cost increases doubled in MPR2010 to £3.3bn. However, the Department specifies the cost increases are due to £2.7bn additional investment into the Typhoon procurement programme and £650m of cost increases in the Queen Elizabeth Class aircraft carries. If these two projects are discounted then the remaining projects show no or minimal cost increases.

It is difficult to make a comparison to the results of MPRs 2000-2008, shown in Table 5.4, since those figures are of cost variances in forecasted budget and the figure for MPR2009 and MPR2010 are of in-year cost variances of the projects. However, NAO (2009) provides a figure of 0.1bn for in-year cost increases in 2008. This shows that the in-year cost increases have been dramatically growing within the last three years. Although, the explanation provided for these in-year cost growths are due to specific exceptionally large projects.

Estimated equipment expenditure for the last seven years is shown to have continually increased (except for estimates for 2010, where expenditure is down by £212m) according

to figures in the 2010 DASA Report. Expenditure is shown to be gradually increasing each year, from £10,886m in 2003/04 to £13,174m in 2009/10 (DASA 2010, p.20). Therefore while the in-year budget deficit has been growing for the last three years, expenditure has been increasing with only £212m worth of cuts identified for 2010.

NAO (2009, pp.11-12) points out '...two thirds (66 per cent) of gross cost increases in 2008-09 are due to Budgetary Factors, largely reflecting decisions made by the Department to reduce the short term cost of the ten-year Equipment Plan to try to make it affordable whilst reprioritising resources to current operations... The other principal reasons for cost increases in the last year have been Inflation and Exchange Rate, over which individual teams have limited influence once projects are under way'.

The MoD was able to make savings on a forecast overspend of £15bn as part of the Equipment Examination and subsequent Planning Round, which it instead shift future military requirement spending to support current operations. Five projects (Queen Elizabeth Class aircraft carriers, Astute Class submarine, Lynx Wildcat helicopter, Merlin Mk2 helicopter and Falcon communications systems) are affected by these budget reductions, however the Department is still overcommitted in its defence programme by a potential £6bn to £36bn (depending on the defence budget) over the next ten years.

In-year in-service date slippage is reported at 93 months, an average of 7 months per project in MPR2009. This has fallen dramatically to 27 months slippage in MPR2010,

which is an average of 2 months per project. In MPR2009, there are 185 of 192 Key User Requirement (renamed Key Performance Measures) “To be met” across 15 post-main investment decision projects, of which 21 across 6 projects are “At risk” and 7 not to be met across 4 projects. A slight change in the figures for MPR2010, 189 of 193 Key Performance Measures across 15 projects are “To be met” of which 27 across 9 projects are “At risk” (NAO 2010, p.5, f.1).

The reasons for 48 months of slippage, in MPR2009, are classified for the A400M project. Terrier has suffered 16 months of slippage due to Changed Requirements. The Queen Elizabeth Class has suffered a net slippage of 10 months, UK Military Flying Training System 8 months, and Watchkeeper 2 months due to Change in Budgetary Priorities. Astute Class and Falcon have suffered 10 and 5 months delay, respectively, due to Technical Factors. Whereas, Watchkeeper and Type 45 have saved 2 and 4 months, respectively, due to Technical Factors. Five other projects of the thirteen included in the time variance study show no slippage (NAO 2009, f.8, p.16).

NAO (2010, p.6) explains the improved performance for MPR2010 on MPR2009 by highlighting the use, by the DE&S, of a project monitoring system called Sentinel. ‘This system uses a number of metrics to quantitatively assess the overall ‘health’ of selected projects. by providing early warning of emerging issues Sentinel is a potentially important step forward for the Department as it seeks to sustain the emerging trend of improving project performance’. There is not much information of how Sentinel (not to be confused

with the long range surveillance aircraft) works as a project monitoring system beyond this. However, it looks like it may become a key part of the MoD project management process.

5.4 Project Assessment and Capability

5.4.1 The Assessment Phase

Whilst the Department has been concerned with appropriate investment in the initial phase of a project lifecycle; it was not until the introduction of Smart Acquisition principles that it was given due importance. In fact the Downey Report (1996) and the Rayner Report (1971) promoted the need to understand risk in the early stage of projects. They suggested that 15-25 per cent of overall project expenditure should be spent on a feasibility study and project definition phase of a project (NAO 1993, p.28).

The Assessment Phase is a preparatory stage in order to ensure the projects can meet their Main Gate approval targets. It is a Smart Acquisition principle to invest in the earlier stage of the acquisition process, in order to drive out risk and to prepare projects for the post-Main Gate stage.

The Assessment Phase of the acquisition cycle of defence projects is a crucial phase. Once passing Initial Gate approval the project undergoes rigorous assessment such as three-point cost and time, technology readiness level and system readiness level examination to

assess the projects fitness for Main Gate approval. The results of the cost and time variance, three-point cost and time estimates, technology readiness levels and system readiness levels of the ten largest major projects in the assessment phase are presented in the second part of the Reports.

When applying the Smart Procurement lifecycle, CADMID, MPR2000 had to equate Initial Gate approval approximate to the Downey cycle. This was due to the fact that all ten Assessment Phase projects in MPR2000 were conceived prior to the introduction of the Smart Procurement Initiative (NAO 2000, p.13).

The indications in the performance of the ten projects showed variations in cost and time since Initial Gate approval. NAO (2000, p.14) reports 'the average forecast variation from approved cost across the 10 projects is 74 per cent. However, this overall picture is adversely affected by the very large variations on two of the 10 projects, BOWMAN and MLS'.

Three-point cost and time estimates were first introduced in 1994; they measure the level of risk affecting cost and timing of projects and became a mandatory requirement under Smart Acquisition in MPR2001 (NAO 2001, p.15). Only four projects had a full three-point cost estimate and four projects had a full three-point time estimate in 2001.

NAO (2001, p.16) states 'under Smart Acquisition, the range of cost and time covered by three-point estimates is expected to narrow between Initial Gate and Main Gate as risks are reduced. It is not clear to what extent the range is expected to narrow during the Assessment Phase or how wide a range is acceptable for a project to proceed through Main Gate. These parameters are unlikely to be standard across projects. They will depend on factors such as the nature and complexity of individual projects, which affect the risks involved and because of this the Equipment Approvals Committee review each project on a case by case basis'.

There is a great amount of uncertainty in the Assessment Phase resulting in greater risk. The Department in the earlier years of reporting on the Assessment Phase was unable to provide much guidance on how to deal with the inherent project risks.

In MPR2003, the Department investigated the possibility of using System Readiness Levels, to measure the maturity of complete systems including the integration of all components. System Readiness Levels were to assess the readiness of the design, development and testing regimes of systems or sub-systems to represent the risk to timely integration, these levels were to have the same scales as the Technology Readiness Levels (NAO 2003, p.22).

There were some concerns in MPR2001 that the Department was not investing an appropriate level of funding in the Assessment Phase. The average expenditure in the 10

pre-Main Gate projects was forecast at 4 per cent of the total procurement cost, this was much lower than the suggested 15 per cent (NAO 2001, p.15). Similarly, in MPR2002 the figure was a 5 per cent average (NAO 2002b, p.24).

NAO (2003a, p.23) reports 'in total terms, nine of the Assessment Phase projects (excluding Future Strategic Tanker Aircraft for which a Private Finance Initiative solution is being sought) are forecasting to spend £423 million in the Assessment Phase. This represents 4.8 per cent of the total forecast procurement expenditure for the nine projects (£8.8 billion). To achieve the suggested 15 per cent would require an increase of £838 million in Assessment Phase expenditure'. It is a challenge for the Department to meet the investment targets, outlined below, and one which, as extensively reported in MPR2004 it has failed to meet.

As a guide, successive studies by the Department over the last 40 years have suggested, depending on the nature of the equipment, around 15 per cent of the initial procurement cost of a system should be spent before reaching Main Gate. In some cases, spending more money or time in the Assessment Phase than originally planned may be the correct thing to do if it results in better risk mitigation for the post-Main Gate phase of the project, when most money is spent. Calculating the average Assessment Phase expenditure as a percentage of the total procurement expenditure for the non-Private Finance Initiative projects in the Assessment Phase this year, the average is 5 per cent.

(NAO 2004a, p.13)

MPR2005 identified some improvements in the Assessment Phase. The Department was able to gain a mature understanding of the project and how they can be effectively delivered. Realistic estimates of what a project is likely to cost were still a challenge for

the Department. It was being realised that identifying the trade space (the cost, time and performance boundaries) was an important part of de-risking and scoping activity of the projects. The Department recognised that it needed to have a more constructive engagement with industry (NAO 2005b, p.18).

In MPR2005 there were indications of improved investment during the Assessment Phase, over half of the projects in the report were spending more time and cost in the Assessment Phase (NAO 2005b, p.20). The Assessment Phase in MPR2006 onwards has been relegated to a one page summary in the Appendix; with such minimal information further comment cannot be made on the Assessment Phase.

5.4.2 The Capability Gap

The effects of cost and time variations of defence projects on the UK defence capability are of major concern in defence acquisition. The reports highlight a number of cases which make it abundantly clear that in-service delays and a lack of investment in projects have a major and negative effect on defence capability. The consequences of in-service delays on defence projects are that existing equipment, of comparable capability or previous model, have to be kept in-service for longer than envisioned denying the Armed Forces of new capability.

The first issue with extending an existing equipment shelf life is that the Armed Forces are deprived of the improved capability in operations and may miss out on important strategic advantages. Secondly, the Department incurs costs due to maintenance and urgent upgrade costs, which are needed to keep the equipment operationally capable in order to defeat current and emerging threats.

The retention of older equipment has an impact on the operational capability of the Armed Forces. The delays to the Eurofighter forced the Department to extend the use of Tornado F3 in a defence role, and Jaguar in an offensive role which effectively means two platforms are being used when one could suffice. Similarly the delays to Merlin meant that Sea King Helicopters had to be used resulting in run-on costs of £147m (NAO 1996, p.28).

In MPR1997 the Department reports that 8 out of the 25 projects have run-on costs⁷. A majority of the cost is attributed to Eurofighter (£101m). However, for some projects it can be difficult to quantify the run-on costs and for others, such as COBRA, in MPR1997 savings can be made on deferred support costs. These savings are not a positive sign if it results in capability gaps, created by the delay in bringing the equipment to theatre.

In MPR1999, the Department had to cover a cost of £753m mainly due to the cost of sustaining or improving existing equipment. Whilst existing equipment can be in some

⁷ Reported on all projects with in-service data slippage beyond 24 months

cases cheaper to support than new equipment, this is offset against the lower capability available to the Armed Forces (NAO 1999, pp. 35-36).

A specific example of capability shortfall was presented in MPR2000, in the case of Brimstone (Air-launched Anti-Armour Weapon). NAO (2000, p.17) points out 'the unavailability of Brimstone has had an adverse effect on the ability of the Royal Air Force to prosecute operations against armoured threats in operations during the 1990s'. This is especially worrying since the UK Armed Forces were engaged in a number of high profile operations in the 1990s.

In MPR2006, the Department identifies savings which are made by 'trading quantities' in equipment acquisition. NAO (2006b, p.9) explains 'trading quantities to remain within cost is often a difficult decision to take. The Department assessed that there was a risk that the quantity changes on projects like Guided Multiple Launch Rocket System could have unwelcome consequences and prevent the Department meeting its assessed requirement in these areas for Large Scale Operations. But, as we have commented previously this is something the Department must be willing to do to live within its means'.

The response to cost increases in certain projects by the Department was to reduce the quantities in other projects, in order to balance the books. Examples are seen in the halving of Type 45 destroyers from an initial twelve frigates to six (HM Government, 2010) and the reduction of Nimrod MRA4 reconnaissance aircrafts from twenty-one to nine (NAO, 2010). Cuts to defence programmes will have major ramifications for UK defence

capability, as acknowledged by the Department, however the NAO point to its necessity. This point highlights the complexity and uncertainty facing defence projects and acquisition decisions.

From the contractors' perspective, its current or future supply arrangements can be adversely affected (through quantity reductions or project cancellations) by projects competing for funds, which it may not have any control over. This can be unsettling for the defence industry as a whole. This can have a knock-on effect on the investments for future projects, jobs, their supply chain, and ability to enter new markets internationally.

Defence companies rely on investment on large projects in order to fund new technology research. Cuts on one of their projects can have adverse effects on their entire operation. This is especially true for defence companies which rely heavily on MoD defence contracts. Some may be able to recoup most of their losses from cancellations; this will not, however, replace the lost opportunities for new investments.

5.5 Summary

This chapter has reviewed seventeen MPRs from its introduction in 1993 to the most recent report released, at the time of writing (MPR2010). The reports have been transformed in style and substance within the last two decades. The reports have gone from including twenty-five of the largest projects with excess expenditure of £250m

(reduced to £10m in MPR1995) in the 1993-1999 period. To examining the thirty largest projects, twenty in the post-Main Gate Phase and ten in the Assessment Phase since 2000.

In assessing the performance of the projects in the reports the NAO have employed a number of indicators. Performance indicators have been mainly cost and time variances for project beyond post-main gate, and cost and time three point risk assessment, Technology Readiness Levels and Systems Readiness Levels for projects in their Assessment Phase.

The cost performance indicators have focused on the yearly forecasted expenditure against cost at the approval stage. This variation provides information on how the Department are able to stay within the budgeted costs. The time performance indicator focuses on the forecasted delays or timely delivery of projects to their in-service phase.

These variations in time and cost are thus assessed applying a number of categories which explain the reasons for variation. Table 5.1 presents the cost and time variance categories, when introduced in 1993, first changed in 1995, and the final list in 2000. Where possible, the analogous categories have been aligned. Some changes are superficial such as the renaming, of cost variance category, specification changes to specification and requirement changes in 1995 and changed requirements in 2000.

Other changes serve the purpose of focusing the category on specificities such as renaming, of cost variance category, price variation to contract pricing in 1995 and contracting process in 2000. In MPR2001, risk differential was added as a category to time and cost variance, due to the focus on risk assessment as part of the changes in procurement process due to Smart Acquisition.

Smart Acquisition principles affected not only the introduction of Assessment Phase projects in the MPR, but also the performance indicators used for this phase. Whilst three point risk assessment of cost and time were used since 1994, they were not commonplace until MPR2002 reported nine projects had undertaken risk assessments.

Similarly, Technology Readiness Levels provided an assessment of the technical maturity of a technology and indicating required risk-reduction work. Eight projects had such assessments in MPR2002. Systems Readiness Levels were introduced in MPR2003, this assessment would measure the maturity of completeness of a system and its integrated components.

The cost and time performance of projects have been presented in the second section of this chapter. The overall results do not look promising! The cost variance of forecast costs against approved costs has risen since 1993 to present time. Whilst some of the results have been skewed unfairly by exceptionally large projects such as Eurofighter and Trident,

the tracking of common projects across these reports provide a clear indication of cost increases.

As such, Table 5.2 provides clear evidence of cost increases in the common projects during the 1993-1999 reporting period (excluding Eurofighter). There is an increase from one per cent cost variance in these projects in 1993 to eighteen per cent in 1999. This is a huge increase in cost variance over a seven year period.

Cost increases during this period have largely been attributed to four causes, Programme Changes, Inflation Adjustment, Under/Over Estimate and Specification Changes. It is clear that the Department can influence most of these cost increases, however it has minimal control over changes in the rate of inflation.

Along with cost increases there is a clear indication that the projects during the 1993-1999 reporting period have suffered in-service date delays. Comparing the results of the common projects time variance to the overall time variance, there seems to be some major projects which are on time or near delivery. Discounting these projects and looking at the progress of the common projects, it is clear that in-service delays have worsened. The in-service delays for these common projects have doubled from 31 months in 1993 to 64 months in 1999.

Technical factors are by far the most troublesome to a project meeting its scheduled in-service date. This is compounded by procurement delays due to the collaborative process in international projects, budgeting constraints and project redefinitions. These four factors account for around 80 per cent of in-service delays during the 1993 to 1999 reporting period.

In the early stages of the 2000s there were improvements in budgeting and scheduling for projects. MPR2001 reported a cost reduction in eighteen common projects for 2000 and 2001. The introduction of the Smart Procurement Initiative and its successor Smart Acquisition had revised acquisition practice for the better, it seemed. There were new projects using these revised acquisition process, known as 'Smart projects'. In MPR2001 there were three Smart Projects, this rose to thirteen in MPR2003.

Smart projects were praised for their cost controls, and were responsible for £1348m cost saving in MPR2002. Legacy projects were identified as being the reason for cost increases. This was in hindsight found to be an inaccurate conclusion. Instead it was found that newer projects exhibit less cost increases and thus showed cost reductions.

The bad results of MPR2003 and MPR2004 in which there was a fourteen fold increase on sixteen common projects and a more than double increase in the overall cost variance, respectively, created a rethink of strategy. MPR2004 focused on assessing lessons to be learnt on the management of major projects. The conclusion was that the principles of

Smart Acquisition were effective and adequate. A major criticism was on the way the Department had handled the implementation of Smart Acquisition. Many principles were not effectively implemented, specifically the principle to invest money in the early stages of the project – during the Assessment Phase.

There were some improvements in MPR2005 and until 2008 the cost variance was held at a 10 – 12 per cent overspend. It is clear the Department has a lot of work to do to close the gap on cost increases, but there do seem to be improvements in the management of newer major projects.

It is clear that the major cause of cost increases during the 2000 to 2008 reporting period is Technical factors. In some cases Technical Factors account for cost increases in a quarter of projects in the reports. Changed Requirement has also been identified as a major reason for cost increases. The Department can influence these two factors by implementing better risk reduction or working closely with the military customer. However, there are two factors which the Department cannot influence which have caused major cost increases, the Exchange Rate and Inflation.

Time variance in the 2000s was difficult to track due to the various parameters used to present the results. However, comparisons can be made in certain period. In the 2000 to 2003 reporting period the delays in in-service dates were worsening as a result of Technical Factors predominantly originating from legacy projects.

During 2003 to 2005 period Technical Factors and the Contracting Process contributed significantly to in-service delays. However, the magnitude of the delay was reduced radically by nearly a third during this period. In the 2006 to 2008 reports the in-service delays have remained at 34 – 36 per cent increase since Main Gate approval. Most of these delays are historic and result from legacy projects.

In the 2000s report we were also able to look at the progress of project teams meeting their Key User Requirements. Again, here the parameters vary making it difficult to make an overall comparison. However, we can state that the trends in two periods show a worsening in the performance of project teams. In the first period, 2001-2003 provides evidence of positive results in meeting the Key User Requirements which improved from 93 per cent of Key User Requirement being met overall in 2001 to 98 per cent in 2003.

In the second period, 2004-2008, there was a clear reduction of the number of projects meeting Key User Requirements. From 18 of the 20 projects meeting their Key User Requirements in 2004, to a drop of 15 out of 20 projects in 2008. The Department has reassessed its Key User Requirements, for two projects in 2008 (Advanced Jet Trainer and Watchkeeper) as a result and has lowered the high standards set.

In order to improve the performance of its cost, time and Key User Requirements the Department needs to ensure it has invested an adequate amount in its Assessment Phase. It is clear in the conclusions made in MPR2004, this was not being achieved. It was

reported in MPR2001, the average level of funding in the Assessment Phase for the ten projects was a lowly four per cent of the total procurement. This is much lower than the suggested fifteen per cent. By MPR2005 there was a more positive report of Assessment Phase spending as more funding and time was given to the crucial work of project definition and risk reduction.

In order to address the cost and time variances one of the principles of Smart Acquisition is to trade-off cost, time and requirements. The Department has traded off by reducing quantities and capability of some projects. This has resulted, in some cases, in creating a gap in operational capability for the Armed forces. This is also a consequence of delays in projects in-service dates.

Cost increases and in-service slippages have resulted in cuts to defence programmes and extensions of legacy projects to fill the inevitable capability gap. Examples include: the delay in Eurofighter resulting in the in-service extension of the Tornado and Jaguar aircrafts; the unavailability of Brimstone in the 1990s created a capability gap for the Royal Air Force; and budget shortfalls meant a reduction in frigates for the Type 45 Destroyer and helicopters for Nimrod MRA4 programmes.

It has been argued that the delays and trading-off requirements have created savings in support costs for the more costly new capabilities, but this comes at a heavy burden for the Armed Forces when they need these new capabilities for their operations.

6 Research Methodology

6.1 Chapter Overview

The methodology chosen for this research is content analysis using a mixture of quantitative and qualitative approaches. Content analysis has been chosen as the research method which best suits the data available in this research. The research is based on documentary evidence, which communicates to the readers (Parliament, Defence Select Committee and the Public Account Committee) the findings of a *Value for Money* (VfM) assessment of defence acquisition.

The purpose of the study is to gain insight and learning through a cross-analysis of seventeen VfM reports on defence. This chapter will, in the first section, provide justification for the chosen methodology. In justifying my methodology I shall look at other methods used in defence acquisition research.

The second section will focus on providing a review of the content analysis methodology. This will assess the qualitative and quantitative approach to content analysis. As my research uses a combination of these two approaches, I will discuss how this is achieved. There will also be a discussion of the reliability, validity and objectivity of a content analysis study.

The research design will be discussed in the third section of the chapter. This section will look at the data, qualitative software and the design (of the tree and relationships) applied to the research.

6.2 Methodological Justification

6.2.1 Common Methodologies in Defence Studies

The area of defence studies is specialised, in that there are security restrictions which make it difficult for empirical research. Four specific research methodologies have been identified in a literature review of defence research: documentary study, questionnaires, semi-structured interviews and case studies. Questionnaires and semi-structured interviews are usually used in combination.

Crocker and Reynolds (1993) undertook a documentary study of contracts. Bishop (1995b) employed a postal questionnaire method with a brief follow-on case study. Humphries and Wilding (2001, 2004a, 2004b) combined the questionnaires and semi-structured interviews method in their studies. Sadeh, Dvir and Shenhar (2000) employed a similar methodology in the Israeli defence context.

Angelis, Dillard, Franck and Melese (2009) and Kebede, Maytorena, Lowe and Winch (2009) use case studies of defence projects in the US and UK, respectively. My own research uses content analysis of documentary evidence in the form of VfM reports.

6.2.2 Documentary Studies

Documentary studies such as the one by Crocker and Reynold (1993) can be a more effective form of research when the objective is to undertake an analysis of process. In their study they are looking at the contracting process in terms of 'the efficiency of incomplete contracts'. Crocker and Reynold (1993, p.132) explain 'we have constructed a panel dataset consisting of contracts under which the Air Force procured jet engines from Pratt and Whitney and General Electric for installation in F-15 and F-16 fighters'.

Using the contract datasets they use a quantitative approach to examine the efficiency of incomplete contracts. They did, however, use a qualitative approach in terms of formulating their variables. Crocker and Reynold (1993, p.135) state 'several Air Force contracting officers with whom we spoke perceived the behaviour of a defence contractor to depend on companywide policies set by the parent for all its subsidiaries'.

Using the variables, some of which they ascertained through conversation with experts, they produced quantitative results to explain efficiencies which can be gained from incomplete contracts. Whilst I also use documentary evidence for my research my methodology is skewed more towards a qualitative approach. The qualitative approach is, however, supported by quantitative descriptions. I, on the other hand, am not as interested in the technical detail of contracts. The role of contracting in my research is in the way it facilitates the relationship between the buyer and supplier, as explained in the Introduction chapter.

6.2.3 Questionnaires and Semi-Structured Interviews

It seems that the most popular methodology of the studies is the use of questionnaires with further insight sought from semi-structured interviews. Bishop (1995) used postal questionnaires in his study of the diversification strategy of defence companies. Postal questionnaires were sent in 1993 to 209 suppliers, in Devon and Cornwall, of DML and British Aerospace establishments in Plymouth, excluding those with business under £1000 (Bishop 1995, p.59).

The survey was Bishop (1995b, p.59) states 'to ascertain the extent and nature of local supply linkages, companies were also asked to provide information concerning their plans for diversification in response to changes in defence business'. The response rate was 42 per cent, 88 questionnaires. Bishop (1995b) followed up the results of the postal survey with a brief case study of a company, Northern Telecom, involved in the survey using it as an example of a successful diversification strategy.

The findings of the survey show that a majority of the companies had yet to diversify fully, and as such Bishop (1995b) found it impossible to comment on their success. However, Bishop (1995b) focused on the companies responses regarding the implementation process towards diversification and found that the majority had problems due to market conditions (recession) and demand (in decline).

Also mentioned was the level of competition in the specialised markets companies sought to enter, which created a barrier to entry for many. In terms of Northern Telecom, the reason for their success according to their managing director was due to their ability to enter the market at the right time and apply competitive pricing.

It seems to me that with questionnaires there are limits to the learning, especially since it is usually uniform questions to all respondents. A more effective approach could have been using unstructured or semi-structured interviews in order to gain greater insight or investigate further certain elements of the survey results. In doing the follow-up case study, the author has attempted to do this. However, the focus is on a successful strategy for diversification – which is a minority result.

Sadeh et al. (2000) study looks at defence projects performed over the last twenty years in Israel. Sadeh et al. (2000, p.16) describe the method: 'The questionnaires included about 400 data items related to the various phases of the project, and were filled out by at least three key personnel, representing the various stakeholders who were accessible at the time of the research. In cases where one key person was not available, another person from the same organisation familiar with the project was approached'.

The research was partially funded by the Israeli Ministry of Defence, thus one would suspect that access was usually forthcoming. It seems that expert knowledge was to be the primary data requirement of this study. With access granted through the sponsors and

the focus on expert knowledge, it is surprising that the questionnaire was not followed-up with a more in-depth interview method. Unstructured or semi-structured interviews might have provided a more in-depth conversation with the experts, providing greater insight and explanations.

Humphries and Wilding (2001, 2004a) use a set of questionnaires and semi-structured interviews in a pilot study. The study attempts to use the TCE framework to describe defence procurement in the UK, similar to my own study. The research question Humphries and Wilding (2001, p.83) pose is 'how to improve sustained economic relationships within UK defence procurement in a monopoly market'.

Humphries and Wilding (2001, p.92) explain 'a pilot project has been carried out, which examined both industry and MOD perspectives of a current, defence procurement relationship. This was a true monopoly worth \$40 million per year for the purchase of aircraft spare parts and the provision of repair services'.

This study is thus focusing on a particular case using questionnaires and semi-structured interviews. Humphries and Wilding (2004a, p.114) state 'questionnaires were administered to both team leaders and their staffs and a 100 per cent response was received from the 50 respondents. The survey was followed-up by 30-minute semi-structured interviews with the two team leaders'.

The pilot study was then expanded with a larger scale of questionnaires and semi-structured interviews. Humphries and Wilding (2004b, p.263) explain 'an exploratory research project was designed which used the key informant methods of surveys (600 staff questionnaires – five-point Likert scales) supported by 115 team-leader semi-structured interviews'. The project has grown and so has the breadth of the research. The research focused on 54 monopolistic relationships accounting for £575.8m annual spend of the Defence Procurement Agency (Humphries and Wilding, 2004b, pp.263-264).

The conclusions of the three papers by Humphries and Wilding focus on the applicability of TCE, supply chain and relationship marketing theories to the decision making process of defence procurement managers in monopolistic buying situations. The findings have developed from the preliminary pilot study of a single case to a study of 53 monopolistic relationships. In general the authors find that the selected theories are applicable to the business environment and they suggest would benefit defence procurement managers (Humphries and Wilding 2001, 2004a, 2004b).

Their study is as all encompassing as one can hope for in a defence study; they have gained a great deal of access in their research. They support the questionnaire by undertaking semi-structured interviews with team leaders. This adds to the richness of the data by allowing the researcher to delve deeper into certain findings of the questionnaire. I have my misgivings of their use of TCE in the study, which I outlined in Chapter 3; however they demonstrate how in-depth research in defence can be undertaken.

In a questionnaire there are pressures to simplify and normalise some research terminology, which they attempted to do, and this can create the problem of misinterpretation. It is my view that the TCE framework was interpreted to the extent that it was diluted. The alternatives to TCE used in the questionnaire do not address the true nature of TCE factors, and so cannot be used as opposites. However, the implications of their study show TCE to be a theory which can be used for defence research although as I have noted – care needs to be taken in the way TCE is applied.

6.2.4 Case Studies

Angelis et al. (2009) and Kebede et al. (2009) employ a case study methodology in their studies. Whereas Angelis et al. (2009) look at two defence projects in the U.S; Kebede et al. (2009) look at a defence project in the U.K. Angelis et al. (2009) investigate the effects of transaction costs on the U.S DoD cost estimation of defence project. Kebede et al. (2009) investigate the collaborative approach in a MoD IPT acquisition of an Advance Military Vehicle.

Angelis et al. (2009) use as their case studies the Javelin and the Army Tactical Missile System (ATACMS) projects. Angelis et al. (2009, p.15) explain ‘one of the authors was fortunate to have served as the Assistant Project Manger for Research and Development

for each of the programs and was thus well qualified to examine transaction cost indicators for the two programs’.

In the Javelin and ATACMS case studies, TCE theory is applied by using System Engineering/Program Management costs as proxies for transaction costs. The case study relies heavily upon the experience of one of the authors, who worked in the projects. The arguments for using TCE for cost estimation in defence was put forward in a previous study, Melese et al. (2007), (reviewed in section 3.4.2).

I argue the step towards using project costs as proxies for TCE in this way creates similar difficulties experienced in the Humphries and Wilding studies. TCE is diluted by the proxies or misrepresented as they simplify the complex nature of the theoretical concepts of TCE in order to provide practical approximations.

Kebede et al. (2009) provide a different perspective in using TCE for defence case studies. Rather than measuring TCE, we used TCE to contribute to our conceptual framework to explain the findings of the case study. The conceptual framework consisted of a three-tier ‘tectonic model’ which was made up of the institutional, governance and process levels (as shown in Figure 4.3, section 4.3.1).

It is in the governance level where the TCE concept is used to describe the transaction governance of defence acquisition. Kebede et al. (2009, p.311) explain ‘in the *governance level* section, we use a transaction cost approach to examine the choice of relational

contracting, demonstrating how the IPT structure and ethos favours relational contracting practices’.

The case study is of an Advanced Military Vehicle project in the demonstration phase of the CADMID process being delivered by an IPT. The data collection for the governance level comes in the form of 19 field interviews. TCE was used as an explanatory tool to describe the findings of the interviews, to understand the way the relational contracting took place in the IPTs. Therefore, the focus is not how TCE can be measured but rather using TCE to describe the phenomenon being measured.

Kebede, Maytorena, Lowe and Winch (2009) case study, along with Humphries and Wilding (2004b) and the US study of Angelis, Dillard, Franck and Melese (2009), provide support for the use of TCE in my own research. Kebede et al. (2009) provides a closer and more recent example of how TCE can be used in the defence case. However, these studies also provide reason for caution in how TCE is implemented when used in defence research.

6.2.5 Justifying Content Analysis

The research methodology is content analysis. Content analysis relies heavily upon documentary data, whether that is interview transcripts, newspaper articles or in this research – defence reports. In the following section content analysis will be discussed in greater detail. At this moment it is pertinent to justify its use in the first place.

The use of documentary data was not the first choice of data collection. In fact the research methodology was originally to be a comparative case study of defence projects. This research methodology was chosen due to the original access opportunities to defence projects.

It is due to unfortunate circumstances that I was unable to undertake my original research plan. BAE Systems decided to end the NECTISE program due to a lack of desired outcomes from affiliated groups. This created the problem of closing many access points for my own research, due to the unified group identity. Those who were participating from BAE Systems no longer had the incentive to contribute research time. After many phone calls and meetings to gain research access it was decided, with my supervisor, that an alternative methodology was required.

Our focus thus turned to a methodology used initially by Dalton (2007), who used documentary data in the form of NAO reports. Dalton (2007) used VfM reports to identify the risk management process in public infrastructure projects. She employed the use of computer software, QSR N6, to analyse the reports. This inspired my own use of defence VfM reports and NVivo 8 (an updated version of QSR N6). In my research, however, I take the analysis one step further by applying content analysis to the NVivo 8 analysis and understanding the findings using a TCE perspective.

It is in the ease of using content analysis in conjunction with TCE theory that the methodology is suitable to this research. Unlike methodologies such as grounded theory, which is more suitable to developing new theory from data (Myers, 2009), content analysis can be used in conjunction with existing theory. It was not my purpose to seek new theory from my analysis of the VfM data, but rather to apply TCE theory to the analysis of the VfM data. In applying TCE to the VfM data, the aim is to provide answers to the research questions focused on the transactional issues surrounding defence acquisition.

The use of documentary data has enabled me to apply the TCE framework to a wider range of defence projects using a number of acquisition processes. This would not have been possible with three case studies, which more than likely would have been limited to similar procurement routes. The documentary data is secondary data by its nature; the original data collection was undertaken by the NAO.

Due to the NAO legislative powers (of scrutiny and auditing of public spending) I suggest that their data collection is more thorough and representative of involved parties than most academic researchers could achieve. Whilst primary sources are usually preferable to most researchers, where there is a lack of access I believe that the methodology I have used is justifiable.

There are, however, certain considerations which must be taken when relying upon secondary sources such as the purpose, language and involvement of the organisation involved in the primary data collection and analysis. These concerns will be addressed further when looking at the role of the NAO and the use of 'value for money' reports, in the following sections.

I was able to return to the NAO with my preliminary findings and gain valuable feedback. This feedback, coupled with more data provided by the NAO, was applied to the final study. Content Analysis provides two solutions for my study: first, it removes the problem of access and second, it is more appropriate for larger documented data sources.

6.3 Content Analysis

6.3.1 Definition

What is content analysis? This is the question I shall address in this part and the purpose of addressing this question is to understand the *what*. It is also, however, important to address the *why*; why we use content analysis in general and in this study specifically. First, it is appropriate to tackle the definition of content analysis.

Weber (1990, p.9) definition is 'content analysis is a research method that uses a set of procedures to make valid inference from text. These inferences are about the sender(s) of

the message, the message itself, or the audience of the message. The rules of this inferential process vary with theoretical and substantive interest of the investigation... '.

The definition provides specific insights: firstly it places inference at the heart of content analysis; second it describes the data being analysed as a message; and thirdly it outlines that there are procedures and rules in the inference process. Holsti (1969, p.2) definition is that 'content analysis is a multipurpose research method developed specifically for investigating any problem which the content of communication serves as the basis of inference'.

Again the word "inference" is key to the definition of content analysis. However, in this definition the word communication is used rather than message. The purpose of a communication is of course to send a message to the recipient. In fact, Berelson (1952), one of the earliest commentators on content analysis focused his book on *Content Analysis in Communication Research*. This would seem logical since the central aim of content analysis is to understand what is behind the content of any communication whether that be verbal or written communication.

This then poses the question, what can be categorised as communication in written documents. If communication is a transfer of information between one/many to one/many (in all variations) then all written documents can be seen as communication.

Take a poem: it is transferring the information possessed by the poet, whether that information comes in the form of emotions or dictums, to the reader(s).

Neundorf (2002, p.17) remarks 'the term content analysis is not reserved for studies of mass media or for any other type of message content. So long as other pertinent characteristics apply (i.e., quantitative, summarising), the study of any type of message pool may be deemed a content analysis'.

In my research the written document comes in the form of reports. The reports are authorised by the NAO and produced for the scrutiny of parliamentarians. The secondary use is to communicate the findings to the public, through a policy of transparency, allowing for those interested to access the information within the report.

I am one of those in the public, in my role as a researcher, who is interested and attempts to understand the information. It is therefore possible to say that the authors, the NAO, are communicating to the primary, parliamentary defence committee, and secondary, the public, users. The focus of my research is to understand the information which the NAO are providing in terms of the defence acquisition process and analyse it according to my propositions.

Content analysis provides further advantages than just purely understanding the message. There is its ability to disseminate and organise large amounts of information. Defence

reports are technical, composed of large text and a variety of topics; it is possible to get lost in the mass information. Content analysis provides clarity and order to the message of the reports.

Weber (1990, p.12) affirms 'a central idea in content analysis is that the many words of the text are classified into much fewer content categories. Each category may consist of one, several, or many words. Words, phrase, or other units of text classified in the same category are presumed to have similar meaning'.

When attempting a cross-analysis of a number of sources, in the form of defence reports, it can be useful to see what similar themes exist in the reports – categorisation allows for that purpose. Berelson (1952, pp.18-20) points out three general assumptions which need to be made for all content analysis:

- Content analysis assumes that inferences about the relationship between intent and content or between content and effect can validly be made, or the actual relationships established.
- Content analysis assumes that study of the manifest content is meaningful.
- Content analysis assumes that the quantitative description of communication content is meaningful.

The first assumption focuses on the coder of the information and the decision that coder makes in his/her inference. This is stating that the coder can make inference on the intent of the author and the content of the unit being analysed. It is best to exemplify this point using my own coding.

When deciding the categorisation of a passage of text in any report, it was not simply a word search. It was a more cognitive process of understanding the message of the process, the intent of the author and how that is represented by the content of the passage. An inference is therefore a decision-making step of the categorisation.

Decision-making regarding coding has in its essence a subjective nature; however its objectivity can be anchored by the ability to define the rules and procedures, as mentioned by Weber (1990). In the research the objectivity is in terms of the clear definition assigned to each category to identify to those critiquing the methodology of what each category represents, in the eyes of the coder. This of course, does not remove (but reduces) the subjective nature of the inference of the individual.

Weber (1990, p.13) explains 'there is no simple right way to do content analysis. Instead, investigators must judge what methods are most appropriate for their substantive problems. Moreover, some technical problems in content analysis have yet to be resolved or are the subject of ongoing research and debate... '. I shall return to this idea of objectivity in content analysis later, and discuss it in more detail.

The second assumption points to the meaningfulness of the content under analysis. In the cross-analysis of the VfM reports the focus is outlined by the primary category, that being the defence acquisition process, the focus of the analysis concentrates on this subject. This does not disregard other information present in the seventeen reports. In fact there

is a separate heading, with a separate branch of investigation, which categorises the 'other' information present in the reports. The fact that both branches are analysed in detail is to highlight that the data has been fully exhausted and utilised.

The quantification of content analysis and its importance, the third assumption, is a central part of my own research. A quantitative description provides insight into the importance of certain categories and their prevalence in the reports. However, whilst the quantitative information is important, it will be argued in this chapter that the qualitative findings also play an important, if not greater, role in providing insight. The following section will look at the use of content analysis in quantitative, qualitative and combined methods.

6.3.2 Content Analysis Methods

Weber (1990, p.70) states 'content analysis procedures create quantitative indicators that assess the degree of attention or concern devoted to cultural units such as themes, categories, or issues. The investigator then interprets and explains the results using relevant theories'.

Content analysis, in its original format, was heavily based on the quantitative nature of the content, specifically on the frequencies of words or categories. In my research quantification takes on the form of the frequencies of categories and categorical

relationships, in order to make statements on emphasis. Weber (1990) suggests the prevalence of certain categories thus provides an indication of their importance or the concern devoted to them by the authors and/or for the readers.

Kassarjian (1977, p.9) says of the quantification, 'this requirement is perhaps the most distinctive feature of content analysis. Quantification of judgements distinguishes content analysis from ordinary critical reading. A measurement of the extent of emphasis or omission of any given analytic category is what content is all about'.

With the quantitative approach there has been a proliferation of content analysis computer software to calculate the frequency and other statistical variables of content. McTavish and Pirro (1990, p.246) explain one such quantitative method. 'This vector of normed scores (called "emphasis" scores or E-scores) permits an investigator to examine the over- and under-emphasis on idea categories relative to the norm of expected category usage'.

This may seem like an overcomplicated form of content analysis quantification but there are much simpler formats used in political science, journalism and other areas where content analysis is popular (Kassarjian, 1977). In any given national election media coverage, in the US and UK, there is the presentation of frequently used words as a way of understanding the priority of politicians.

In the first ever televised debates in British election history, the three leaders of the major political parties discussed their political views and policies in front of an audience of millions. One of the content analyses of the debates highlighted as a major news story was the number of times the two front runners, (at the time the Labour leader Gordon Brown and Conservative leader David Cameron) stated “I agree with Nick” (the Liberal Democrat leader, Nick Clegg).

The media suggested through their quantitative content analysis that the two leaders were attempting to win favour with Nick Clegg in order to gain support for their own policy priorities. Thus, it is clear the way insight may be developed in quantitative description of content analysis.

In my research the quantitative approach to the content analysis focused on using frequencies. I look to see how the frequency of a category evidences its importance to its parent category or to the entire tree. As I have separated the tree into four sub-levels with three branches, the emphasis of a category in the content takes on three dimensions: in the context of the levels, branches and the entire tree.

Neundorf (2002, p.15) suggests ‘the empiricism of a careful and detailed critical analysis is one of its prime strengths and may produce such a lucid interpretation of the text as to provide us with a completely new encounter with the text’. It is possible to find information which may have been buried upon the masses of text in the content analysis

providing new insight. In terms of the quantitative approach this may come in the form of identifying the emphasis of the wider reporting through the cross-analysis method.

There are four key aspects of the quantitative content analysis process:

1. Measurement – the assignment of numbers that stand for some aspect of the text
2. Indicators – the inference by the investigator of some unmeasured quality or characteristic of the text from those numbers
3. Representation – techniques for describing syntactic, semantic, or pragmatic aspects of texts
4. Interpretation – the translation of the meaning in the text in some other abstract analytical or theoretical language.

(Weber 1990, p.70)

Measurement has been discussed at length, in its ability to provide insight through the measurement of frequency in occurrence (or omission contrarily). Indicators concerns ‘the message behind the message’ this is the latent (or hidden) information in the communication. This is a difficult part of the process, since it can be difficult to reliably infer the latent message such as the attitude or purpose of the author(s) in writing a certain passage.

Representation looks at the way syntactic or semantic features of language or text are deployed (Weber, 1990, p.76). Interpretation is described as the transformation of the text, from many to few, into a theoretical structure using social science theory or theories (Weber, 1990, p.79).

There are two important points here. First, the transformation of 'many to few' and second, the application of theory to the few. In the process of quantifying the mass into categories the information is disseminated into manageable volumes which represent specific ideas or themes. Therefore, the movement of many to few is an organisational process of the content which provides a clear and concise means of viewing the information and thus allowing us to discern the message.

The second point is of applying scientific theory to the categorised information. The categorisation process provides an easier way to apply the theoretical labels to specific categories or to understand the presence of certain categories in conjunction with the expectations of the theory.

TCE theory is applied to the categorised content analysis of the defence acquisition process in order to further analyse the initial findings. Applying such theoretical approaches to a mass of data in the reports would be a tall order. By categorising the defence acquisition process into identifiable factors, it allows me to use TCE to understand the presence or prevalence of certain factors or categorical interrelatedness.

The quantification of the data from many to few categories eases the way to applying theoretical insight. It is important, however, to understand as Kracauer (1952, p.631) puts it 'overemphasis on quantification tends to lessen the accuracy of analysis'. The

theoretical approach will thus rely upon the qualitative findings of the content analysis, as much as the quantitative.

Berelson (1952, p.114) points out 'a great number of non-numerical content studies call for attention by virtue of their general contribution in insight and interest'. The frequency of categories may tell us a lot about the prevalence of the category, but little of the significance. To understand the significance of a category we need to delve further into the content itself.

Morgan (1993, p.113-5) discusses the divisions between those researchers who follow the quantitative and qualitative approach:

Because most current applications of content analysis are highly numerical approaches to texts - a sort of quantitative analysis of qualitative data - many qualitative researchers justifiably feel that such techniques are an affront to their own analytical goals... Many qualitative researchers will undoubtedly be surprised to learn that there once was a tradition of qualitative content analysis... A generation ago, the early proponents of content analysis had difficulty recognising the value of qualitative approaches to their concerns. Today, I am more likely to encounter qualitative researchers who have difficulty recognising the value of content analytic approaches to their concerns.

Mayring (2000, p.3) suggests 'but within the framework of qualitative approaches it would be of central interest, to develop the aspects of interpretation, the categories, as near as possible to the material, to formulate them in terms of the material'. One problem with quantitative content analysis is that it does not discuss how category formulation comes about. It may be straight-forward to undertake a frequency of words or categories, but how do you go about creating the category itself.

Mayring (2000, p.4) poses this question and suggests the inductive approach, as described, or a deductive approach 'prior formulate, theoretical derived aspects of analysis'. I undertook an inductive approach in which I used the reports to recognise the main topics of discussion to come up with the categories. Hsieh and Shannon (2005) provide three approaches to qualitative content analysis 'conventional, directed, and summative'.

In my research, the approach taken was that of a conventional content analysis (as described below). The study focused the analysis on the nature of defence acquisition using the process as a basis of investigation. The description provided for the conventional content analysis process mirrors the approach taken in my study.

Data analysis starts with reading all data repeatedly to achieve immersion and obtain a sense of the whole... Next, the researcher approaches the text by making notes of his or her first impressions, thoughts, and analysis. As this process continues, labels for codes emerge that are reflective of more than one key thought. These often come directly from the text and are then become the initial coding scheme... Depending on the relationships between sub-categories, researchers can combine or organize this larger number of sub-categories into a smaller number of categories. A tree diagram can be developed to help in organising these categories into a hierarchical structure.

(Hsieh and Shannon 2005, p.1279)

From the careful reading and making notes of the data through to the organisation of subcategories into a hierarchical tree diagram, these steps were taken in the content analysis of the VfM reports. An additional step was taken in which TCE theory was applied to the content analysis, in order to achieve focussed insight.

The directed approach uses existing theory or prior research of the phenomenon to deductively analyse the content. The summative content analysis approach, however, identifies and quantifies certain words or content, in the text, to contextualise the words or content (Hsieh and Shannon, 2005, pp.1281-3).

McTavish and Pirro (1990, p.249) explain 'contextual information is also contained in the focus upon some words or word groups compared to others. This can be seen in probability distribution patterns across idea/word categories. Individuals use ideas/words in distinctive, patterned ways which reflect role and location within a social system as well as individual socialisation and other individual factors'.

Steps in the content analysis have been briefly identified as reading, coding and categorising. After the researcher has immersed him/herself in the content and made adequate inferences as on the purpose of the message this must be coded.

Holsti (1969, p.94) explains 'coding is the process whereby raw data are systematically transformed and aggregated into units which permit precise description of relevant content characteristics'. For the purpose of my content analysis the defence reports are seen as raw data. Whilst they have been processed by the authors and presented in their format. For our case they have not been processed using the system of content analysis and thus are in a raw form.

The focus then turns to the units to be used, the categories, and the enumeration of the codes. The codes can be in the form of the categories selected to represent the topic, however how is the data codify in terms of units?

Neundorf (2002, 71) explains 'in content analysis, a unit is an identifiable message or message components, (a) which serves as the basis for identifying the population and drawing a sample, (b) on which variables are measured, or (c) which serves as the basis for reporting analyses. Units can be words, characters, themes, time periods, interactions, or any other results of "breaking up a 'communication' into bits"'.

In choosing the unit for the VfM report content analysis I made the decision that the unit had to be large enough to properly represent the category it was being coded into, but fairly compact to show focus. The reports are highly descriptive and due to that nature it was not possible to identify the category simply through words or a single sentence. Theme in a passage was chosen to represent the unit of analysis. Therefore, the unit chosen can be labelled as a passage with an undetermined length, but can be reasonably estimated as a number of sentences but not a paragraph.

Finally, the categories were chosen for two reasons, first the focus of the research is the defence acquisition process and through that there were expectation of certain topics; and second, with the first requirement in mind, in the process of reading the seventeen

reports the common factors describing the defence acquisition process were chosen to categorise the data.

Kassarjian (1977, p.12) comments 'content analysis is no better than its categories, since they reflect the formulated thinking, the hypotheses and the purpose of the study. The categories are, in essence, the conceptual scheme of the research design'. With that in mind, it is clear the categorisation process is the key to the successful implementation of the research.

As part of the categorisation process there are important steps such as defining, organising and relating the categories. Hsieh and Shannon (2005, p.1279) state 'next, definition for each category, subcategory, and code are developed. To prepare for reporting the findings, exemplars for each code and category are identified from the data. Depending on the purpose of the study, researchers might decide to identify the relationships between categories and sub-categories further based on their concurrence, antecedents, or consequences'.

This process was aided by the use of the qualitative software, NVivo 8, and was instrumental to the categorisation of the content. Each category and sub-category, coding, relationship and other queries of the content analysis is defined and explained.

Having presented the case of the quantitative and qualitative approach to content analysis, I shall now argue that the use of both approaches creates the best of both worlds for the researcher. In my research, the approach taken was to first understand the quantitative description evident in the content analysis and use that to support and extend the qualitative aspects of the content analysis.

Kracauer (1952, p.637) argues 'quantitative analysis includes qualitative aspects, for it both originates and culminates in qualitative considerations. On the other hand, qualitative analysis proper often requires quantification in the interest of exhaustive treatment. Far from being strict alternatives the two approaches actually overlap, and have in fact complemented and interpenetrated each other in several investigations'.

The quantification process in some cases can take on a heavily statistical approach, however in most cases it can simply be a matter of identifying the emphasis of categories or sub-categories within the content using frequency calculations.

Morgan (1993, p.115) points out 'in quantitative content analysis, counts and tabulations of the codes summarise what is known about the data, and the analytic effort typically stops with the presentation of these numerical results. In qualitative content analysis, however, such counting leads to the crucial further step of interpreting the pattern that is found in the codes'.

In my study the frequency of categories, sub-categories and relationships provided clear identification of the emphasis of certain factors in the reports. Beyond the point of emphasis, and in some cases omission or infrequency, there is the question of how this count affects the overall picture, in terms of the defence acquisition process.

If the emphasis is on one sub-category, how does this play out with the other sub-categories or the hierarchical tree? If there is an omission of certain factorial relationships, what does that mean for expectations of the defence acquisition process? These are the inferential questions posed in the qualitative analysis using counts in content analysis. There is also the overall connection of the content analysis with the transaction cost perspective.

There are some qualitative researchers who are uneasy (Morgan, 1993) with quantification in qualitative research. However, Holsti (1969, p.9) points out 'a further advantage of quantification is that statistical methods provide a powerful set of tools not only for precise and parsimonious summary of findings, but also for improving the quality of interpretation and inferences'.

When trying to identify the crucial areas of focus for the defence acquisition process it is important to identify what the authors are trying to communicate to us, the message, the frequencies provides a clear indication of their focus. Moving beyond simply counting and interpreting the count, the focus moves towards the meaning of the message. This is

undertaken by providing a summation of the theme in the factorial relations or a discussion of common categories.

The factorial relations provide a clear identification of the cause and effect of certain factors in the defence acquisition process. Their interrelatedness makes them an important aspect of the categorisation. In the quantification the emphasis is identified and in the qualification the meaning is presented. The use of quantitative content analysis without further analysis using a qualitative approach would be limited in its ability to provide proper conclusions in the research.

6.3.3 Reliability, Validity and Objectivity

Weber (1990, p.17) identifies three types of reliability for content analysis 'stability, reproducibility, and accuracy'. Stability refers to the ability of multiple coders to record the same classifications for the code. Reproducibility regards the ability of multiple coders to classify the text in the same categories.

Whereas stability measures the capability of the coders to understand the classifications, reproducibility is the degree to which their understanding is coherent. These reliability tests are weak for content analysis where usually the coder is a single person, as in my case. Accuracy is the extent to which the classification of the text corresponds to a standard or norm; a stronger form of reliability (Weber, 1952, p.17).

The accuracy of the research can be tested by creating a standard, in most cases the definition or boundary of the category, and investigating each code to see whether they conform to the standards assigned. There can be hundreds of coded references within a category, but a sample of these can be taken to review the accuracy of the coding process.

Neundorf (2002, p.12) suggests 'reliability has been defined as the extent to which a measuring procedure yields the same results on repeated trials'. It is explained, this is again down to multi-coder consistency. Kolbe and Burnett (1991, p.248) comment 'interjudge reliability is often perceived as the standard measure of research quality. High levels of disagreement among judges suggest weakness in research methods, including the possibility of poor operational definitions, categories, and judge training'. A major factor of this 'interjudge reliability' is the objectivity of the research, which I shall discuss further shortly but first let's look at validity.

Neundorf (2000, p.12) states 'validity refers to the extent to which empirical measure adequately reflects what humans agree on as the real meaning of a concept (Babbie, 1995, p.127). Generally, it is addressed with the question, "Are we really measuring what we want to measure?"'. This question goes to the heart of the researchers purpose, is the research satisfying his/her own curiosity properly.

In order to ensure there is focus in the research, it is important to highlight the purpose of the research. The purpose of my research is to understand the UK defence acquisition

process by focusing on specific elements of the transaction between the MoD and its prime contractors. With that in mind the choice of the VfM reports as the dataset provides a logical link to that purpose. It is then a matter of defining what the defence acquisition process represents and then defining how the categories and sub-categories fit in with that purpose. The test is then whether the codified unit represents the category it has been placed in.

Weber (1990, pp.18-19) states 'a category has face validity to the extent that it appears to measure the construct it is intended to measure. Even if several expert judges agree, face validity is still a weak claim because it rests on a single variable... Unfortunately, content analysts often have relied heavily on face validity; consequently some other social scientists have viewed their results sceptically'.

It is difficult to provide multiple variables for a single category, especially since the whole point of that category is to measure the occurrence of a specific factor. However, I do attempt to view the categories or the relationships they exhibit in a different light using the TCE theory. This is less to do with validity and more to do with providing a second layer of analysis. This may, however, provide a greater justification of my conclusions.

In the last two methodological tests, reliability and validity, a constant theme has cropped up on the critique of content analysis, that being how objectivity is ensured. This idea of

'interjudge reliability' or 'agreement' comes from the desire to objectively outline the rules, procedure and standardisation of the coding, units and categories.

This objectivity might be achievable in terms of choosing a specific unit type (words, themes, characters, etc.) and the way the categories are outlined (through definition or boundary explanations), but the real test comes from the coding.

In the definition of content analysis inferential judgement is at the heart of the process. By their nature inferences are subjective; each person will make decisions on whether the category definition or even the unit style is adequate to the rules outlined.

As Holsti (1969, p.3) argues 'objectivity stipulates that each step in the research process must be carried out on the basis of explicitly formulated rules and procedures. Even the simplest and most mechanical forms of content analysis require the investigator to use his judgement in making decisions about his data'.

It is impossible to remove judgement from the process of content analysis and even through the creation of rules and procedures this judgement can only be confined to a certain extent. It is therefore difficult to satisfy the classic view of objectivity, but the process of inter-subjectivity provides an attempt to be objective.

Beyond the coding process, the analysis of the categories using qualitative content analysis further disturbs this so-called need for objectivity. Earlier the focus was on what approach to use for content analysis, qualitative or quantitative, the argument put forward was that there is advantages in combining the two. Some would argue that the use of qualitative analysis would create greater subjectivity.

Kracauer (1952, p.641) however argues that disciplined subjectivity can be achieved. 'The believers in exact science among the social scientists are inclined to exaggerate, along with the objectivity of quantitative analysis, the danger which qualitative techniques incur because of their subjectivity. Any historical period produces only a limited number of major philosophical doctrines, moral trends and aesthetic preferences, and if qualitative analysis operates, as it should, below the level of sheer opinion, these influences can be discerned and controlled'.

I believe in my study there is a clear understanding of the purpose (as explained in the Introduction Chapter) and this ensures the focus on the way the categories are defined. It is through these definitions that I have made my inference as to which categories the references are coded. Through this purpose and research objectives I identify the relationships amongst categories and subcategories (which are to be explained below), and discern with disciplined subjectivity my interpretations of the findings.

6.4 Research Design

6.4.1 Research Data

The research data comes in the form of seventeen VfM reports, produced by the NAO, focussing on defence projects delivered by the MoD. The NAO scrutinises public spending on behalf of Parliament under the powers given to them by Section 6 of the National Audit Act 1983, for presentation to the House of Commons in accordance with Section 9 of the Act. The VfM reports provide a number of aspects of the acquisition process for the delivery of defence equipment and services to the Armed Forces. The reports are from a variety of dates and projects, as shown in Table 6.1.

Nine of the reports, from HC 1246 downwards, were sourced from the NAO website (www.nao.org.uk, accessed 18th March 2009). The older reports were sourced directly from the NAO by agreement with the Head of Defence in the NAO, Tim Banfield. My supervisor, Prof. Graham Winch, and I met with Mr. Banfield at NAO Headquarters to discuss the aim of the research and the need for greater resources.

Mr. Banfield's office provided me with a number of defence reports from the NAO, including the eight remaining VfM reports and many other useful reports for reference. The access to these original data sources provide a contribution to defence research, in that it is the first time such data has been analysed and presented.

On my part, I produced a report discussing the initial findings of the analysis of the seventeen reports. I received some useful feedback from Mr. Banfield in response to my presentation.

Table 6.1: Defence Value for Money Reports

Session	Report	Report Title
Feb 1984	HC 287	Trident Project
Mar 1985	HC 291	The Torpedo Programme
Jul 1993	HC 864	The Awarding of the Contract for the Landing Platform for Helicopters
1994-1995	HC 692	Procurement Lessons for the Common New Generation Frigate
1994-1995	HC 724	Eurofighter 2000
1998-1999	HC 738	The Procurement of Non-Combat Vehicles for the Royal Air Force
1999-2000	HC 328	The Private Finance Initiative: The Contract for the Defence Fixed Telecommunications System
2001-2002	HC 840	Helicopter Logistics
2001-2002	HC 1246	Building an Air Manoeuvre Capability: The Introduction of the Apache Helicopter
2002-2003	HC 90	The Construction of Nuclear Submarine Facilities at Davenport
2005-2006	HC 1050	Delivering Digital Tactical Communications through the Bowman CIP Programme
2006-2007	HC 825	Transforming Logistics Support for Fast Jets
2007-2008	HC 512	Chinook Mk3 Helicopters
2007-2008	HC 627	Hercules C-130 Tactical Fixed Wing Airlift Capability
2007-2008	HC 788	The Defence Information Infrastructure
2007-2008	HC 1115	The United Kingdom's Future Nuclear Deterrent Capability
2008-2009	HC 295	Providing Anti-Air Warfare Capability: the Type 45 Destroyer

Keen (1999, p.509) points out 'the UK National Audit Office (NAO) is responsible for the external audit of government departments, agencies and other public bodies. The NAO carries out two main types of work, financial audits of government expenditure and Value for Money (VfM) reports on specific programmes, projects and other activities'.

VfM reports are common for all other government procurement projects such as transport infrastructure, public service buildings, government accommodation projects etc. The VfM reports in defence provide a number of purposes:

- They allow the NAO to scrutinise the performance of the MoD in delivering the acquisition of specific projects;
- The reports provide a vital part of the UK democratic process in that they make civil servants accountable to elected officials in the defence parliamentary committee;
- The NAO are tasked with determining the value gained for the taxpayer and the Armed Forces on specific defence projects, as well as providing recommendations for improved acquisition practice.

Lonsdale (2000, p.73) states 'unlike the regular audit of sets of financial statements, value for money (VfM) work is usually undertaken on discrete subjects on an ad hoc basis, with results often appearing in a published report containing recommendations for improvements in practices or procedures'.

VfM reports also differ to regular audits, in that they are not really seen as audits. Keen (1999, p.510) explains 'at the NAO, VfM studies are not usually referred to as audits,

though in almost all cases they are undertaken by auditors. VFM studies typically focus on specific topics, which might include the awarding of a contract, the implementation of a new programme or the management of a service. Topics are investigated periodically, perhaps only once every few years, rather than yearly'.

VfM reports go beyond financial audits in their remit, they investigate the practice of the audited body not only its financial information. It is the fact that the scrutiny is focused on a wide variety of management and acquisition practices, whilst specifying individual projects, that the VfM reports represent a rich source of research data.

There have been few discussions on the work of the NAO, in the academic sphere. However, those which do make mention of the NAO provide insight into the background and focus of the institution. In terms of its inception the NAO in its institutional format was a product of a private members bill during the Thatcher government (Roberts and Pollitt 1994; Lapsley and Pong 2000). It is not, however, alone in its ability to scrutinise public expenditure.

In their study, Bowerman et al. (2003, p.2) present the role the NAO plays alongside other auditing bodies. 'The present framework of public audit in the UK is the product of a patchwork of legislation enacted over the past 150 years. The result is huge diversity of purpose, power, organisation and methods between the public audit bodies. Briefly, there are four national audit agencies, covering central government departments and agencies

in England and Wales (the National Audit Office), local government and health bodies in England and Wales (the Audit Commission), an audit body for Northern Ireland and one for Scotland’.

In 2011, it was announced by the coalition Government that the Audit Commission is to be disbanded and a new arrangement for auditing local public bodies is intended to be implemented by 2012/13 (www.audit-commission.gov.uk, accessed 22/02/11).

Bowerman et al. (2003) suggest these institutions compete for influence and power. The NAO are the definitive voice in the evaluation of defence projects and thus the focus of my study lies with them. Roberts and Pollitt (1994) study provides some interesting discussions on a study of the NAO, specifically the limitations they identify of the institution, they present three such limitations.

The first, Roberts and Pollitt (1994) suggest, is a format limitation, of which is largely self-imposed, in which the NAO is constrained by the ‘politeness of Whitehall speak’. This states that the NAO while giving recommendations on ‘continued efforts’ or ‘further consideration’ or ‘review’ are not heavily critical of failings.

The second limitation is largely (but not wholly) self-imposed upon the NAO by its founding legislation, and its relationship with the Public Accounts Committee (PAC). This limitation is that it is concerned mainly with the financial aspects of reporting rather than

the managerial issues, and when management practice is discussed it is only where a link to expenditure decisions can be highlighted.

The third limitation is on its reporting style. They argue that in order to satisfy the interests (or lack of) the audience, parliamentarians and the PAC, the methodological and technical details are usually exercised or limited. Furthermore, due to the time limitations of parliament the length of the VfM studies are constrained (Roberts and Pollitt, 1994, p.546-7).

The first limitation may in the whole be true, but in my experience of reading the NAO reports on VfM and MPR, in the defence context, there doesn't seem to be too much restraint in criticising the MoD where mistakes or lack of development is perceived by the NAO. In terms of the second limitation it is true that some VfM reports rely too heavily on providing financial information, especially the earlier reports.

In my study the more detailed financial information was not much use in understanding the defence acquisition process, as they did not provide much evidence towards the process but instead were more statistical based. The financial information, those which made no reference to the effect on the acquisition process, were thus categorised in a separate tree – the 'Other' tree. It is, however, obvious there was a rich source of data in terms of the acquisition process and managerial decision-making, which was the focus of my study and most NAO VfM reports.

The last of the limitations is, of course, a part of the nature of a parliamentary democracy where elected officials are not expected to be experts and their time in parliament can be limited, this fact cannot be helped. The information which the NAO presents is mainly subject to scrutiny of current parliamentarians and not for future intakes. This is proper as the electorate are only able to judge those in power at the time of the projects in terms of how they accounted for the taxpayer's expenditure.

It should, however, be noted that Roberts and Pollitt (1994) study used a case study of job creation and safeguard in Wales and so the reporting of this case study is likely to differ from that of defence reports. Their conclusions are, however, based on a general overview of NAO working. The NAO as an institution will have its own purpose and objectives, it is difficult to ascertain how that is influenced by politics but it would be naïve to think that it was immune to such considerations.

Beyond the NAO as an institution there is an interesting study of the 'value for money' philosophy in public auditing, conducted by Lapsley and Pong (2000). The study looks at the opposing views of 'modernisation and problematisation' of value for money audits. The argument centres on the different use of language and perception in what can be justified as 'best practice'.

The modernisation path views 'value for money' as a way to move towards the language of seeking 'best practice' and how such practice can be applied. The path taken by the

problematism view is to question the basis of what 'best practice' stands for and how it can be defined or identified (Lapsley and Pong, 2000).

The study was conducted using interviews with 'expert' groups. Lapsley and Pong (2000, p.562) suggest 'these VFM auditors did suggest that both operational and strategic benefits arose from the conduct of VFM audits'.

Lapsley and Pong (2000, p.563) caution 'the major difficulty of VFM audit as perceived by this expert group is that of the determination of what constitutes 'best practice'... The above analysis of the views of the expert group of VFM auditors depict the process of determining VFM as problematic, challenging, even messy, with a strong emphasis on the experiential'.

In this problematist view of VFM language, there is also the question of whether the search for value for money itself is a highly politicised discourse. In my view, such considerations are difficult to resolve, the research instead focuses on the learning of the transactional issues regarding defence acquisition. While value for money plays the role of the 'bottom line' in these reports, my purpose is more to highlight whether value for money is being achieved rather than question its basis.

The conclusions of the paper provide a stark warning for my own research to be cautious of promoting 'best practice'. The research provides a great amount of data on acquisition

practice; it does, however, have its own limitation. The research methodology focuses on understanding the meaning behind the message of the reports rather than appraising the reports.

In the first instance, of my content analysis, the research method focuses on what can be extracted from the reports. The second phase is applying the theoretical basis, TCE, to explain how it applies to the findings of the content analysis. These research objectives are far removed from the arguments of what VfM reports should recommend as best practice, but it is something to bear in mind.

6.4.2 NVivo Coding Process

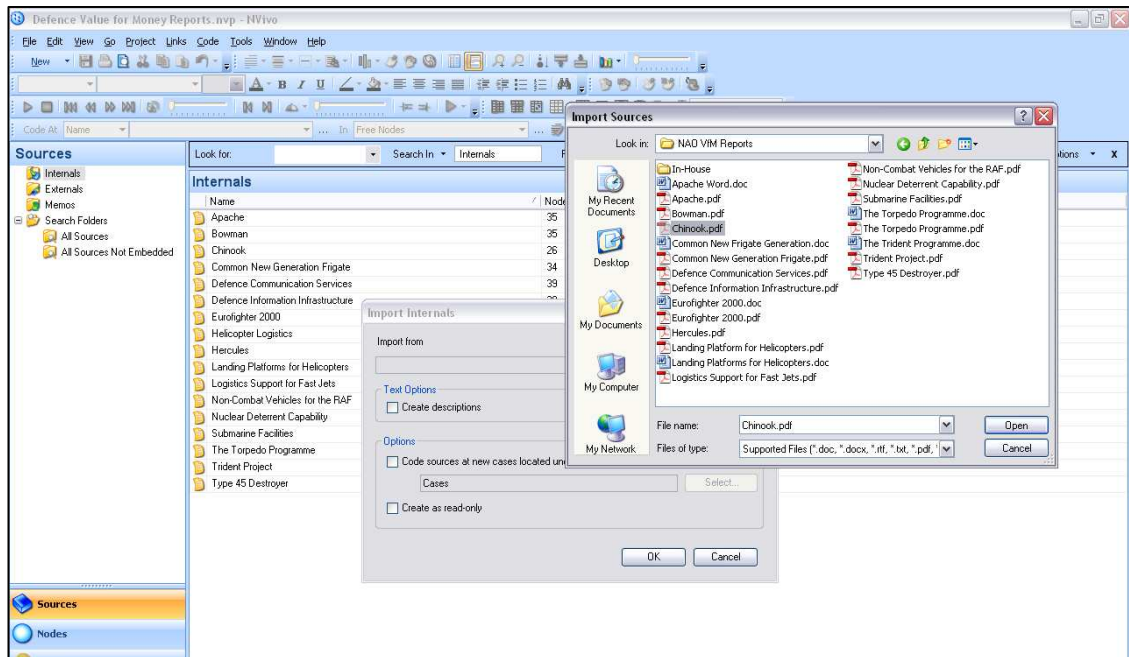
The content analysis of the VfM reports were undertaken using an initial process of textual analysis using qualitative software NVivo Version 8 (NVivo 8). The purpose of the qualitative software is to undertake the first step of the content analysis, which is to organise the data into discrete areas of focus.

As Richards (1999, p.413) explains 'much of what is in NVivo responds to user requests for ways of extending the accepted code-based theorizing methods. These include major changes to document handling and coding and in visual displays'. Therefore, NVivo 8 has allowed me to organise the data into the chosen categories within a hierarchical tree structure and produce models to represent this.

The first step is downloading the data into the software. The data comes in the form of the published reports, which are downloaded as a portable document folder (pdf) files. It is possible to download these files onto the NVivo 8 software as *sources*. In some cases, the pdf files were too large due to the numerous figures and pages in some reports. They therefore had to be copied into a word document and downloaded in document format.

Figure 6.1 represents the process for importing a source into NVivo 8. The document is chosen from the required folder, in this case that is the 'NAO VfM Reports' folder and imported into the internals section.

Figure 6.1: Importing a Source into Internals



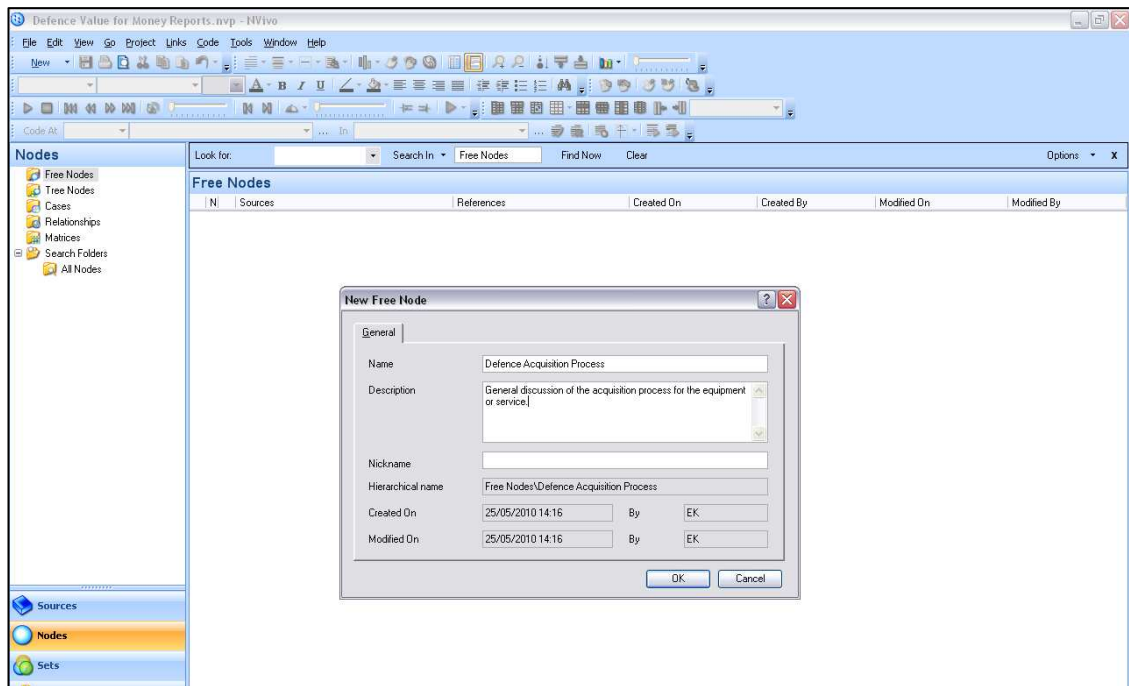
Using the importing function it is possible to download all seventeen reports into the internals section of the *Sources*. As can be seen in Figure 6.1, all seventeen reports are

shown in alphabetical order list with a paper style icon to the left. This icon can be selected in order to open the document; this action will open the full document with all the text and figures. In some cases the data were slightly corrupted, in terms of the spacing or order of text: this was easily overcome by editing the text using the paper copy for proofing.

The next step was to create categories to compartmentalise the text, according to interpretation. The unit, as has already been mentioned, was chosen to be multi-sentences (or passage) based. This first required the creation of the categories. Richards (2002, p.201) points out 'categories are not coding, categories are entities in their own right that can be related to each other, commented on in memos, and defined. Coding, if you want to do it (and many don't) can be stored in the relevant category or node to provide links to evidence texts'.

Figure 6.2 represents the process of creating categories, known in NVivo 8 as *Nodes*, in the first place as *Free Nodes*. As free nodes they are stand alone categories. These free nodes can be selected and dropped into the *Tree Nodes* and in this section the tree structure can be organised.

Figure 6.2: Creating a Free Node



The purpose of the hierarchical tree in the tree node is to start the analysis from a wide perspective to a more focused area. In Figure 6.2 the free node begins with 'Defence Acquisition Process', this is the principal category for the entire research. The nodes can then be generated in more focus and with a range of topics covering the purpose of the research. The hierarchical tree provides a description of how each factor has been exhausted downwards using sub-categories.

Bazeley (2002, p.239) explains the benefit of the tree in his work. 'Selective inclusion of nodes from different levels of a tree in a matrix allowed for sub-categorisation within trees without loss of flexibility in conducting analysis. The ease of generating complete

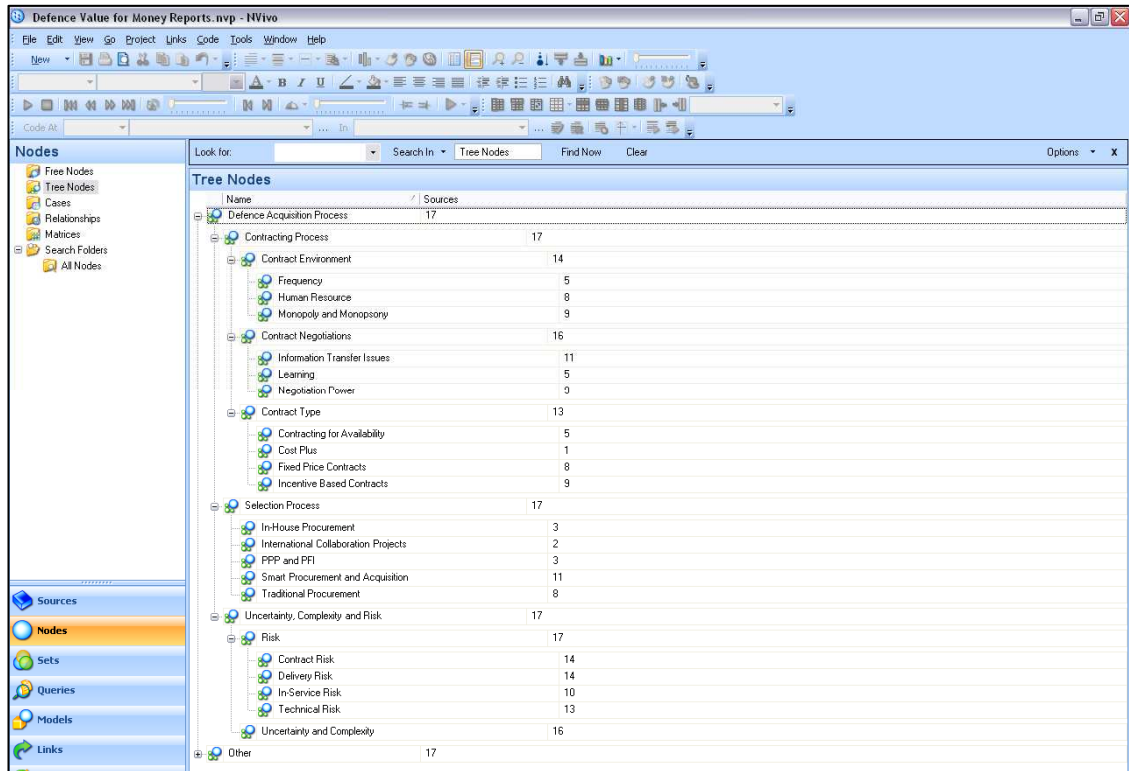
tables in NVivo thus prompted a series of analysis to examine the stability of the inferred underlying structure of the data across different subgroups...’.

The process of creating a tree is a part of the exhaustive analysis in the early stage of content analysis; this is aided greatly by the use of the software which provides visuals of this. Figure 6.3 demonstrates the full hierarchical tree of the Defence Acquisition Process tree.

As can be seen in Figure 6.3, the Defence Acquisition Process tree is represented by the categories I had chosen through my analysis of the seventeen reports. Consequently the category is sub-divided until I was satisfied enough detail was captured. These categories and sub-categories are of course not empty. The data from each source is placed in the appropriate category. Each category has a number next to it to identify the number of sources which reference it.

In total, there are 28 nodes included in the Defence Acquisition Process tree. The process of coding the data begins with the parent nodes, with the data being taken from each source, selected and ‘dropped’ into the node. The data are transformed into a *reference*, in that they reference the existence of the factor they describe. Each tree node will have a number of references, with the higher up the tree having a larger number of references. The references are filtered down the tree structure and placed in the appropriate nodes.

Figure 6.3: Defence Acquisition Process Tree Nodes

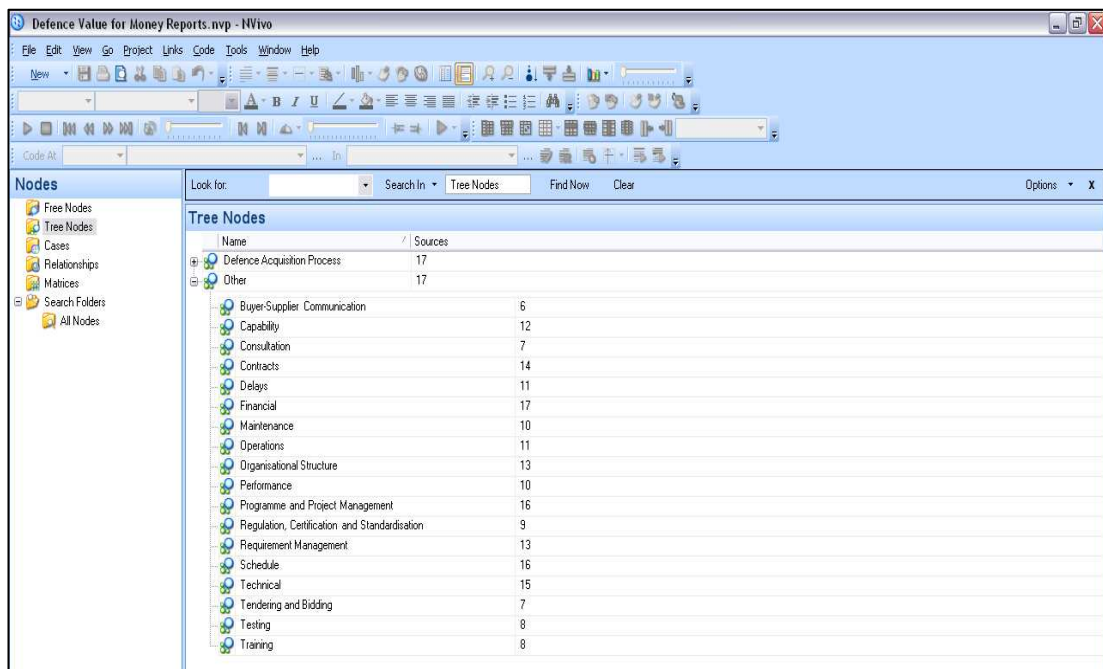


The table shown in Figure 6.3 under the Tree Nodes represents the number of sources (reports) which make reference to the categories and sub-categories named on the left. The results of this frequency count and its importance to the research will be discussed in greater length in the Research Findings chapter.

At the bottom of Figure 6.3, it is possible to see a separate tree to the Defence Acquisition Process – this is the ‘Other’ tree, shown in Figure 6.4. The ‘Other’ represents all references which do not refer to the Defence Acquisition Process. The analysis of the research data is satisfied when all possible text has been disseminated to the categories it references.

Crowley, Harre and Tagg (2002, p.195) state ‘...the Tree structure is simply an organising system in the software that enables more efficient interrogation of its databases; it can be restructured very simply at any time and it can also be completely ignored and not used’. It makes the analysis of data easier, but it also allows the user to visualise the structure of the analysis which can be of great help in the next stage of identifying category relationships.

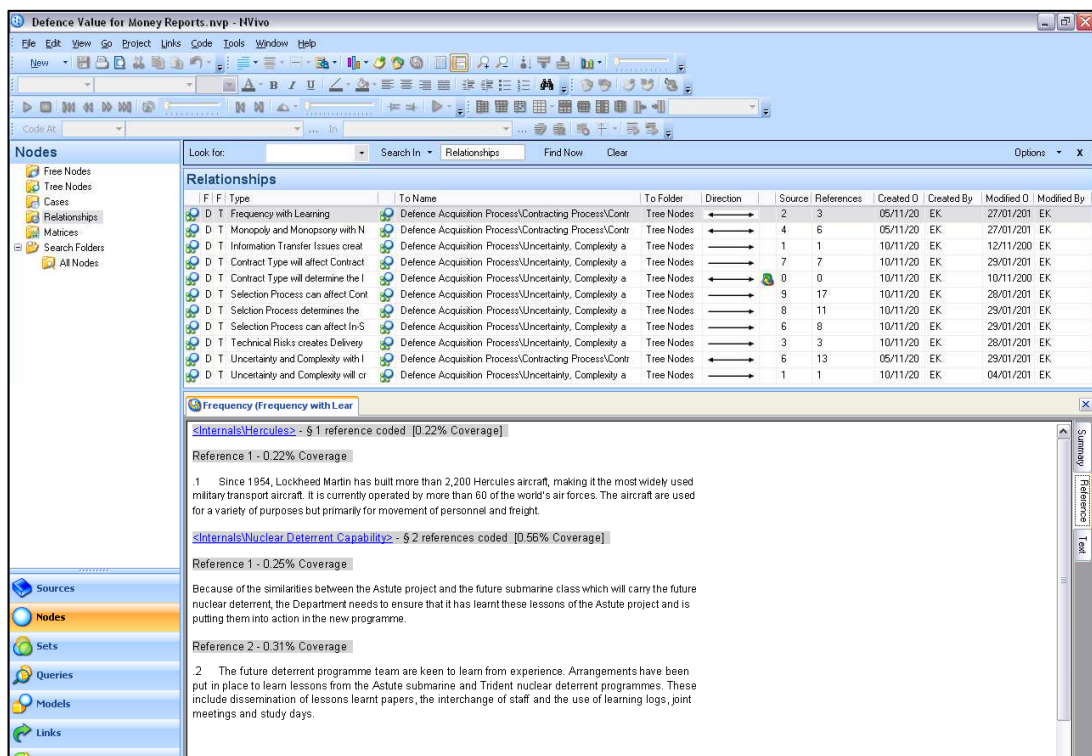
Figure 6.4: The ‘Other’ Tree Nodes



In the content analysis section, I pointed to what Hsieh and Shannon (2005) discussed as the process of identifying the relationships between categories and sub-categories based on their ‘concurrency, antecedents, or consequences’. This process can be aided using NVivo 8, since the data has been compartmentalised into their respective categories.

The investigation becomes a matter of identifying the hypothesised relationship, the type of relationship and the reference to evidence its existence. These relationships are placed in *Relationship Nodes* by selecting the reference and dragging it to the relationship node. Figure 6.5 shows the listed relationship nodes and as an example one is opened, 'Frequency with Learning' relationship. The references evidencing the existence of such a relationship are listed below.

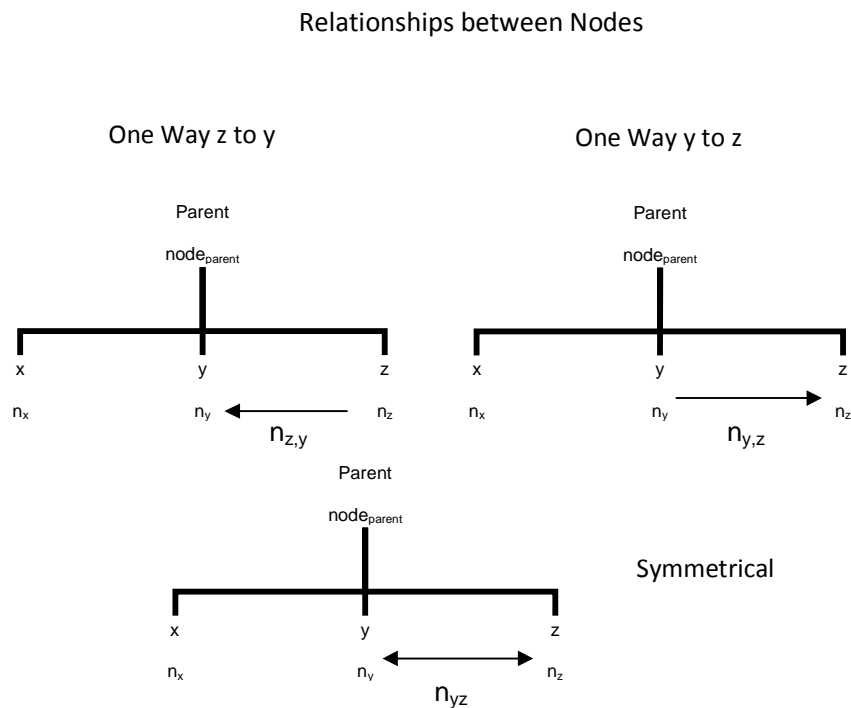
Figure 6.5: The Relationship Nodes



In the relationship section there are a number of columns to describe the relationship in detail giving information such as the type, the name, the tree nodes represented and the number of sources and references. The results will be explained further in the Research Findings.

In terms of relationship types there can be associative, one-way or symmetrical relationships; our interest lies with the one way or symmetrical relationships as shown in Figure 6.6: x, y and z represent a category, with n representing their respective coded node.

Figure 6.6: How Factorial Nodal Relationships Are Developed



This is the last step to coding the data in order to represent the initial stage of the content analysis, in terms of organising the data. NVivo 8, as already pointed out, provides another advantage in terms of its visualisation techniques. Apart from the obvious tabular form it provides as shown in all the Figures, it can also be used to create models representing these tabulate forms in Figures. Using shapes and arrows a diagram of the hierarchical tree and factorial relationships can be drawn with hyperlinks to the original coding.

6.4.3 Formulating Categories and Relationships

I shall now describe the process for creating the categories within the Defence Acquisition Process tree and the structure with which it is designed. The first process of identifying the major factors in the VfM reports was undertaken by a full reading of the seventeen reports. Having read the reports and with the findings of the MPRs in Chapter 5, the main themes describing the defence acquisition process were identified.

The categories describing the defence acquisition process are separated into three parts:

- Selection Process – this describes the procurement strategy used to identify the method of procuring the platform from a prime contractor or in-house production.
- Contracting Process – once the selection process has been fulfilled the buyer and supplier have to agree to certain exchange parameters. These parameters are in the type of contract, negotiating the contract and the environment under which the contract takes place.
- Uncertainty, Complexity and Risk – a major part of the defence acquisition process during selection, contracting and delivery. Uncertainty and Complexity can be seen as twinned factors creating the same effect, namely Risk.

These three factors represent the first sub-categories to the Defence Acquisition Process category. There are three branches to the tree and four levels, as is shown in Figure 6.7. The Selection Process, Branch 1, has five sub-categories, in Level 3, describing the procurement routes chosen for the acquisition. The Contracting Process, Branch 2, splits into three in Level 3 and a further 10 factors in Level 4. The Uncertainty, Complexity and

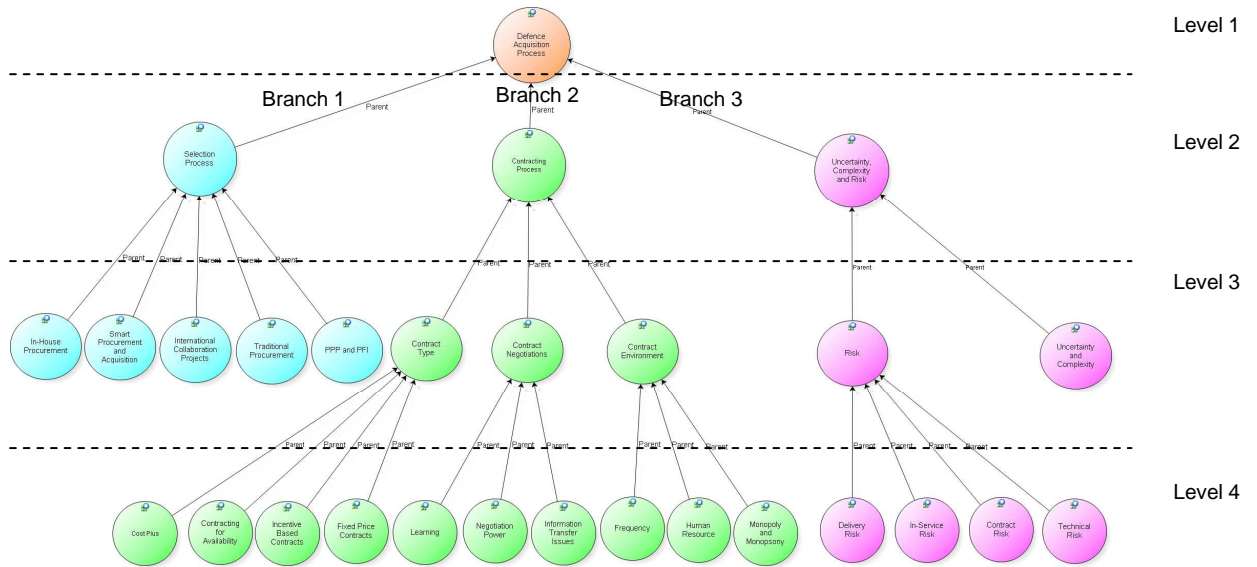
Risk factor, Branch 3, split into two in Level 3: Uncertainty and Complexity which is definitive and Risk which is of four types in level 4.

The tree model is colour coded to represent the fact that there exist three distinctive branches of the tree. The arrows in the model point upwards from one circle to another indicating the parent node. In the coding process the parent category is first analysed and all reference to its existence is placed in the parent node. The sub-categories are therefore selected from the references in the parent node.

This process is reiterated until the content of the text has been fully exhausted analytically. The unit of analysis is constant for all factors and no changes are made in the way the analysis is conducted for parent or child nodes. Examples of the coded references for each Defence Acquisition Process nodes are provided in Appendix 1.

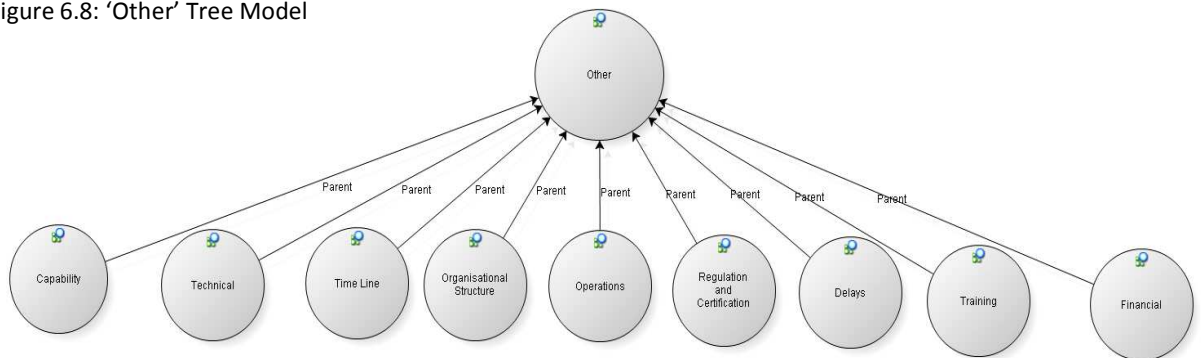
The model provides a visual representation of the defence acquisition tree which provides clear and concise recognition of the origins of the nodes. It is from looking at the references in the tree and linking that with the research propositions that the next stage of identifying relationships between the factors is formulated.

Figure 6.7: Defence Acquisition Tree Model



The Defence Acquisition Tree represents only one part of the VfM reports. It represents the part in which my research interest lies. However, there is a second part of the reports which play no part in the research question. These are categories in a separate tree, the “Other” Tree – shown in Figure 6.8. Passages, in which the information relates to references other than defence acquisition are categorised into the “Other” node and its sub-categories.

Figure 6.8: ‘Other’ Tree Model



The second level nodes are independent from each other for the purposes of my analysis. They represent the categories which are of no consequence to the defence acquisition process in the context of my research (e.g. financial is a category for all financial information such as pricing or technical which discusses technical information in the product development). These factors do not provide insight, as say the contracting process or technical risk categories might do.

These two trees are simply organising the VfM reports into the appropriate categories and sub-categories to be used when analysing the research questions and propositions. The TCE perspective, thus, is implemented at the analysis stage where the references from the Defence Acquisition Tree are used as evidence to support or refute the propositions. Aiding this process is the formulation of factorial relationships, which show causal relationships between the factors and provide further insight when analysed using the transaction cost perspective.

Factorial relationships are the name that has been assigned to describe the proposed relatedness of the categories and sub-categories in the Defence Acquisition Tree. The relationship types have already been discussed. However, Table 6.2 presents the eleven relationships proposed from expected cause and effect relationships in defence acquisition.

Table 6.2: Factorial Relationships

Relationship	Relationship Type
Selection Process can affect Contract Risk	One Way
Selection Process determines the Contract Type	One Way
Selection Process can affect In-Service Risk	One Way
Contract Type will affect Contract Risk	One Way
Technical Risks creates Delivery Risks	One Way
Information Transfer Issues creates Delivery Risks	One Way
Uncertainty and Complexity can create Technical Risks	One Way
Contract Type will determine the In-Service Risk	Symmetrical
Uncertainty and Complexity with Information Transfer Issues	Symmetrical
Monopoly and Monopsony with Negotiation Power	Symmetrical
Frequency with Learning	Symmetrical

Of the eleven relationships there are seven one way relationships and four symmetrical relationships. The one way relationships are inferred by looking for references which identify the causal factor in a category (i.e. in the Contract Risk node I looked for references which mention the effect of the Selection Process). In terms of the symmetrical relationships the process is similar, but rather than collecting the references of just one of the nodes the relatedness is evident where references occur in both nodes.

These factorial relationships will allow me to investigate in great detail the cause and effect of certain defence acquisition processes. They allow me to look in detail at certain expected relationships such as: how Information Transfer Issues may symmetrically affect

the Uncertainty and Complexity of the acquisition process OR that the Contract Type chosen for a certain acquisition may be determined by the Selection Process of the supplier.

These investigations will open up, it is hoped, a number of exchanges in the factors describing the defence acquisition process. The analysis will look at the statistical significance in terms of looking for emphasis, omission and infrequency. The qualitative content analysis will be even more important, as it will provide insight to how the relatedness of certain categories affects the overall defence acquisition process. The references from the factorial relationship, along with the defence acquisition factors, will be used to analyse the support, or not, for the propositions and to answer the research questions linked to them.

6.5 Summary

There has been a variety of research methodologies used in the study of defence acquisition. Amongst the commonly used methods are documentary studies, postal questionnaires, field-based questionnaires, questionnaires followed-up by semi-structured interviews and case studies. My own research combines documentary study with content analysis.

I justify the use of the content analysis methodology in terms of the limited access to primary data sources. However, I believe I have benefited from this limitation. The plentiful access to secondary sources, thanks to the NAO, has allowed me to use a larger sample of documentary data to analyse a wide-range of acquisition practice.

Content analysis has enabled me to decipher the information from the VfM reports. To infer the acquisition process represented in the reports and to present them through categorisation. The fact that the sample represents a wide-range of projects from the past and present allows me to analyse a range of acquisition practice.

I am also confident that the reports will represent a wide range of groups and individuals who have been interviewed and consulted by the NAO for the report. This allows me to use a data source which represents a wide range of views on defence acquisition. The focus of each report, however, is on a particular project and its value for money to the taxpayer. Unlike the MPRs this provides me with the opportunity to view a greater breadth of the project, as the reports explain all aspects of the project at the time of the report.

In my research I use a combination of quantitative and qualitative approaches to the content analysis. The reason being an analysis which addresses the case of emphasis, omission or indifference to categories is initially described. This is then backed up by a qualitative understanding of the overall message using the summative process. In

combination these two approaches provided a clearer picture of what is occurring in the content analysis.

Content analysis is subject to three methodological tests: reliability, validity and objectivity. Each test has been explained in their own context and how they apply to content analysis research. However, not all have been accepted in their stated form. Some have been adapted to the case of content analysis. It is no use trying to use tests which go against the nature of content analysis. However, it is also useful to ensure there is an attempt to adhere to these methodological requirements.

Reliability tests are difficult for content analysis because they require replicable actions, which can prove difficult when a single coder is used as in my case. Three types of reliability have been explained: stability, reproducibility, and accuracy. The first two types look at whether other coders can repeat the actions or inferences of the original coder. This is difficult to prove, since a single coder was used in my research and to have other coders analyse my data would be time consuming due to the large dataset.

The third type, accuracy, focuses on the way the coder provides standardisation in the coding process. This can be proven, since the standardisation is based on ensuring the meaning and boundaries of categories are standardised so that all the references belong to their category. This I have ensured by providing a definition of each category.

Validity looks at whether the purpose of the research has been addressed. The purpose of the research is to understand the defence acquisition process at the points in which the buyer-supplier interactions determines the transaction governance. This has been done by understanding the defence acquisition process supported by Chapters 2 and 5, and the economics of the defence acquisition using Chapters 3 and 4. I then combine the knowledge gained from these chapters with an analysis of the VfM reports to address the research objective, the purpose of my research.

Objectivity, it has been argued, goes against the nature of content analysis which relies heavily on the inference of the coder. Inference is a subjective interpretation of the evidence. Thus, instead of objectivity we look for what has been termed 'disciplined subjectivity'. Disciplined subjectivity ensures that the coder is consistent with the interpretation that is being made. This consistency relies upon a clear set of principles. These are that the unit of analysis, the definition of the category and the structural discipline of the tree.

The unit of analysis is a passage of text which describes a particular action, explanation or recommendation of the defence acquisition process. The definitions of each category and relationship has been provided and explained. The structure of the tree ensures that the information is continually reduced to its determinant category. Where the passage does not belong in the defence acquisition tree, a separate 'Other' tree has been constructed with its own categories.

The research data relies upon the analysis of the NAO VfM reports. These reports are based on a parliamentary legislation, which gives the NAO powers to audit the value gained from defence projects led by the MoD. The reports are provided for the scrutiny of parliament and in an era of transparency, for the public. The independence of the NAO provides it with a great amount of credibility and the wide range of contributors to the report makes them an invaluable source of research data.

NVivo has been useful software in that it can deal with a large amount of data and allow the researcher to analyse the entirety of the data. It has also been valuable in that it can allow the researcher to build models from the data. It also allows the user to manipulate the data by creating certain commands, such as the factorial relationships which have been proposed.

7 Research Findings

7.1 Chapter Overview

This chapter will present the findings of my research. It will be separated into two sections: Results and Analysis. The chapter will focus on the central research question: how does transaction cost economics provide insight to the defence acquisition process?

In the results section, the findings of the NVivo analysis of the VfM reports will be presented being separated into the Defence Acquisition Process Tree results and the Factorial Relationship results. This will then be followed by the analysis the findings of the defence acquisition tree using the research questions and propositions (outlined in Chapter 1).

The focus will be on the references to each category and how they provide a basis to interpret the propositions using TCE. The three propositions will be assessed using the appropriate factors and factorial relationships, with evidence being presented to support or reject for each proposition. This evidence will rely upon the inferences made of the passage coded in the defence acquisition tree and factorial relationships. A conclusion will be made after evidence of the proposition has been analysed.

7.2 Results

7.2.1 Defence Acquisition Process Tree Results

Table 7.1: Defence Acquisition Tree – Factors against Sources

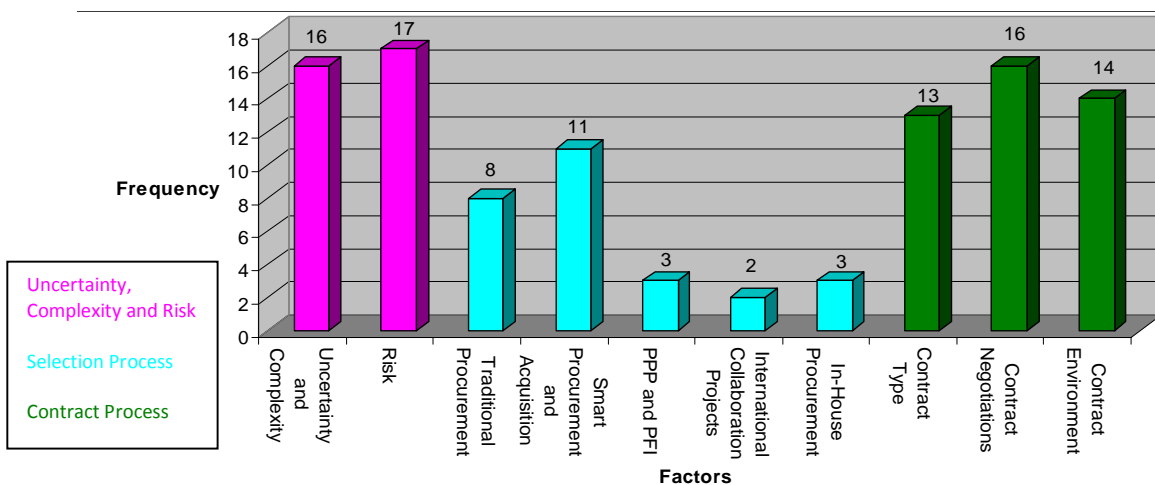
Level 1		Level 2		Level 3		Level 4	
Factor	Sources	Factor	Sources	Factor	Sources	Factor	Sources
Defence Acquisition Process	17	Uncertainty, Complexity and Risk	17	Risk	17	Technical Risk	13
						In-Service Risk	10
						Delivery Risk	14
						Contract Risk	14
				Uncertainty and Complexity	16		
				Selection Process	17	Traditional Procurement	8
		Smart Procurement and Acquisition	11				
		PPP and PFI	3				
		International Collaboration Projects	2				
		In-House Procurement	3				
		Contracting Process	17	Contract Type	13	Incentive Based Contracts	9
						Fixed Price Contracts	8
						Cost Plus	1
						Contracting for Availability	5
				Contract Negotiations	16	Negotiation Power	9
						Learning	5
						Information Transfer Issues	11
				Contract Environment	14	Monopoly and Monopsony	9
						Human Resource	8
				Frequency	5		

Each of the 17 VfM reports were coded into factors from the first to the final level of the branch, as shown in Figure 6.7, using NVivo. Table 7.1 represents the results of the Defence Acquisition Process tree model. Each factor is referenced in a number of sources.

It is self evident that the Level 1 factor, Defence Acquisition Process, would be present in all seventeen VfM reports since all the reports were selected on that basis. All the Level 2 factors are also present in all seventeen VfM reports. The three factors in Level 2 were then disseminated into their sub-categories; Uncertainty, Complexity and Risk is split into two factors, the Selection Process into five factors, and the Contracting Process into three factors.

Figure 7.1 is a bar chart representing the *Frequency* (the number of sources) of the *Factors* (tree nodes) for Level 3. Figure 7.1 shows that the most frequent factor in the VfM reports is *Risk* and the least frequent is *International Collaboration Projects*, for Level 3.

Figure 7.1: Presence of Level 3 Factors in VfM Reports



The Uncertainty, Complexity and Risk factors show a high presence in the reports. Risk is the only factor in Level 2 to be present in all reports, with Uncertainty and Complexity in all but one (Chinook Mk3 Helicopters, HC825). The Contracting Process factors show a high presence in a majority of the reports. Contract Negotiations is the highest with presence in all reports bar one (Trident Project, HC287). The other two factors, Contract Type and Contract Environment, are present in 13 and 14 reports, respectively. Here is an example of the references made to Risk:

Under a privately financed contract, best value for money is most likely to be achieved when risks are allocated to the party best able to manage them. Under the terms of this contract, which were initially drafted by BT, risk transfer is more limited than in other privately financed contracts we have examined. The retention of these risks means that elements of the contract are more like a traditional outsourcing contract than a privately financed contract. The Department, therefore, may have missed opportunities for better value for money by not seeking greater transfer of these risks where BT are best able to manage them. The Department believe that all risks considered appropriate for transfer at the time they were developing this project have been transferred to the contractor, and that transferring further risks would have been at a price which would have reduced value for money.

The Private Finance Initiative: the Contract for the Defence Fixed Telecommunications
System, HC 328, 2000

This passage represents a Risk factor reference in which the transfer of project risk within the contract is being evaluated by the NAO. The passage highlights the significance of risk in a defence project and how contracting can affect the reduction or transfer of risk. The NAO points out that the MoD had an opportunity to reduce the contract risk by transferring a large extent of the risk to BT, a common practice in PFI projects. Similarly, the passage below provides an example of Risk – this time in the form of technical risk:

As with the rollout of hardware, the Department and ATLAS assumed that the design of software functionality would be relatively straightforward. Most of the software requirements relating to functionality for users of DII were already available, albeit in earlier versions, to users of DII(Convergent). The software tools necessary for ATLAS to monitor and manage the system are, for the most part, standard in the IT service industry. The risk analysis that helped the Department to decide to fund DII stated that 'work to integrate, test, assure and accredit the detailed technical design presents a low technical risk'.

The Defence Information Infrastructure, HC 788, 2008

In this passage, the NAO are discussing the risk analysis undertaken for technical risk describing the process taken rather than evaluating the effectiveness. Each passage has its own message; however they all provide evidence of the discussions on Risk in the VfM reports.

The Uncertainty and Complexity factor is significant within the 17 VfM reports, second to Risk in frequency count, providing evidence for strong emphasis for the factor in the VfM report. However, the factor is in the same category as the Risk factor – let us instead look at Contract Negotiation. Contract Negotiation is joint second in Level 3; within this category Information Transfer Issues scores highest in Level 4 within the Contracting Process category. Below is a passage from this factor:

The interface between the Department's and Lockheed Martin's spares software systems is poor. There is a lack of visibility of spares held and stocks are sometimes reported inaccurately as being unavailable. This delays the process of getting the right stock to the right place. As a temporary solution, the information transfer is replicated manually which is time consuming and inefficient. The proposed software for automatic transfer is yet to be fully developed and implemented.

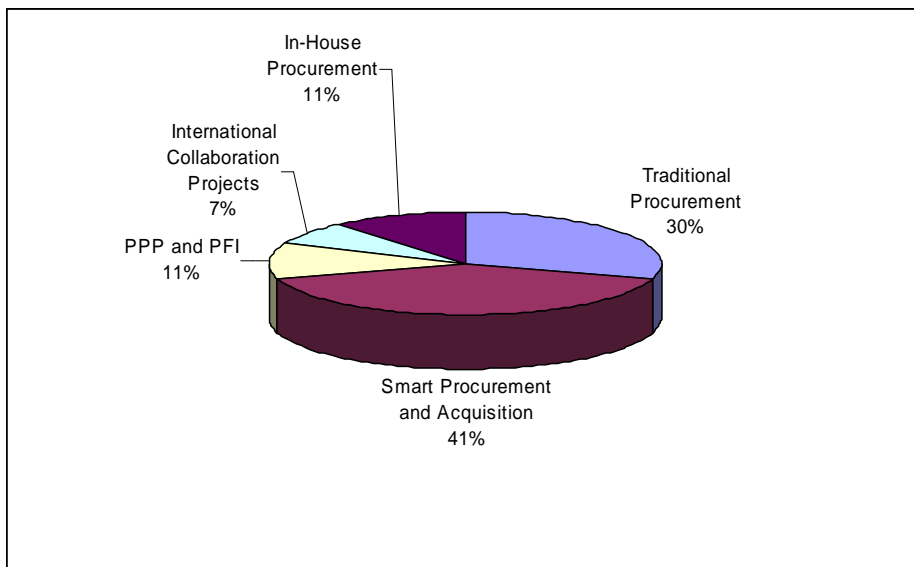
Hercules C-130 Tactical Fixed Wing Airlift Capability, HC 627, 2008

It provides evidence of the existence of Information Transfer Issues in the VfM reports and demonstrates the effects ineffective transfer of information can have on a defence project. As highlighted by the factor score, it seems that Information Transfer Issues is a common difficulty in the defence acquisition process of the VfM report projects.

The spread of the Selection Process types is of medium to low presence in the reports. The highest of the Selection Process is the Smart Procurement and Acquisition factor (11 reports) and the lowest is the International Collaboration Projects factor (2 reports).

The Selection Process factors have a lower probability of overlap (the same factors in one or more reports). It is unlikely more than two procurement strategies are used in the lifetime of a project. Figure 7.2 is a pie chart of the Selection process result, highlighting the share in the procurement strategy followed by the MoD.

Figure 7.2: Selection Process in VfM Reports



The Selection Process factor represents a number of possibilities in which a single or multiple procurement strategy (-ies) was followed in the acquisition decisions reported in the VfM studies. The highest share, 41%, of the acquisition decision followed a Smart Procurement and Acquisition process. While the second highest share, 30%, is a traditional procurement route this may be seen in terms of the legacy projects in the project population rather than a way of business for the MoD.

It is suggested that the MoD will be taking on less in-house based procurement, which in the project population represented mainly logistic projects. References to in-house procurement highlighted an eventual or current transition to outsourcing, with the MoD moving towards a buy decision.

As such it is less likely that the MoD will take on many in-house projects especially as it has privatised most of its research, development and technology centres. In-house work will most likely in the future be focused on in-theatre maintenance and support, being provided through training and development provided by the private sector.

The other two procurement routes, international collaboration and PFI projects are influenced by political direction towards greater private finance or strategic alliances in defence acquisition. These two procurement routes will be followed where there is a will in government to procure with strategic allies in the EU or US, and whether PFI projects are seen as viable for value for money.

The use of PFI projects by the previous government has been highly criticised for their cost escalations, and as such there may be political and economic pressure to reduce this procurement route. It is also evident in the VfM reports that the MoD has not been wholly able to transfer risk in PFI projects to the prime, and as such, goes against the *raison d'être* of PFI.

The reason for a greater spread in the frequency scores for the Selection Process is not due to a lack of emphasis, but more due to the nature of the factor. In a VfM report the project may exhibit a selection process using one or two procurement strategies. There is less overlap with the factors so there is more spread in the frequency. However, some projects may exhibit all four risks throughout their lifecycle and therefore there is greater overlap of these factors.

However, projects which start off as Traditional Procurement may take on a Smart Procurement or Smart Acquisition procurement strategy, but are unlikely to overlap with any other Selection Process factors. The passage below provides an example of a Selection Process factor:

To ensure the delivery of these facilities, at the same time as the sale of the dockyard and after four years of negotiation, the Department entered into a Prime Contract with DML for the design, construction, commissioning and licensing of the facilities in accordance with nuclear safety requirements. For its part, to ensure the project's successful delivery, DML adopted partnering arrangements with its key sub-contractors. The Department was not part of these arrangements and kept its relationship with DML on a more traditional, contract-orientated basis.

The Construction of Nuclear Submarine Facilities at Davenport, HC 90, 2003

This passage provides indication of a traditional procurement basis, in which the MoD keeps its relationship at an arms-length contractual term with the contractor. Another reason for the overlap is because the MoD practised some procurement process previous to their inception. For example, the passage below describes the ‘whole-life costing’ of the Eurofighter project. Whole-life costing is an important principle within the Smart Procurement and Acquisition process and as such the passage is included in that category as well as the Traditional Procurement category.

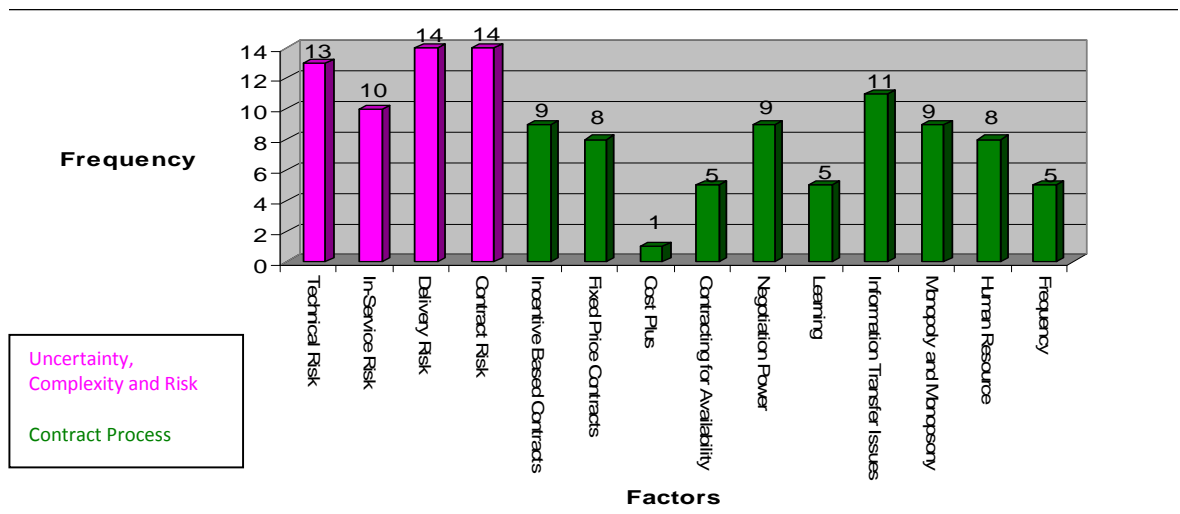
Typically, well over half of the overall cost of an equipment is incurred after it has entered service. A key factor in the Eurofighter 2000 procurement strategy has therefore been to minimise costs across the whole life cycle of the aircraft and not just in the procurement phase. The use of Integrated Logistics Support (ILS) techniques has been a major plank in this strategy.

Eurofighter 2000, HC 724, 1995

It is reasonable to assume that the effective procurement strategies were kept on and encompassed in more recent defence acquisition policies. It is therefore, I would argue, quite reasonable to show an overlap between the traditional form of procurement and the Smart Acquisition process.

Figure 7.3 presents the results of the Level 4 factors, Uncertainty, Complexity and Risk, and Contracting Process factors, which excludes the Selection Process branch as it has reached its conclusive point at Level 3. There are four factors presented of the former and ten of the latter. The graph provides the frequency count of the factors with regard to the number of sources the factors are referenced within.

Figure 7.3: Presence of Level 4 Factors in VfM Reports



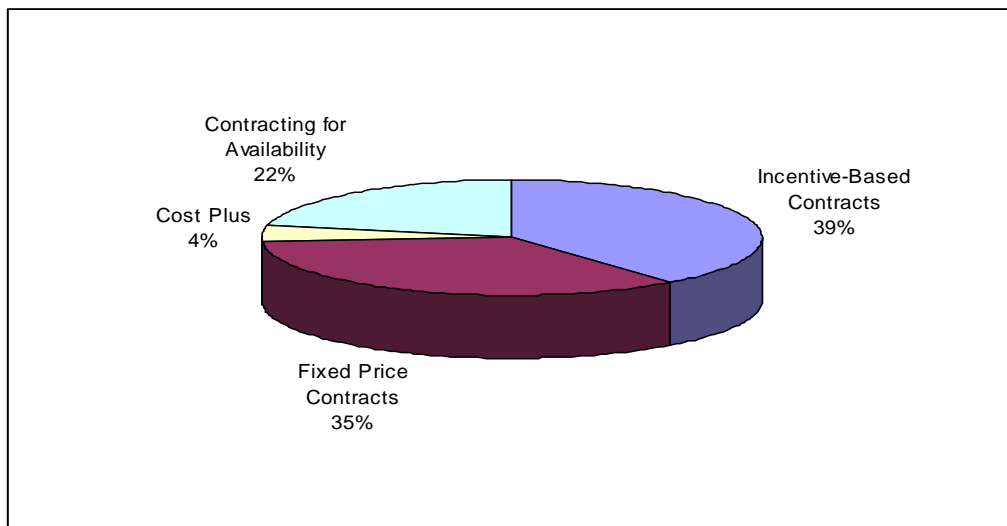
The Level 4 factors represent the Level 3 Risk, Contract Type, Contract Environment and Contract Negotiation sub-categories (as shown by the colour of the bars). Overall, the Risk factors show a much higher presence than their counterparts. However, no factor in Level 4 is present in more than 14 reports. The highest presence is the Contract Risk and Delivery Risk factors in 14 reports. The lowest in the Risk category is In-Service Risk, which is present in 10 reports.

This result suggests that the risks, most often identified in the VfM reports, are contract and delivery risk. This puts the focus of risk in defence acquisition on these two factors; however technical risk and even in-service risk are not far off in the frequency count. Risk, as a whole, is a major challenge for defence acquisition, originating from the level of uncertainty in the transaction. The solution to reducing the risks in these factors may be

to address issues of uncertainty in the transaction, as will be discussed further in the next section.

The rest of the factors show, overall, a much lower presence in the reports. In the Contract Type category, Incentive Based Contracts has the highest score at 9 reports and Cost Plus is the lowest with presence in only 1 report. The Contract Type results are presented in the pie chart in Figure 7.4.

Figure 7.4: Contract Type in VfM Reports



It is not surprising that cost-plus contracts are the least followed contract type in the VfM reports. In fact there is only one mention of it, this being in the oldest project in the population, the Trident Project, reported in February 1984. The purchase was US led and the use of cost-plus was quite common for major development projects during that period.

However, as has been discussed in Chapter 2 and shown in Table 2.1, the UK has reduced its use of cost-plus contracting dramatically since the Leven reforms. The excessive profit gained under cost-plus contracting has been a major controversy in the past. The tendency of suppliers to increase the costs of a defence project in order to gain greater cost reimbursable payments (Peck and Scherer 1962; Williamson 1967) discouraged the MoD from awarding cost-plus contracts.

The MoD has awarded more incentive-based contracts in its more recent projects. The MoD has followed this model because it believes it's the best way it can link payment to deliverables in order to align its interests with that of the supplier. Using mechanisms such as key performance indicators the MoD attempts to ensure that the supplier is delivering key user requirements. Williamson (1967), however, warns that incentive-fee contracting leads to contractor over-estimation of project costs, since the contractor attempts to gain on 'virtual' savings and increase their profit margin.

There is a larger share of incentive-based contracts in the research sample than the 'population' figures (shown in Table 2.1). However, there is a distinction in these two datasets. This research uses the category *contract type* as defining the contract mechanisms used for delivering the project, in all aspects.

DASA uses contract type specifically in terms of the pricing mechanism followed. Thus, a contract negotiated using competitive pricing in the research can still have incentive-

based mechanism for delivering value for money. My definition of incentive-based contracting is therefore broader, and this explains the discrepancy between sample and population.

In the Contract Negotiation category, Information Transfer Issues scores the highest frequency count, 11 reports, and Learning is the lowest with a presence in 5 reports. The Contract Environment category frequencies are lower, with its highest category being the Monopoly and Monopsony factor at 9 reports and the lowest is the Frequency factor at 5.

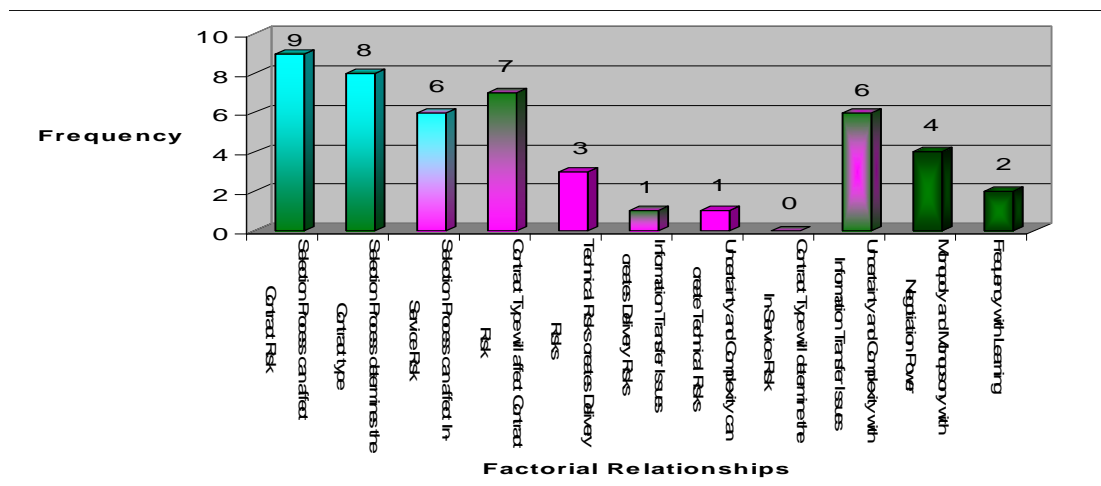
The presence of the factors in the VfM reports as a frequency count has been presented. This information indicates which factors the NAO address in terms of their audit of the MoD defence acquisition process with respect to a value for money focus. The result is that Risk is of great interest in the VfM reports as it scores highly, as well as the Contract Negotiation process. Contract Risk and Delivery Risk is a common factor in the reports, closely followed by Technical Risk. Information Transfer Issues is given the most focus in the contracting process. Smart Procurement and Acquisition strategies are the most common Selection Process referenced by the NAO.

7.2.2 Factorial Relationship Results

The results thus far have focused on the factors chosen for investigation in the Defence Acquisition Process category. I will now discuss the results of the factorial relationships.

These relationships are as a result of the textual analysis of the VfM reports. Their existence is less frequent than individual factors, but their existence provides for a richer investigation into defence acquisition. The literature reviews especially that of the Major Projects Reports and the textual analysis of the VfM reports directed the search for these relationships. The relationships are coded and searched within each node; the results are shown in Figure 7.5.

Figure 7.5: Presence of Factorial Relationships in VfM Reports



The first seven bars (from Left-to-Right) represent one way relationships and the last four bars represent the symmetrical relationships. There is a lower frequency count, in terms of references in the VfM reports, for the factorial relations, as compared to individual factors.

The highest frequency score in the factorial relationship is the ‘Selection Process can affect Contract Risk’, which is evident in 9 reports. This relationship looks at the way the

choice of procurement strategy may affect the risks in the contracting process. As an example, if a PFI procurement route was taken, the risks in contracting are meant to be transferred to the supplier-side. The lowest score is zero, a non-existent relationship, for 'Contract Type will determine the In-Service Risk'.

Table 7.2: Summary of Factorial Relationships

Relationship	Relationship Type	Frequency of Sources	Frequency of references	Summary
Selection Process can affect Contract Risk	One Way	9	17	The contract risk may be determined by the procurement route taken by MoD. Some references show a transfer of risk to the contractor via the PPP/PFI model, shared risk through Smart Acquisition or MoD taking on the contract risk in traditional procurement and cost-plus.
Selection Process determines the Contract Type	One Way	8	11	The contract type will be a result of the selection process. In the international collaboration procurement of CNGF it was specified that the contract should 'maximise the use of competition, taut contracting, and the concept of prime contractor-ship'.
Contract Type will affect Contract Risk	One Way	7	7	Contract risk is specified in the contract type, whether it is transferred to industry through Firm Price contracting or is taken-on by MoD in the case of 'contracting for availability'.
Uncertainty and Complexity with Information Transfer Issues	Symmetrical	6	13	Political, economic, requirement uncertainty and complexity is compounded by information transfer issues. They can be present in tandem and can also be a factor for the presence of each other.
Selection Process can affect In-Service Risk	One Way	6	8	In-Service risk mainly comes in the form of the support provisions required for the through-life management of equipment. The risk to the proper support and maintenance contracts is determined by the selection process.
Monopoly and Monopsony with Negotiation Power	Symmetrical	4	6	Suppliers gain monopoly powers through information-based and standardisation monopoly. MoD tries to use competitive contracting to reduce monopoly powers.
Technical Risks creates Delivery Risks	One Way	3	3	The timely delivery of the equipment is based on the ability of the contractor to properly identify and manage the technical risks within the project, or associated projects.
Frequency with Learning	Symmetrical	2	3	Learning is demonstrated by supplier through repeated production capabilities. MoD identifies learning possibilities through generational knowledge of defence equipment.
Information Transfer Issues creates Delivery Risk	One Way	1	1	A single reference to the lack of information transfer on standardisation by the MoD in the Chinook Helicopters case, this is further compounded by the requirement not being specified in contracting.
Uncertainty and Complexity can create Technical Risks	One Way	1	1	The level of uncertainty and complexity in the CNGF project created a number of technical challenges for the project team.
Contract Type will Determine the In-service Risk	Symmetrical	0	0	There were no references to the existence of this relationship, even though it would seem intuitive. This may be due to the fact that there are few mentions of contracting at the in-service stage.

Table 7.2 provides the relationship, the type, the frequency of sources (number of VfM reports), frequency of references (number of passages) and a summary of the content. This provides a summary of the qualitative content analysis for the factorial relationships

The most frequent factorial relationship is the one way relationship ‘Selection Process can affect Contract Risk’. This provides relatively strong evidence of this relationship. The relationship also shows that it has the most frequent references (as shown in section 6.4.3, Table 6.2). The focus of this relationship is to assess how the procurement strategy is affected in relation to contract risks.

Below is an example of the relationship between the Selection Process (as the determinant factor) with contract risk:

In line with the normal methods of procurement of outsourced services, the project was not defined following a comprehensive analysis of the allocation of risks. It is standard practice in PFI projects for an attempt to be made to allocate risks optimally in the sense of placing each major risk on the party best able to manage it. In this deal, by contrast, the payment mechanism implicit in the invitation to tender would share volume risk between the Ministry and the contractor, but does not provide incentives for the contractor to minimise the number of vehicles required.

The Procurement of Non-Combat Vehicles for the Royal Air Force, HC 738, 1999

This passage is a reference to the allocation of risk in a PFI contract. The NAO suggests that the MoD could have transferred greater risk towards the contractor. This reference provides evidence that the procurement strategy can have an affect on the way contract risk is handled. Of course, in this case, I infer that the NAO believes the effect was not maximised in the MoD’s favour.

Another example of a one way relationship is the relationship of 'Contract Type will affect Contract Risk'. This relationship has a frequency of 7 reports, the highest outside of the Selection Process as the determinant. The Contract Type will determine the effect of Contract Risk in this one way relationship; an example is given below:

The contract placed the risk of the volume of repairs on the contractor, in return for a firm price of £55 million. As with the Contractor Spares Package the risk to the contractor has so far been less than envisaged. The level of usage of the facility has been low because of the reduced flying rates. However, the current contract provides this special repair facility for a further two and a half years.

Building an Air Manoeuvre Capability: The Introduction of the Apache Helicopter, HC 1246,
2002

In this passage the contractor negotiates a firm price contract in order to accept the contract risk connected to the volume of repairs as part of the deal. This is providing evidence that the relationship can be determined by the Contract Type.

However, there is a distinction between the relationship Contract Risk has with Contract Type and Selection Process. The Selection Process is the first stage of determining Contract Risk and the Contract Type being the second stage. The Selection Process is the procurement strategy chosen to select prospective buyers, within that there will be an appreciation for approaching risk sharing. The Contract Type, however, will be the method in which the risk is apportioned.

For example, if a PFI procurement strategy is chosen there is an expectation that the prospective supplier will take on the risks of development work. The method used for

pricing the risk will be determined by the type of contract – the contractor may be awarded an incentive-based contract or contracting for availability, which provides a premium for taking on risk.

In terms of the other one way relationships the frequency is quite low; these relationships are mentioned in a range of 1 - 3 reports. The number of passages referring to such relationship is also in the same range. These relationships are omitted in the majority of the reports and this reflects their insignificance in the VfM reports.

This may be due to a lack of impact in the defence acquisition process or that such factors have been ignored by the NAO review. However, looking at some of these categories such as ‘contract type will determine the in-service risk’ it is surprising that it is not mentioned in a single report. It would seem logical that if there are certain risks in the contract it would manifest in the in-service phase.

As for the symmetrical relationships they are less frequent in comparison to the one-way relationships. This may be due to the difficulty in finding references which are present in both factors rather than just one. The symmetrical relationship ‘Uncertainty and Complexity with Information Transfer Issues’ is the most frequent relationship, with 6 reports.

Below is an example of a reference of the relationship:

Inability to provide accurate information meant that bidders were likely to have increased their contingencies for uncertainties, in turn increasing their bid prices. The Department made available more and better information as they obtained it as the competition progressed, and this enabled bid prices to be improved. Racal believe they could have reduced their bid prices further if more accurate information had been available.

The Private Finance Initiative: the Contract for the Defence Fixed Telecommunications System, HC 328.

This passage provides an illustration that the uncertainties involved in defence make it difficult for contractors to make appropriate bids. In this case, the contractor chooses to cover the uncertainty by placing a contingency price in the bid.

The MoD is able to influence the bid price by providing information, such as specifications, requirement and so on, to the bidder. It is clear that there is an issue with the transfer of the information to all bidders, as Racal has informed the NAO they feel that they could have submitted a better bid if they received better information from the MoD.

The lack of information in these defence project can create greater uncertainty and complexity. It is this problem which is at the heart of the defence acquisition process and one of the reasons why the MoD has expressed its desire to create a more collaborative relationship with Industry, with communication as a core principle.

7.3 Analysis

7.3.1 The Fundamental Transformation

Research Question 1 asks: *How is the relationship between the MoD, as buyer, and Industry, as supplier, affected by the fundamental transformation in the acquisition process?* The proposition is:

Proposition 1: If the Prime makes transaction-specific investments then the fundamental transformation results in a bilateral dependency, between the MoD and the Prime, in defence acquisition.

The proposition is focused on the transaction-specific investments made by the prime in the transaction with the buyer. These transaction-specific investments are made during the contract and are designed to gain an advantage for the supplier over its future competitors.

Where the supplier has made effective transaction-specific investments, they are able to gain the desired advantage over their competitors to transform the situation to a sole-supplier condition, hence the fundamental transformation is observed.

The fundamental transformation, thus, creates the post-contract asset specificities in that the buyer has no alternatives for their supply arrangement due to the high switching

costs. Therefore, the buyer is dependent on the supplier to deliver those specific assets which are crucial to the transaction.

The contribution made in this research is that the source of the post-contract asset specificities has been identified as originating from the buyer, in the case of defence acquisition. It will be shown that the MoD is responsible for major transaction-specific investments, such as building dockyards, which transfers the post-contract asset specificities to the supplier, by granting them ownership (through privatisation).

The focus, thus, turns to the existence of pre-contract asset specificity in defence transactions. This feeds from the post-contract asset specificities, in that the supplier will make transaction-specific investments (i.e. physical assets, dedicated assets, site-specific assets) in order to ensure that they capture the buyer in a long-term supply arrangement.

This results in a bilateral dependency between the buyer and supplier, since the buyer is dependent on the delivery of the transaction through these asset specificities and the supplier is dependent on the long term supply arrangements. This sequence of events has occurred over the last few decades, in defence acquisition, since the beginning of privatisation in the UK (see Chapter 2).

This insight is a unique contribution to the transaction cost economics perspective, as applied to the defence case. The unique nature of defence procurement, in that the buyer

(MoD) makes transaction-specific investments, provides this new insight in TCE theory. The suppliers in defence are unable to fund the large scale investments required of major defence projects, since the risks are too high and the customer-base too low (at the national level) for it to be financially viable. Therefore, it is necessary to view the impact of this unique buyer-supplier arrangement using Winch's (2010) tri-level tectonic model (see section 4.3.1).

At the *Institutional Level*, it is the UK's industrial policies that begun with Thatcher's Government privatisation programmes, which was implemented in a way that created dominant suppliers in sectors such as telecommunication, nuclear, shipbuilding and defence. In the *UK Defence Acquisition* Chapter, I outlined how the MoD has contributed to the dominant supplier situation in following policies such as 'Buy British' and Prime Contracting.

The *Governance Level* is the focus of this analysis and it is in the causal link of the pre-contract and post-contract asset specificity that the bilateral dependency, as a function of the Fundamental Transformation, results. While a major part of the pre-contract asset specificity is due to the legacy of privatisation, it is also due to the continued investments made in physical, dedicated, site, human and temporal asset specificity usually by the MoD and sometimes by the Prime.

The *Process Level* is observed at the IPT level, or a similar MoD-Industry interface, in the way the MoD interacts with the Prime. It is the level at which a solution is required to the

negative effects of the bilateral dependency, e.g. in dealing with the tendency towards opportunistic behaviour.

In the analysis of *Proposition 1*, evidence of a symbiotic relationship between pre-contract and post-contract asset specificity in the governance level of defence transactions, supported at the institutional level and implemented at the process level, is sought. Where the MoD attempts to mitigate the fundamental transformation the result is usually counter-productive and fails to remove the bilateral dependency; instead the consequences filter through to the process level in a negative manner.

Evidence for Proposition 1:

The fundamental transformation can be observed in the PFI procurement of the Defence Fixed Telecommunications System. The reference below, taken from the *Monopoly and Monopsony* node, explains how BT was able to win the bid for the contract, due to its position as the 'dominant telecommunications supplier'.

Prior to the competition for this new contract BT were the dominant telecommunications supplier to the Department, providing most of their network and equipment and the Department were BT's biggest single customer. This meant that BT had a greater knowledge of the Department's fixed telecommunications requirements than any other bidder. In addition, BT are the only telecommunications supplier with a network covering the entire UK, and other bidders for the contract would have to use part of the BT network or invest large sums in laying their own network. Bidders told us that using BT's network would increase their business risks compared with BT and would limit their scope for innovation, as they would be relying on another supplier's equipment to deliver some of their services.

The Private Finance Initiative: The Contract for the Defence Fixed Telecommunications System, HC 328, 2000

The reference is an example of how contract execution is affected not only by post-contract asset specificity (which emanates from the fundamental transformation), but also how pre-contract asset specificity leads to bilateral dependency. The transaction is characterised by post-contract asset specificity in the physical assets owned by BT, in terms of its network coverage in the UK (a legacy of the privatisation of the telecommunication industry).

BT has an advantage over its competitors at contract execution due to its existing supply relationship with MoD (its major customer) and the pre-contract asset specificities it invested in to win further contract tenders.

Even though BT had a clear competitive advantage over its rivals, the Department continued with a competitive tender, by inviting Racal and Nortel to compete with BT for the Defence Fixed Telecommunications System contract. The tendering process, it seems from the reference below in the *Contract Negotiations* node, was a way to enforce competitive pricing.

The Department retained the interest of both bidders until they selected BT as preferred bidder in November 1996. This was despite BT's dominance and the fact that the Department requested two further bidding rounds after the first Best and Final offer.

The Private Finance Initiative: The Contract for the Defence Fixed Telecommunications System, HC 328, 2000

In this reference, the NAO discuss the MoD's competition for the final and best offer between BT and Racal. It, however, seems that the bid was always likely to go in favour of BT even though the MoD profess otherwise. This in effect was pseudo-competition since all parties were aware or at least suspected that the contract was going to be won by BT. The MoD seem to be using this strategy to mitigate the effects of the fundamental transformation (buyer lock-in).

The Department can re-tender the contract at the end of the period, but BT will have advantages over other bidders due to their experience in operating the contract, if they perform satisfactorily during the current contract price. But the Department have told us that they intend to generate competition, possibly by including other service in which BT are less dominant.

The Private Finance Initiative: The Contract for the Defence Fixed Telecommunications System, HC 328, 2000

The reference above suggests that BT would have a likely chance of winning the re-tendered contract if it is able to provide a satisfactory service. MoD acknowledges BT has pre-contract advantages due to the asset specificity in the transaction; however they suggest that this can be eliminated by changing the nature of the transactions (i.e. through requirement or capability change).

However, BT will still be the favoured supplier by the MoD due to the high switching costs involved. Capability change requires a great deal of investment, which will deter competitors and the MoD, the investments that they would be needed to create a new capability may not be worthwhile in the long-term on a value for money basis.

There is, therefore, a clear bilateral dependency between the MoD and BT in the telecommunications. For BT, the MoD may not be its sole customer due to its civilian business. Although, the MoD is a major customer for BT and the project may allow it to diversify its business in the defence sector to create separate revenue streams, thus BT will view the transaction as vital to its business.

The contract requires BT to make certain information available to enable a full and open competition towards the end of the ten year period. This information does not include data on BT's methods and mechanisms for delivering the services, which is commercially sensitive. Despite the requirements to make information available for a further competition, BT's ten years' experience of operating the Department's fixed telecommunications will mean that they will be the only supplier with full knowledge of the Department's service requirements. This could place them at an advantage in the future competition, and other telecommunications suppliers have told us that they are unlikely to bid against BT as they would expect BT to retain the contract.

The Private Finance Initiative: The Contract for the Defence Fixed Telecommunications System, HC 328, 2000

The contract for the Construction of Submarine Facilities at Devonport is an example of the MoD creating post-contract asset specificity in the transaction. The sale and capital investment (by the MoD) in the Devonport dockyard to DML is a classic example of post-contract asset specificity in defence. The contract also guarantees submarine refitting work and since it is a key docking area for the MoD, DML can rely on a long-term supply arrangement. This pre-contract site specificity leads to a bilateral dependency between DML and MoD.

The Department required new and upgraded facilities at Devonport for the refitting and refuelling of its nuclear- powered submarines. As part of the sale of Devonport dockyard in 1997 the Department agreed to fund the provision of these facilities which, when completed, would then be owned and operated by the new dockyard owners, DML. The provision of these facilities by the Department, together with the guaranteed submarine refitting workstream underpinned DML's business case for its purchase of the dockyard.

The Construction of Nuclear Submarine Facilities at Devonport, HC 90, 2003

This example demonstrates how in certain cases the MoD contributes to the bilateral dependency situation. The MoD is responsible for the post-contract asset specificity by transferring ownership and providing capital investments to the contractor. They then wish to reduce their dependency on the contractor. The MoD has contributed greatly to the situation but is unable to manage it.

As will be shown in later analysis, this project was highly problematic and the MoD had major disagreements with the contractor. Unfortunately for the MoD by the time the problems surfaced the bilateral dependency had fully manifested.

In the Future Nuclear Deterrent Capability programme, the MoD has inadvertently created a bilateral dependency situation due to the post-contract temporal asset specificity. The reference below highlights the fundamental transformation is due to *small numbers bargaining* in the nuclear capability sector.

The MoD through a number of policy initiatives, which includes a 'Buy British' philosophy and investment in prime contracts, has allowed a monopoly to exist in the sector. In

outlining the in-service dates, which the MoD must stick to due to the nature of the capability they have increased their dependency on the contractor to meet that date.

In addition to being bound to its monopoly suppliers, the Department has disclosed the forecast acquisition cost and set a deadline for the entry into service of the first of the new submarines which cannot be missed if continuous at sea deterrence is to be maintained. This gives the Department little manoeuvre in contractual negotiations with its suppliers.

The United Kingdom's Future Nuclear Deterrent Capability, HC 1115, 2008

It is clear that even after the MoD follows a competitive procurement route (UK vs. US contractor); the winner of the bid gains an advantage in the sector and is able to solidify their position through pre-contract asset specificities. This can be through investments by the supplier in technical capabilities such as dedicated assets or physical assets (as in the reference of the Torpedo project). What results is a bilateral dependency between the buyer and supplier, creating a monopoly market condition for the supplier and first-mover advantage in future tenders.

The company, now Marconi Underwater Systems Limited (MUSL), is currently in a monopoly position for torpedo development and production in the United Kingdom, supporting MOD in the three on-going projects referred to above.

The Torpedo Programme, HC 291, 1985

In the following reference the MoD discusses the cost of sustaining a competitive industrial base in the shipbuilding sector. This strategy is focused on mitigating the bilateral dependency. However, as is explained by the MoD, such a strategy may not

equate with the benefits of competition and they therefore indicate that such decisions should be made on a case-by-case basis.

The MoD is thus caught in a situation where it may not be able to mitigate the bilateral dependency. This reference also demonstrates the fragility of certain defence sectors, where business sustainability is dependent on continued business from the Monopsony buyer.

Much has been said about the prospects for future competition should Swan Hunter cease shipbuilding, given the Government's current policy of building warships only in the United Kingdom. The Department have been monitoring the situation for several years and in January 1993 considered that, if Swan Hunter were to close, VSEL might be left with a United Kingdom monopoly for "big ships". The Department also recognised that, whilst the retention of a competitive industrial base required keeping a high level of industrial capacity, the cost of maintaining this capacity - which may be passed on to the Department in prices quoted in competitions - had been more than outweighed by savings from competition. Overall, the Department concluded that these problems could only be addressed in the context of individual procurements and not as part of an abstract wider strategy.

The Awarding of the Contract for the Landing Platform for Helicopters, HC 864, 1993

The reference from the *selection process* node for the Bowman CIP programme (below) demonstrates that the MoD follows a competitive route where one is not necessarily needed. The MoD had already contracted General Dynamics UK to deliver the Bowman project. Rather than adding CIP to the Bowman contract, the MoD tendered a separate contract for CIP.

Given the operational imperative to deliver secure voice communications capability and the relatively immature state of the CIP requirement, the Department chose not to invite bids for the Bowman and CIP projects as a single programme. Rather, it ran a separate competition for CIP, after General Dynamics UK had been contracted to deliver Bowman. General Dynamics UK won the CIP competition and, in December 2002, were contracted to deliver the project, with an approved In

Service Date of December 2004, (although meeting this date was not a contract deliverable). In October 2005 the Department and General Dynamics UK reached agreement in principle to a recast programme for Bowman and CIP with an increased cost and timescale, recognising the difficulties they had encountered and that the technical solutions, as expressed in system requirements, needed to meet users' requirements had evolved in the intervening four years.

Delivering Digital Tactical Communications through the Bowman CIP Programme, HC

1050, 2006

It must have been highly likely that General Dynamics were the front runners (if not certain) for the CIP contract. The key user requirement in the CIP project, as in most communications software systems, must have been integration with Bowman.

The fact that General Dynamics won the Bowman project meant that they possessed pre-contract asset specificities which gave them an advantage in the CIP project; integration issues were always likely to favour General Dynamics in the competition. Thus, the only reason for MoD to run a separate competition for the Bowman CIP programme was to mitigate a bilateral dependency situation.

The fundamental transformation could have been reduced temporarily had the contracts been tendered separately, but simultaneously. Integration issues might still have favoured the award to a prime contractor; however, the competition would not have favoured any of the competitors. Post-contract asset specificity would have been removed temporarily allowing for realistic competition.

Interestingly, post-contract asset specificity returns as soon as the contract for the Bowman CIP programme is awarded. It is not possible to remove post-contract asset specificity permanently, since the fundamental transformation always exist where the transaction requires idiosyncratic investments to be made. Furthermore, pre-contract asset specificity will remain for future tenders of support or upgrade contracts for the Bowman CIP programme.

General Dynamics has deployed its advantage through pre-contract asset specificity by offering to integrate the Bowman CIP communication systems of the ground troops to the communication systems in the Apache Helicopter (HC 1246, 2002). This demonstrates the way the advantages that a supplier can gain through the fundamental transformation leading to a bilateral dependency.

The MoD has recently indicated its desire to implement NEC (see section 2.5.1) as part of its defence modernisation policy; making communication and systems integration central to achieving this new defence capability. General Dynamics would be right to feel confident that it could take advantage of this opportunity, as the Bowman CIP programme could play key role in this defence networking revolution. This exemplifies how defence contractors can use their advantage through pre-contract asset specificities in future supply opportunities.

In the Defence Information Infrastructure project, the MoD implemented a number of strategies to mitigate contractor failure. The MoD explains that it is due to major cases of contractor failure in the commercial sector that it has taken these steps. Below is a reference outlining the MoD strategy to reduce the chance of contractor failure.

The Department devised a robust commercial structure for the DII contract. The structure includes contractor shadowing, incremental acquisition and payment on performance to manage the risks of the Programme and drive contractor performance.

The Defence Information Infrastructure, HC 788, 2008

While ‘incremental acquisition’ and ‘payment on performance’ are incentive-based contracting terms ‘contractor shadowing’ is a mechanism for terminating and replacing the contractor. Contractor shadowing seems to be a mechanism designed to mitigate bilateral dependency. It attempts to reduce the pre-contract asset specificity by removing the contractor’s ability to take advantage of its transaction-specific investments. There is a competitor ready to step into the contract, where the original winner fails to deliver.

The Department sought to protect against potential contractor failure or withdrawal from the contract by requiring each contractor in the consortium to be shadowed by a competitor with equivalent capability that would be able to step in to deliver the Programme requirements if required. At the time of contract negotiations for DII during 2003 and 2004, the generic risk of contractor failure was a pertinent issue following a number of high-profile corporate failures. However, including competitors within the same consortium can generate issues for cooperative working.

The Defence Information Infrastructure, HC 788, 2008

However, there are certain weaknesses with contractor shadowing. Firstly, as pointed out by the NAO, there are issues with competitor cooperation (as the Japanese call it ‘enemies

in the same boat'). Secondly, the MoD will incur greater costs as it will have to reimburse the *shadow contractors* for investment cost and expenses. Thirdly, the MoD will have to manage all these stakeholders which may be difficult where there is a lack of technical knowledge or human resources. The policy of contractor shadowing is aimed at changing the transaction governance; however there are problems at the process level which makes it unsuccessful in this aim.

The planning for the Common New Generation Frigate looks at the risks involved in the delivery of national variants, in the collaborative programme. The winner of the collaborative procurement will have gained an advantage to supply national variants to the nations involved in the collaborative project. This is discussed in the reference below; however it is also an example of bilateral dependency in a collaborative procurement.

A Prime Contractor will be responsible for the design and construction of the first three CNGF platforms, and for the configuration and installation of equipment systems. There are, however, several major equipments that may be procured under separate programmes, either as collaborative ventures or as national variants; it is essential that the Joint Venture Company has a clear understanding of all the equipments to be provided as national variants before commencing detailed design of the ships' platform; the prime contractor's assumption of integration risk in respect of these separate procurements will be reflected by a premium in the price which they propose to charge for the programme. The Department should look carefully at this premium and assess whether it offers best overall value for money given the prospect that, in practice, programme constraints may result in at least part of the risk being borne by the collaborative partners.

Procurement Lessons for the Common New Generation Frigate, HC 692, 1995

There is an element of post-contract asset specificity in the form of the dedicated and physical assets the Joint Venture Company has acquired (through investments made by

the collaborating nations – UK, France and Italy). The national procurement agencies (as a single buying entity) are bilaterally dependent on the Joint Venture Company.

In the Apache and Chinook helicopter procurements there is a clear case that the MoD became reliant on the suppliers to deliver the specified assets. The primes have, in these cases, used the pre-contract asset specificities (design rights in Apache and source codes in Chinook) to determine the nature of the transaction.

In the Apache case, McDonnell Douglas ensured that due to its design rights, it will be involved in any future training contract packages; while Boeing has ensured that its source codes can only be accessed with its permission. In each case the bilateral dependency is due to a lack of contractual specifications in the transfer of the specific assets. The prime contractor is able to use its contractual rights of asset ownership to enforce terms on the MoD.

The Department intended to hold a separate competition for the training package but McDonnell Douglas' ownership of the design rights, and the tight timetable made the competition unattractive to other bidders.

Building an Air Manoeuvre Capability: The Introduction of the Apache Helicopter, HC 1246,

2002

In order to meet the Department's airworthiness standards, (Appendix 4), analysis and testing of the software source code for the Mk3 cockpit was required to reduce the possibility of unforeseen system and safety problems during flight. The Department had failed to specify access to the source code in the original procurement and therefore had no leverage with which to negotiate with Boeing for release of the source code. Boeing and its sub-contractors, for their part, in seeking to protect their intellectual property rights, resisted the Department's requests for access to the source code. Even if it had been able to access the source code, the Department estimated that it might take up to two years to analyse the source code with no guarantee that the code would be written

in a way which might make it comprehensible for analysis purposes.

Chinook Mk3 Helicopters, HC 512, 2008

The reports which focus on the support phase of the acquisition (Hercules C-130, Logistic Support for Fast Jets and Helicopter Logistics) mention how support contracts may be undertaken. The contracts are awarded to the original equipment manufacturer (OEM). The pre-contract asset specificity in the projects is high and favours the initial winner of the competition (the OEM).

The Department characterises its historical relationship with providers of logistic support as adversarial. It believed that incentivising and partnering with repair providers was therefore the only way that contracting for availability could become a realistic mechanism for the support of RAF aircraft fleets. Subsequently the Department decided that it would be most efficient to focus on prime contracts with the original equipment manufacturers, an approach that is now wholly consistent with the Defence Industrial Strategy.

Transforming Logistic Support for Fast Jets, HC 825, 2007

The transition towards providing prime contracts to the OEM was initiated at the institutional level. This policy has seen the transfer of assets (manufacturing capacity) and skills (engineering/technical) to industry. This creates a lack of knowledge and skills on the buyer side.

At the governance level, this was implemented through partnering and incentivising the Prime. The relationship, however, becomes bilaterally dependent as the prime desires continued business and the MoD is reliant on the prime to undertake these support services, due to a gap in technical skills.

The report on the Trident project mainly focuses on the financial expenditure rather than the contracting. In the Eurofighter 2000 report, there is mention of a lack of competition in the procurement process however this is mainly attributed to work-share agreements between the collaborating nations.

As for the report on the Non-Combat Vehicles for the RAF, the procurement is of a non-specific kind and thus there is a lower switching-cost than normal in defence acquisition. These three reports, as a whole, show few indications of the fundamental transformation leading to bilateral dependency.

Conclusion to Proposition 1:

The MoD becomes highly dependent on the Prime to deliver the project due to the transaction-specific investments the MoD makes in defence projects. These post-contract investments can also be delivered in the form of the transfer of assets from the MoD to the Prime, as well as monetary investments in physical, dedicated and/or site-specific assets. The prime makes transaction-specific investments of its own post-contract to further 'lock-in' the MoD to the contract and gain advantage in future opportunities through pre-contract asset specificities in the transaction.

The MoD becomes bilaterally dependent on the Prime due to the fundamental transformation. The MoD has contributed to the bilateral dependency situation due to its role in the creating post-contract asset specificities.

The MoD attempts to remedy the negative effects (in the form of lock-in and opportunism) of the bilateral dependency, using three main mechanisms identified in the analysis: pseudo-competition, contractor shadowing and capability change. These mechanisms are usually counter-intuitive since they either do not succeed to deliver the desired outcome, create further costs in the tendering process (which is transferred to the MoD), or are seen as pointless exercises by those involved.

7.3.2 Transaction Costs in Defence Contracts

Research Question 2 asks: *Is the presence of the environmental dimensions (uncertainty, asset specificity, and frequency) in the contract responsible for the cost and time variations and poor performance in customer requirements?*

Proposition 2: The presence of transaction costs in the contract contributes to the failure to meet value for money criteria.

This research question is based on the major projects reports findings of an overall trend towards cost and time variations and missing key user requirements in major defence projects. It is due to this trend that the question is posed: where does the 'poor project management' originate from? The proposition is that it is due to the presence of the environmental factors – uncertainty, asset specificity, and frequency – which create transaction costs due to a lack of safeguards in the contract design.

The presence of the environmental dimension is not wholly responsible for transaction costs. Rather it is their combination with behavioural assumptions of human decision makers – bounded rationality, opportunism and learning – which creates the contractual hazards.

However, the behavioural assumptions are a part of the human decision making process, which are inherent in any transaction and are not unique to defence. Such behavioural assumptions are difficult to identify in this type of research, which relies on documentary evidence. An interview-based research would be more appropriate, and even in that case psychological reasoning would be required.

The focus is instead on the way the environmental dimensions manifestations are symptomatic of the difficulties arising in defence acquisition. The proposition states that it is due to these environmental dimensions that failures in project control are observed in the acquisition process.

There are three elements to the proposition, thus I have created three lemmas to test

Proposition 2:

Lemma 2.1: The presence of uncertainty in the contract contributes to the failure to meet value for money criteria;

Lemma 2.2: The asset specificity in the contract contributes to the failure to meet value for money criteria; and

Lemma 2.3: The frequency of the contract contributes to the failure to meet value for money criteria.

Within the VfM reports, the categories which represent the TCE environmental factors are: Uncertainty and Complexity, Monopoly and Monopsony (where a majority of the Asset Specificity proof is found) and Frequency. Within these categories there are references to the presence of the environmental factors coinciding with descriptions of project failure in time, cost and user requirements – the proposition coincides with these references.

Evidence for Lemma 2.1:

The reference below, coded in the *Uncertainty and Complexity* node, provides evidence of how uncertainty can affect the scheduling of a project. Political uncertainty was a major factor in the Eurofighter project due to its procurement strategy being an international collaboration with four other nations.

There seems not to have been proper safeguards for these uncertainties, in light of the importance of getting agreements in the contracts at the national level. This has created the situation where the project is delayed due to the political uncertainty and a lack of expediency in reaching agreement.

Although difficult to quantify, the uncertainties over whether, and in what form, the Eurofighter 2000 project should continue have affected progress on the programme. For example, political and financial uncertainties have delayed the formal agreement of the re-orientated programme by nations, principally Germany, by more than one year. If these uncertainties continue they are likely to have an impact on the achievement of the currently projected timescales for completion of both the development and later stages of the programme.

Eurofighter 2000, HC 724, 1995

The reference below is of a different nature, in that it is a national procurement project using a traditional procurement strategy of arms length contracting. In this case, the uncertainty comes in the form of design changes being made in the project. This creates the difficulty in making estimates of total forecast costs, which are required for contracting and budgeting purposes.

The Department and DML had problems identifying the forecast total costs of the contract. This uncertainty arose as the extent of the work remaining to be undertaken was changing, due to the large amount of design changes and reworking in response to the regulators' observations and due to the correction of instances of poor DML and subcontractor performance.

The Construction of Nuclear Submarine Facilities at Devonport, HC 90, 2003

Changes to requirement are one of the most common reasons for uncertainties in defence contracting. The MoD has to make a number of changes to its requirement, from contract conception to execution due to a number of reasons such as political, policy, budget, technical, and security changes amongst other reasons.

The supplier can find it difficult to adapt to the changes and this can have consequences in budgeting, scheduling and performance. In the reference below, the supplier is clearly finding it difficult to cost the changes being demanded of it from the MoD. This is having a knock-on effect on the budgeting and scheduling, hence a lack of project control is observed.

Costing Change: ATLAS has been slow to provide the Department with costs for change requests, including updated rollout schedules. It has never met the contracted timescales to cost change, although the Department agrees that for complex changes these timescales are challenging. In such cases, the Department agrees a specific date with ATLAS, but these revised deadlines are not met in the majority of cases. Consequently, the Department has agreed to proceed with some changes without knowing the full cost, but has agreed a set liability with ATLAS to allow work to commence. The Department and ATLAS have established a joint team to improve the timeliness of costing Requests for Change.

The Defence Information Infrastructure, HC 788, 2008

As well as requirement changes, technical factors have been identified as a major reason for difficulties in defence acquisition projects in the Major Project Reports reviewed in Chapter 5. In the reference below, there is evidence of how technical factors can impact a project. It is mainly due to the inability of the transacting parties' inability to foresee or create contingencies for uncertainties in the technical challenge which they may face, that makes project control difficult in defence.

This project suffered delays in design and construction work because of difficulties in delivering technically challenging components whilst meeting exacting nuclear safety standards. As a result, total project costs at the time of our report were estimated at £933 million, 31 per cent more than the approved budget. Rolls-Royce's view is that the new manufacturing plant is less complex than the D154 project, although they are aware of the risks involved.

The United Kingdom's Future Nuclear Deterrent Capability, HC 1115, 2008

The challenge of uncertainty is usually in the planning stage, although it manifests in the delivery stage, where the schedules, budgets and resources are outlined. In some cases, as in the Type 45 Destroyer, the planning can be overly optimistic and the project starts badly and will continue to do so until corrections are made. This optimism-bias has been discussed in the defence literature (reviewed in section 3.3.3). It appears due to uncertainties in the transaction, it makes it challenging for the parties to create an accurate picture of the project development.

The Department and its commercial partners were over-optimistic in their predictions of the time and resources required to procure the first six ships, and did not establish the project on a suitable basis given the levels of risk and uncertainty and the immaturity of the design of the ships and the PAAMS missile system.

Providing Anti-Air Warfare Capability: the Type 45 Destroyer, HC 295, 2009

Evidence for Lemma 2.2:

The evidence in support of Lemma 2.2 is more difficult to identify than the previous proposition, however the evidence leads directly from the test for the bilateral dependency condition in Proposition 1. The reason for failure due to asset specificity considerations result from the unattractive switching costs which lead to a “lock-in” with the supplier. There are three specific projects (Chinook, Torpedo programme and Submarine Facilities in Devonport) which demonstrate a failure to meet time, cost or performance demands due to asset specificity conditions.

The disagreement surrounding the source codes impacted the schedule of the Chinook procurement, and due to the high transaction-specific nature of the procurement, the

contract negotiations were prolonged. A consequence of high asset specificity in the contract is a balancing of the negotiating powers of the buyer and supplier.

The MoD as the largest buyer of defence equipment and services can exercise its Monopsony powers in negotiations. However, the supplier - in this case Boeing - poses a highly specific capability, which the MoD desires and that Boeing can use to negotiate a more favourable outcome for itself. This power play, due to the transaction-specific nature of the procurement, is the reason for a prolonged contract negotiation and schedule over-run i.e. failure to meet time targets.

It took longer than expected to agree on a programme of work with Boeing. A detailed work project in which all parties could have confidence was not agreed by the Department and Boeing's senior management until April 2005. This meant the preparation phase was extended to July 2006.

Chinook Mk3 Helicopters, HC 512, 2008

The difficulties in the Construction of Submarine Facilities in Devonport are evident in the references made in Proposition 1. This project is an example of the effect asset specificity can have on the buyer-supplier relationship. Each party is trying to gain advantage over the other to the detriment of the project. This project, in my opinion, was the closest to total failure in delivery of all the reports that I read. It resulted in what I infer as a breakdown in the relationship between the supplier, DML, and the MoD.

The reference below provides an example of how the MoD used the temporal asset specificity in its favour to create pressure on DML to honour the contract. However, in the

end it was the MoD which had to incur the majority of the cost increases. The MoD was in a situation where while it was threatening to terminate the contract, the reality was that the MoD had invested a significant amount and was locked-in with DML.

The Department recognised that there were pressures on DML to settle. DML was keen to complete the Vanguard facilities on time to allow the revenue stream from the contract for the refit of Vanguard submarines to commence (paragraph 1.8). To exert further pressure, the Department made it clear to DML that it had other options to the contract's renegotiation and would be prepared to use these if it were left with no acceptable alternative. For example, the Department threatened to suspend the contract.

The Construction of Nuclear Submarine Facilities at Devonport, HC 90, 2003

The effect of the bilateral dependency was significant in this case. The MoD had planned to continue the contractual relationship with DML in future. Since it had sold the port to DML and the port was important to its strategic needs, the switching costs were high. This situation was hampered by the 'arms-length' contracting in the project, which led to a lack of control on the project for the MoD – more of which will be discussed in the third proposition.

It is in the lack of viable competition resulting from the fundamental transformation, which makes the switching costs challenging. The MoD invests considerable amounts of funds in these large and complex projects and if they were to terminate the relationship, some of the investment would be lost and greater investment might be required to initiate a new contract.

Compounding this problem is the nature of defence markets where monopolies exist in specific sectors, thus the substitute supplier may not exist in the certain sectors such as nuclear submarines, war ships, and fighter aircrafts and so on. However, in some generic sectors such as information communication technology, substitute suppliers exist due to their dual civilian-defence business models (which make them less reliant on the defence business for survival).

While in the communication project of the Bowman CIP contract a substitute (General Dynamics) was found to replace Archers Consortium (comprising BAE Systems, Racal and ITT) due to their failures to meet the demands of the MoD. In more specific areas of technology (such as Torpedoes), the MoD are restricted in replacing suppliers. This then hampers the ability of the MoD to negotiate a contract, which will provide value for money.

The examination also indicated that the problems encountered and the lack of competition for the main contractor role in the United Kingdom have created difficulties for MOD in ensuring fully that value for money is obtained for the resources invested.

The Torpedo Programme, HC 291, 1985

These three cases may not be statistically significant in a population of seventeen reports, however the overall lessons they provide is significant for defence acquisition as a whole. Failure to meet the value for money requirements of defence acquisition can be seen in the spectra of a failure to create sufficient competition in UK defence acquisition. The underlying reason for a lack of competition (or viable competition, where certain

companies do not have first-mover advantages) is due to the transaction-specific nature of defence.

Evidence for Lemma 2.3:

The presence of Frequency in the contract i.e. the unique, occasional or recurrent nature of the transaction is not mentioned as a concern in the failure to meet value for money requirements. In fact, examining the references to frequency and learning (which results from frequent transactions) the opposite seems to be true. It is due to the lessons learned from previous contractual experience that measures are put in place to mitigate contract failure – as is the case in the reference below.

Recognising the difficulties inherent in estimating costs and timescales on complex defence equipment projects, the Department has, since 2005, required major equipment projects to include historical cost trend analysis to act as a check on the realism of cost estimates when the main investment decision is taken on projects.

Providing Anti-Air Warfare Capability: the Type 45 Destroyer, HC 295, 2009

The nature of defence transactions are more a case of occasional transactions, where there may be a 20 year (or more) gap between the procurement of say a nuclear submarine and its next generation – such projects are expected and planned ahead, as in the case of the Future Nuclear Deterrent Capability report.

Conclusion to Proposition 2:

The evidence for Proposition 2 is not as statistically significant as Proposition 1; however the evidence provides some general indications of the challenges in meeting value for money in defence acquisition.

Uncertainty is the most common reason given for project failure, in terms of value for money criteria, in the reports. Uncertainty is varied in its presence and impact. Asset specificity may be a factor in the failure of defence acquisition projects; this is mainly when it creates a situation where there is a lack of cooperation or partnership between the transacting parties.

Due to the fundamental transformation and transaction-specific investments post-contract and pre-contract in future contracts, the transacting parties become bilaterally dependent and locked-in to a long-term contract. Negotiations become prolonged and opportunistic behaviour may result. The project may deliver, but it will not meet its value for money requirements in time, cost and performance.

While the references to the Fundamental Transformation were high in Proposition 1, there was a lack of evidence that this resulted in project failure as proposed in Proposition 2. This suggests that the Fundamental Transformation effect is prevalent in defence acquisition; however this does not necessarily result in project failure.

The search for evidence of project failure due to the Frequency of a transaction failed to provide any support for the proposition. Instead, there was some indication that the evidence showed the reverse was possible. Frequent transactions foster greater learning opportunities for the transacting parties, which result in better project planning and management. This was rarely mentioned, since defence transactions are of an occasional kind reducing the possibility of learning to be gained.

7.3.3 The Transaction Governance of Defence Projects

Research Question 3 asks: *What is the response, by the buyer (MoD), where project failures exist, in terms of the transaction governance?*

Proposition 3: If defence projects fail due to transaction-cost considerations in organisation then a governance trade-off is expected in defence acquisition.

This research question and proposition is investigating the buyer's response to an organisational failure situation. The TCE perspective suggests the buyer to respond by remedying such a situation by moving to more appropriate transaction governance. In seeking evidence of such actions being taken by the MoD, references to the *Selection Process* category have been analysed. This category most commonly codes references to transaction governance issues, as well as other selection processes.

Evidence for Proposition 3:

The references in the *Selection Process* category are of four types regarding the transitions in transaction governance within defence projects: (1) successful changes; (2) unsuccessful changes; (3) no changes; and (4) no/minimal mention regarding transaction governance. The classifications of these references have been interpreted for each project and are shown in Figure 7.6.

As was the case in the analysis of the Fundamental Transformation, changes at the governance level is impacted by and structures the focus at the institutional level and process level. When changes are made at the governance level, the cause may be due to institutional changes such as policy change towards a new selection process e.g. PFI procurement or Smart Acquisition. The transformation at the governance level is then implemented at the process level e.g. IPTs.

Figure 7.6: Transition Types of VfM Projects

<u>Type 1</u>	<u>Type 2</u>	<u>Type 3</u>	<u>Type 4</u>
Bowman CIP	Apache Helicopters	Common New Generation Frigate	Chinook Helicopters
Future Nuclear Deterrent Capability	Defence Fixed Telecommunication System	Defence Information Infrastructure	Landing Platform for Helicopters
Helicopter Logistics	Non-Combat Vehicles for the RAF	Eurofighter 2000	The Torpedo Programme
Hercules C-130	Nuclear Submarine Facilities at Devonport		Trident Project
Logistic Support for Fast Jets			
Type 45 Destroyers			

There is an almost even spread of projects in Figure 7.6. The success or not, or no change to transaction governance has been interpreted according to the NAO report of the project transitions. Type 4, which is no or minimal mention of transaction governance considerations has four projects. There is not much which can be learnt about MoD transaction governance decision making in these reports. Type 3, no changes, is the least populated by a mere margin of one.

In the majority of projects in the report population, the MoD made a decision to make a change in the transaction governance of the project – either in the acquisition mechanism itself or through policy (i.e. moving from in-house to market governance) which then filtered to the governance level, by creating partnerships. These are then followed-through to the process level by creating IPT structures and incentive-based contracts.

Type 1 projects show a successful organisational change, a transition from poor to good project transaction governance. As in the case of the Bowman CIP project the non-competitive award to Archers Consortium was terminated after failures to deliver and General Dynamics won the competitive tender for the project.

The success of this competition policy was evident in the working relationship created with General Dynamics. Competition created a better bargaining position for the MoD, and it was thus able to start off in a position of strength and then negotiate its desired

outcomes. It resulted in a long-term view of the contract, where discussions focused on future integration possibilities for the Bowman CIP capability.

In parallel, the Department have established a Joint Networks Integration Body involving General Dynamics UK, EADS and Paradigm, which is a joint venture to ensure end to end communications between the Department's communications systems, Bowman CIP, SkyNet, FALCON and Cormorant. Finally, an Interim Design Authority has been set up by the Department and General Dynamics UK, to integrate Bowman CIP into future platforms.

Delivering Digital Tactical Communications through the Bowman CIP Programme, HC 1050,

2006

The changes to industrial relations policy have impacted the governance and process level. The MoD has changed its relationship with industry in its logistics projects. This is seen in the Helicopter Logistics and Logistic Support for Fast Jets projects. The support contracts between MoD and its industrial partners, especially in aircraft manufacturing, are more recurrent than most other defence contracts.

It is therefore important that the MoD moved from its traditional adversarial relationship with Industry to one of partnership. This has been achieved mainly due to the changes implemented as part of the Smart Acquisition principles and specifically due to the creation of the IPT mechanism.

In Helicopter Logistics, this change in governance to having a closer partnership with Industry has created a positive impact on the way support contracts are delivered for Helicopter maintenance and services. The IPT mechanism has been an important change

in the process of delivering the contract, especially due to the co-location of the support teams.

The Defence Logistics Organisation is committed at senior levels to transforming relations with industry and incentivising key suppliers to perform better. Much of this high level aim is being implemented by Integrated Project Team leaders, who are seeking to replace excessive numbers of contracts either with single contracts or reduced numbers. These new contracts are being designed as much broader packages that will reward effective performance. In the past manufacturers have not been incentivised to build in reliability in equipments.

Helicopter Logistics, HC 840, 2002

A similar change is reported in Logistic Support for Fast Jets; the MoD moved from a traditionally adversarial relationship with Industry to one of partnership. This institutional change has created improved relational contracting governance, which is evident at the process level in terms of co-located project teams and communication processes.

The Department's Integrated Project Teams have broadly followed the best practice recommendations outlined in the Gold Standard contracting practices report, such as joint teams with a common aim, open book accounting and the sharing of information and benefits between projects. In particular, the use of collocated teams has improved the pace of communications and decision making. In addition, Prime Contractors have been willing in many cases to invest, take on work and share information prior to contract signature, based on an informally agreed behavioural charter and the knowledge and trust that was built up during the course of contract negotiations.

The Department has been successful in incentivising Prime Contractor behaviour, to move from a traditional model of supplying spares and undertaking repair, to one where industry provides technical knowledge and innovation whilst minimising cost.

Transforming Logistics Support for Fast Jets, HC 825, 2007

In the Hercules C-130 project, the change observed is of a similar transition in the transaction governance involving the support contracts. The change at the institutional

level is to seek greater partnership with Industry, however at the governance level it is a move from unified to bilateral governance.

Where the MoD used to undertake operational support through its internal service personnel it transferred this task to Industry through an integrated support contract involving key suppliers of Hercules. At the process level this is, again, undertaken through co-located teams.

The costs of running and basing the fleet at RAF Lyneham have decreased since May 2006. This reduction is in part due to the Hercules Integrated Operational Support contract because the responsibility for some of the more minor repair and maintenance activity, which had previously been undertaken by Service personnel, has been transferred to industry.

Co-location of the staff from the Department and industry, at Marshall Aerospace's site in Cambridge and at RAF Lyneham, has been central to enabling more effective team working to resolve issues.

Hercules C-130 Tactical Fixed Wing Airlift Capability, HC 627, 2008

In the Type 45 Destroyer and Future Nuclear Deterrent Capability projects, the MoD implemented a partnership approach to deal with the uncertainties pervading the acquisition process of these projects. Again, this is an organisational change from the traditional adversarial contractual relationship to one with greater collaboration to deal with the political and technical uncertainties present in these projects.

Policy changes at the institutional level through the introduction of competitive tenders for prime contracts, created a relational contracting approach at the governance level implemented at the process level in the way the contract was delivered.

Contrary to the effect of the changes implemented by the MoD in Type 1 project, Type 2 projects show a trend towards unsuccessful changes in transaction governance. The change from traditional to PFI procurement in the Apache Helicopters, Defence Telecommunication Systems and Non-Combat Vehicles for the RAF was an unsuccessful change.

The failure in the fourth project, Nuclear Submarines Facilities at Devonport, was due to the use of traditional classical contracting transaction. Rather than change the transaction governance in this project, the MoD continued the project by renegotiating the terms of the contract.

PFI procurements are a part of the defence policy reforms introduced in the early 90s. Their implementation has been mixed in terms of success. It is argued here that one of the reasons for the failure to successfully implement PFI is due to a failure to match it with an appropriate transaction governance.

In the Apache (training equipment and services contract) and Defence Telecommunication Systems procurement the problem was that the MoD made the decision to change to PFI

too late and was therefore unable to maximise the benefits of PFI procurement, while the failure in the Non-combat Vehicles for the RAF procurement was that the MoD did not transfer an appropriate amount of project risk to the contractor.

We found that the late decision to select a PFI route may have reduced the scope for potential PFI benefits. The benefits of the PFI approach are maximised when the contractor can offer innovative solutions to the requirement, which is presented as an output specification. Because the delivery of Apache training services began as a conventional procurement, the benefits from PFI have in this case been limited. For example, ATIL inherited detailed equipment specifications against which the contract was let which has restricted the scope for innovation.

Building an Air Manoeuvre Capability: The Introduction of the Apache Helicopter, HC 1246,

2002

The changes to the procurement process (at the institutional policy level) from traditional contracting to PFI contracting did not structure the way the MoD were engaged with the supplier at the governance level. A lack of flexibility or risk sharing is symptomatic of a market-based approach.

If the MoD moved towards a hybrid or bilateral form of transaction, then the success of the PFI procurement may have differed. The MoD may have implemented a policy which they thought would create benefits in terms of value for money; however they did not match PFI with an appropriate transaction governance mode or effective processes.

In terms of the Construction of Nuclear Submarine Facilities at Devonport, the failures of this project have been discussed in all the propositions. The effects of the fundamental transformation and the bilateral dependency, as well as the effects of asset specificity on

value for money requirements have been discussed. However, it is in the decisions made at the governance level which has most created project difficulties.

There was a breakdown in the relationship between the MoD and DML, mainly due to a lack of control on the project by the MoD. This lack of control comes in the form of an 'arms-length contracting' policy (used more often in market governance) followed by the MoD in this project. This results in a lack of control, guidance or monitoring by the MoD, which led to a number of disagreements in the project finally resulting in contract renegotiation.

To ensure the delivery of these facilities, at the same time as the sale of the dockyard and after four years of negotiation, the Department entered into a Prime Contract with DML for the design, construction, commissioning and licensing of the facilities in accordance with nuclear safety requirements. For its part, to ensure the project's successful delivery, DML adopted partnering arrangements with its key sub- contractors. The Department was not part of these arrangements and kept its relationship with DML on a more traditional, contract-orientated basis.

The Construction of Nuclear Submarine Facilities at Devonport, HC 90, 2003

As is clear by the reference, there is a lack of partnering and monitoring. The project results in a failure to meet buyer demands and due to the governance arrangement remedying this situation becomes challenging. The poor performance of DML in the project resulted in cost increases and disputes in the contract regarding customer requirements. The MoD rather than terminating or changing the nature of the contract failed to react to the situation, which resulted in it having to take on most of the burden of the cost increases.

The third type of projects are characterised by no changes made to the transaction governance of the projects. There are three projects in Type 3 – Common New Generation Frigate, Eurofighter 2000 and Defence Information Infrastructure. The first two are international collaborations, where the procurement is undertaken by a multinational programme.

There are relatively few considerations made in TCE theory of the impact of a buying situation with more than one stakeholder. However it is clear that there is some transaction costs involved due to the rigidity of such buying situations from the analysis of collaborative procurements.

It is difficult to make changes to the transaction governance of such buying practice due to: (1) the slowness to react by the buyers due to the complicated organisational (i.e. political) structures; and (2) work sharing agreements which create rigidity in the contract tenders. Change, where there is failure, is more demanding in such acquisition projects and is less forth-coming.

In practice, overly rigid adherence to the worksharing requirements has compromised the price benefits that would have been expected to accrue from competition for the equipments and engine accessories. In particular, the preference to select bids from specially created consortia rather than single companies has led to proposals being constructed to meet worksharing requirements rather than to match technical expertise and achieve best value for money. This has impacted on timescales and costs since the consortia arrangements have necessarily been far more complex, and management far more unwieldy than would have been the case if contracts had been awarded to single companies.

Eurofighter 2000, HC 724, 1995

The Defence Information Infrastructure project, on the other hand, is an example of a project which had the appropriate transaction governance. It required no changes as the MoD had put in place the required mechanisms of partnership in the beginning of the contract. This is an example of good governance arrangements in defence transactions, from the outset.

While Departments must make every effort to avoid problems through good planning, procurement and management, they must also put in place measures to address problems when they occur. For the most part, the governance structures set up at the outset of the DII Programme have remained robust. In addressing the problems that have affected the implementation of DII, the Department and ATLAS have tried to work jointly wherever possible and have adopted a partnership approach.

The Defence Information Infrastructure, HC 788, 2008

As for Type 4 projects, they are negligible to the proposition as there are no/minimal information regarding transaction governance in the reports. The reason for this case in the Chinook and Landing Platforms for Helicopters reports are due to a lack of focus on governance arrangements. In the Torpedo and Trident reports, changes in governance arrangements were limited at the institutional level and so were limited at the governance and process level.

In the 1990s, there were major changes at the institutional level focused on process – with the introduction of Smart Procurement, Smart Acquisition, Prime Contracting and PFI. This was less so in the 80s where changes were mainly focused on market conditions

– competition and liberalisation. The reporting for the earlier projects therefore has less focus on the governance arrangement between the MoD and Industry.

The focus in the Chinook report was on the issues surrounding the airworthiness standards of the helicopter. This was a major issue in the report because of the high impact this had on the procurement as a whole. In fact, the report states that the Public Accounts Committee labels the Chinook project as the worst example of equipment procurement (HC 512, 2008). While there is mention of a ‘fast track procurement arrangement’, this is not explained further and the governance arrangement as a whole is neglected in the report.

In the Landing Platforms for Helicopters report, the focus is on the tendering process. The majority of the report is therefore evaluating whether value for money was gained in the selection process of the contract. The evaluation of value for money is therefore focussed on the competition for the contract. Since the report looks particularly at the contracting, it makes minimal mention of how the governance arrangements are made post-contract.

The Torpedo Programme report mentions governance arrangements of Torpedo procurement as a historical study of previous procurements. It mentions the transition from in-house to private design and manufacturing of Torpedoes. There is, however, minimal mention how such arrangements take place in the three Torpedo projects mentioned in the report. While creation of a prime contractor role is suggested as a move

forward, there is a fear of losing expert knowledge in-house. It is clear that governance arrangements are an important consideration for future procurement of Torpedoes; however it is not the focus of the 1985 report.

The previous analysis is also true of the Trident project, however even future considerations of governance arrangements are limited. The Trident project report focuses mainly on the financial aspect of the project and in some cases the technical considerations.

Conclusion to Proposition 3:

There is an interesting trend in the spread of projects of the four types. The more recent reports published in 2002-2009 are clustered in Type 1; Type 2 is populated with projects from 1999-2003 reporting period; and Type 3 and 4 are predominantly in the 1984-1995 period. The exception is the DII project in Type 3 and Chinook Helicopters in Type 4, both being from 2008.

This trend is interesting because it indicates that the MoD became more focused on governance within the last decade. Its success has been in the more recent projects this may be due to the introduction of successful acquisition strategies. The trend on the whole shows that the MoD has become more willing to intervene in projects where the transaction governance is failing to deliver the desired outcomes. The evidence also indicates that the MoD has moved to focus on partnering arrangements with its suppliers.

There is however a clear failure in the MoD's ability to apply PFI contracting to defence projects. The main reason for failure seems to be a lack of transaction governance consideration in these PFI projects. The MoD may see PFI as a useful tool to transferring greater project risk to suppliers. However, its ultimate success to achieve this aim will be in how the MoD combines this with effective transaction governance.

7.4 Summary

This chapter has presented the findings of the NVivo analysis of the seventeen VfM reports selected for the research. The results of the Nvivo analysis provide clear evidence of where the focus in defence acquisition is in terms of value for money. The NAO in their reports have presented the Risk factor in all seventeen reports, this being the most frequently discussed factor in Level 3 of the Defence Acquisition Process tree.

This focus continues at the following level, with the Contract Risk and Delivery Risk being discussed in 14 reports. The Risk sub-categories in general score highly in their presence in the VfM reports. This result emphasises the importance of risk management in defence acquisition.

The Contracting Process is split into three sub-categories, of which Contract Negotiation is the most referenced in the report population, in Level 3. In Level 4, it is a Contract Negotiation subcategory which scores highly. This being Information Transfer Issues, present in 11 reports, is the third most frequent factor. The emphasis on this factor

provides evidence that the MoD has in some projects had issues with the way it communicates with its contractors.

The frequency of the Selection process subcategories in Level 3 provides greater spread. There are overlaps in the Traditional Procurement and, Smart Procurement and Acquisition factors. As such these two factors have the highest frequency within the group, with the other factors showing a low level of frequency. It is evident that the majority of projects have been undertaken using a Smart Procurement and Acquisition route.

In the factorial relationships, the emphasis was on the one way relationships between the Selection Process, Risk and Contract Type factors. These combinations showed a higher frequency than the other relationships. Uncertainty and Complexity with Information Transfer Issues was the most frequent of the symmetrical relationships. The qualitative analysis of the relationships provides evidence on how the relationships affect the defence acquisition process.

There is supporting evidence that the Fundamental Transformation effect exists in defence transactions. This Fundamental Transformation leads to bilateral dependency for the MoD and Prime post-contract. The consequence of which is a lack of viable competition, due to the first-mover advantage gained by the initial winner and the high switching cost for a substitute.

The main factors identified in the existence of the bilateral dependency resulting from the fundamental transformation are the pre-contract and post-contract asset specificities in defence transactions. The MoD provides investments (or transfers ownership) to the prime, which leads to post-contract asset specificities in the transaction.

These investments or ownership of specific assets play a key role in the prime winning further contract tenders due to the advantage gained from the pre-contract asset specificity. The consequences of the combination of post-contract and pre-contract asset specificities is they provide the initial winner of the bid with first-mover advantage for future tenders and it increases the switching costs for the MoD. Thus, through sequences of moves the bilateral dependency condition is created in defence transactions.

The MoD has made some attempts to mitigate the effects of the bilateral dependency by following policies of (pseudo-)competition, contractor shadowing and capability change to slow the progression of the fundamental transformation. These policies have, however, on the whole failed to achieve their desired outcomes; instead, it is more likely that they increase the cost of the tender, which will be passed on to the MoD.

Proposition 2 is separated into three sub-propositions, each addressing the three elements of the environmental dimension: uncertainty, asset specificity and frequency. Support for Proposition 2, as a whole, was underwhelming. While, the existence of these

factors are clearly shown in the result of the defence acquisition tree and factorial relationships, the cause and link to failure in defence projects is less forthcoming.

Of the three factors, Uncertainty had the greatest support as a cause and link for project failure in terms of the value for money criteria. The evidence presented in the analysis of the effect of uncertainty on project success provided insight into the varied nature of uncertainty in defence acquisition and the extent of the disturbance it creates to reaching the cost, time and performance targets.

While supporting evidence for the Fundamental Transformation in the VfM reports was significant, the proposition that this leads to project failure was less convincing. The three examples providing support for the proposition demonstrate the strenuous effect that asset specificity, under conflict, can create for the buyer-supplier relation and on achieving value for money.

This however was not a common trend in the reports as a whole. The reason for this may in part be due to the findings of Proposition 3 - in that the hazards in bilateral dependency are mitigated through the use of (or transition towards) appropriate transaction governance.

The analysis of the Frequency node content rejects Proposition 3 as there is no evidence to suggest that the frequency of the transaction is responsible for project failures. In fact,

there is more of a case for the opposite to be true. Where defence transactions are recurrent (even in long intervals, as is common in defence acquisition), the opportunity to learn from previous transactions can contribute to successful projects. Transaction-specific learning can enable the MoD to strengthen its project planning and management.

In Proposition 3, the aim was to assess the MoD's response to project failure in terms of transaction governance. The transaction governance is the mechanism created for the interaction between the buyer (MoD) and the supplier (the Prime). The trend shows that the MoD is likely to intervene, where project failure seems likely or occurs, and this intervention has been predominantly successful.

The success of the governance trade-off is referenced as being one which has been a transition from the classical contracting stance to a relational contracting approach, with partnership as the main mechanism. In six out of the ten reports where a governance trade-off is observed it has been successful, and in one where no change has been required, this has been due to a partnership approach being taken.

I infer that the lack of evidence for project failure due to asset specificity (mainly that of the Fundamental transformation kind) is due to this partnership approach, which applies mechanisms to deal with the long-term nature of the transaction and mitigates the negative impacts of bilateral dependency (namely that of opportunistic behaviour).

An interesting trend has also been identified in the six projects, where governance trade-off has been observed. All six projects are from reports post-2000, the same time that Smart Procurement Initiative and Smart Acquisition Principles policies were implemented. I suggest that this is no coincidence; rather that it is evidence of the success of these policies for defence acquisition. I shall discuss these ideas further in the next chapter.

The answer to the central research question of how TCE provides insight into defence acquisition is thus shown in the way it allows a greater depth to the content analysis of the value for money reports. TCE goes beyond looking at what is happening in defence transaction to why it is happening. This is has been achieved, especially, in testing Proposition 1 and 3 and to a certain extent Proposition 2.

8 Discussion

8.1 Chapter Overview

The discussion in this chapter will focus on three themes of UK defence acquisition: bilateral dependency; risk, uncertainty and complexity; and the IPT mechanism. Applying a transaction cost approach to defence acquisition has highlighted the importance of these three aspects in defence transactions.

The *Bilateral Dependency* section will explore the engagement part of the acquisition – the buyer-supplier relationship. This will, therefore, look at important procurement processes such as the buyer's selection choice, contract negotiations and supply agreements. The purpose of looking at these three specific areas is to highlight how market conditions, contract tender, buyer-supplier relations and contract terms are affected by the bilateral dependency in the acquisition of defence equipment.

Uncertainty and Complexity is an ever present condition in defence transactions. There are clear indications, from the analysis, that the presence of uncertainty and complexity leads to project failures in achieving value for money criteria. The VfM reports have identified *Risk* to be an important factor in defence projects.

The concept of risk is on the whole sidelined by Williamson as he developed the TCE theory. Risk is mentioned only in terms of the behavioural assumption of risk neutrality on the part of the decision-maker. In the VfM report risk is seen as an important element of the acquisition process, this is also evident in the defence acquisition and MPR chapters. However, the risk identified by the NAO differs to the definition given by the Carnegie School. The difference is important in understanding how risk is observed and interpreted by the NAO and the impact this has on defence acquisition.

The impact the *IPT Mechanism* has had on the MoD's desire to create a partnering approach with Industry has been identified in the analysis section of the previous chapter. The IPT structure will be examined using the findings of the VfM reports. The purpose will be to see what strengths and weaknesses exist in IPTs. How the MoD can improve and highlight the collaborative elements of the IPT mechanism. To assess whether the IPT mechanism effectively addresses the nature of defence procurement and whether it is able to efficiently deal with risk in defence acquisition.

8.2 Bilateral Dependency

8.2.1 Buyer's Selection Choice

The selection choice is one where the buyer must decide which seller to engage with in the market. The buyer's selection choice is a crucial part of the acquisition process in defence transactions. A large proportion of defence transactions, of the major projects

type, are under a bilateral dependency situation. While there are cases of competition-based procurements, these are the exception rather than the norm for major projects. This research contributes to new knowledge in identifying the reasons behind the bilateral dependency situation in defence transactions.

In the analysis of Proposition 1 it was shown that bilateral dependency is a function of the fundamental transformation in the transaction. This research has highlighted, as its major contribution, the effect of pre-contract asset specificity on the bilateral dependency situation. Even more consequential is the role played by the MoD in this situation through its acquisition policy and investment decisions, which leads to post-contract asset specificity.

In this discussion the existence of the bilateral dependency situation will focus on the presence of post-contract asset specificity leading to pre-contract asset specificity in future contracts. In that aim, the former is identified by a combination of the buyer's investment decisions and market conditions, which have emerged due to economic policy at the institutional level. The latter is a consequence of the transaction-specific investments made by the supplier in order to lock-in the buyer to the transaction.

The combination of these two factors thus completes the sequences of events leading to the bilateral dependency condition in defence transactions. The impact of the post-contract asset specificity is more immediate to the selection choice facing the buyer.

However, the consequence of the resulting pre-contract asset specificity is in future selection choices.

The market conditions impact the selection process in that they determine the chances of the buyer seeking alternative sources of supply i.e. monopoly vs. competition. In the analysis of Proposition 1 it was clearly shown that market conditions can play a central role in the transaction (e.g. BT's bid for the Defence Fixed Telecommunication System), since where monopolies exist seeking alternative suppliers is no longer viable and the buyer is placed in a non-competitive supply situation, thus the fundamental transformation.

The monopoly condition in the UK defence sector is a legacy of the privatisation programme in the 1980's by the Conservative administration of Margaret Thatcher; consolidation moves by large defence contractors in the defence sector; and the high capital investments which the MoD must make in defence acquisition programmes when procuring from its domestic supply base. The combination of these market and investment conditions causes the fundamental transformation in defence contracting.

The MoD contributes to this situation, in its role as investor as well as buyer in the acquisition project. The high capital intensity of defence acquisition means that the buyer must play a dual role of investor and buyer of the goods. It is in the buyer's role as investor, where asset specificity becomes an important part of the transaction. The MoD

provides a great deal of the capital investment in the early phases of the project in research and development.

The MoD, therefore, makes transaction-specific investments for a product for which it is the sole buyer (where export is ruled out, at least in the short-term). This creates an interesting situation, where the buyer plays a role in the bilateral dependency condition through its own investments decisions. Williamson's discussion of asset specificity is usually from the seller's perspective.

As pre-contract asset specificity creates the bilateral dependency situation; post-contract asset specificity leads from the fundamental transformation and the transaction-specific investments, which result in the transaction. While the MoD play a crucial role in post-contract asset specificity, it is the supplier which aims to take advantage of the pre-contract asset specificity in future transactions.

The supplier can achieve this by making transaction-specific investments during the contract, in order to gain from its post-contract advantages. The ultimate motive for the supplier is to create a long-term exchange relationship and 'lock-in' the buyer; hence a bilateral dependency condition. This would ensure that the supplier can secure future sales opportunities.

From the MoD perspective the transaction-specific investments is welcomed, in that it requires the specialised equipment for its ultimate defence capabilities. It is in the investments to asset specificity of the physical kind (i.e. technology) where the MoD is able to procure military equipment to gain operational advantage. The consequence, however, is that it becomes dependent on the technology (physical asset specificity) and, thus, the supplier.

In *The Torpedo Programme*, Marconi Underwater Systems Limited (MUSL) was able to gain a monopoly position in the UK after having won the tender competition against a US supplier. The MoD is left with no alternative for procuring future torpedo capability, since the pre-contract asset specificity allows MUSL to deploy its first-mover advantage. The defence market, as evidenced in the data analysis, is shown to be controlled by monopolies in specific sectors. This reduces the chances of the MoD following a competitive route to its procurement, as was desired in the Levene Reforms.

It does raise the question of whether the Levene Reforms were realistic by focussing on competition policy in a sector characterised by monopolies and market entry barriers are high. If market barriers were lowered the monopoly condition may be removed. However, for that to be realised the MoD would have to either provide investment to new entrants or create more generic requirements to allow companies to cross over from the civilian sector. These inducements are unlikely due to defence funding gaps and the asset specificity of defence requirements.

It is in the presence of asset specificity in defence transactions and the relationship-specific investments being made by the prime contractors, that rather than creating greater competition in defence, the data indicates more cases of bilateral dependency.

It is clear from Proposition 1 the lack of competition for defence contracts due to the fundamental transformation and asset specificity has created a bilateral dependency between the MoD and its suppliers. Where competition exists or is encouraged the prime contractor is usually able to use its first-mover advantage and the large switching-costs, for the MoD, to hold onto its monopoly powers.

The tendering methods by the MoD during contract tender have been observed in the analysis of Proposition 1 (e.g. in the Bowman CIP programme). In its desire to create greater competition in defence contracts and mitigate the effects of the fundamental transformation the MoD employed some questionable tactics. The MoD has enforced (pseudo-)competition, contractor shadowing and used capability change to create greater competition instead these policies resulted in an adversarial relationship with industry.

These tendering methods are clearly an attempt to remove first-mover advantage for follow-up projects or support contracts are being tendered. However, the analysis of the data shows that the MoD has been unsuccessful in applying these methods effectively. This is mainly due to the fact that the reason for the bilateral dependency is due to asset

specificity. In that it is the transaction-specific investments which the Prime has made in the project, which gives them the first-mover advantage.

It is, therefore, not a matter of creating greater competition instead it is a question of creating a larger supply base, willing to make the same transaction-specific investments. Where this fails it is inevitable that bilateral dependency results. This means that there needs to be an appropriate transaction governance to deal with the situation and create safeguards from opportunistic behaviour which may lead to organisational failure.

It is clear that if the MoD follows these tendering methods, which create extra costs to the prime that can be avoided and better spent on development costs then the buyer-supplier relationship will continue being adversarial. The data analysis shows that more recent projects have instead successfully moved away from this adversarial position to a more conciliatory partnership approach. The MoD have realised the best way to deal with contractual hazards brought on by the bilateral dependency is to move to a partnership approach.

The data also shows that the MoD has failed to create appropriate transaction governance for the use of PFI procurement. This centres mainly on how the MoD are able to effectively transfer risk to the prime, while incentivising them to deliver the project within the value for money criteria. As such the failure, thus far, to implement PFI contrasts to the success of Smart Acquisition.

The PFI procurement route removes the dual role of the MoD by replacing it as an investor with a private contractor. This removes the responsibility for transaction-specific investments from the buyer and places it with the supplier, as such project risk is supposed to be transferred to the investor in return for a premium payment.

However, the capital-intensive nature and the presence of uncertainty and complexity within defence transactions have meant that the MoD has not been able to fully transfer the investment responsibilities to the private sector in high asset specific transactions. PFI has, so far, been more successful in low asset specific transactions such as *The Procurement of Non-Combat Vehicles for the Royal Air Force*.

Smart Acquisition has been, in the latter part of the decade, a vehicle to improve the acquisition process. The reason I would suggest that it has been able to succeed is that rather than resist the bilateral dependency – it has been designed to support bilateral governance. It does this through the principles of Smart Acquisition which allows the fundamental transformation to take place; however it does so in a manageable manner.

The use of a 'whole life approach' is not new to defence procurement but it has become ingrained since becoming a Smart Acquisition principle. The whole life approach has an element of pre-contract asset specificity of the temporal kind. In that, when the MoD is planning a project with a prime, with future costing and development strategies, it allows the prime to make transaction-specific investments according to those plans. This gives

first-mover advantage to the prime, however it also provides the MoD to better align its value for money expectation with the prime.

Similarly, the principles of 'investment in the early project phases' and 'new procurement approaches, including incremental acquisition' encourage bilateral dependency resulting from the fundamental transformation. These aspects of the Smart Acquisition principle impact the post-contract asset specificity of the transaction.

Greater investment at the early phase of the project means that the prime would have more funding to develop its physical or dedicated assets, and thus the switching costs increase due to higher transaction-specific investments. However, the MoD and its prime can also use the increased investment in the early stage for better risk identification and reduction work, and reduce the negative impacts of technical factors on achieving value for money criteria.

8.2.2 Contract Negotiations

The fundamental transformation in defence procurement transforms pre-contract competition into a bilateral dependency situation post-contract. This has led, as shown in the analysis, to a number of suppliers consolidating their positions in the market as a monopoly supplier in their sector. Even with the introduction of liberalisation policy in the

1990s, to create competition, the MoD is still in a position where a number of its large projects are given to preferred bidders (see chapter 2).

Therefore, the non-competitive procurements which the MoD follows have created a bargaining dilemma for the MoD and its prime contractors because the negotiations are between a monopsony buyer and a monopoly supplier with equivalent bargaining powers. In the past the MoD and the defence industry have followed an adversarial negotiation approach. This, as shown in the analysis, has created a number of challenges in the contract negotiation process and contributing to the power play is the environmental dimension of the transactions.

The environmental dimension has a major effect on contract negotiation. The uncertainty, asset specificity and frequency of the transaction will determine the way the transacting partners adapt to the bilateral dependency and will determine whether the safeguards in place are steadfast in instances where opportunistic behaviours may occur.

The contractual safeguards in *The Construction of Nuclear Submarine Facilities at Devonport* were weak; this was as a result of the arms-length nature of the transaction. The project was given as an example of project failure in delivering value for money, mainly attributed to the presence of uncertainty and asset specificity. In terms of uncertainty, cost uncertainties in the project due to technical complexities and poor supplier performance made it difficult for the MoD to identify future costing plans.

As for asset specificity, the reference discusses the way the MoD uses temporal asset specificity to pressure the supplier, DML, into delivering its cost and time targets in the contract renegotiation. This bargaining situation was adversarial in the way that each party was using uncertainty and asset specificity to gain pricing advantages in an opportunistic manner.

Another example, where uncertainty and asset specificity is present in contract negotiations is in *The United Kingdom's Future Nuclear Deterrent Capability*. In the project the MoD created a situation where temporal asset specificity has become an important factor in contract negotiations with suppliers, by outlining its desired in-service date.

In publicising its desired in-service date and the MoD has weakened its bargaining position and, as is suggested by the NAO, given itself little manoeuvring space. The post-contract temporal asset specificity is increased, which may lead to the 'hold-up' problem, where the buyer is dependent on the seller to deliver to the specified date.

While, in-service dates can be changed or varied they can be sensitive at the institutional level, such as political pressures and budgetary conditions. The contractual hazard is that the supplier can act opportunistically due to the pressures of temporal specificity and hold the MoD to ransom – this does not necessarily mean that the supplier will act as such.

Hartley (2007, p.1162) explains 'competition can determine prices and 'police' profits whereas negotiation with a preferred supplier requires both prices and profits be agreed between buyer and seller. Such bilateral monopoly bargaining between a monopsony government buyer and monopoly seller involves two 'sticking points' namely, the buyer's maximum price or willingness to pay and firm's minimum supply price below which it will not undertake the work'.

In the balance between the buyer's maximum price and the firms minimum supply price, uncertainty and asset specificity will play a role in which side gets to achieve the optimal outcome. In the data analyses the evidence points to the MoD being most affected by the uncertainty and asset specificity of the transaction, it is usually the MoD which moves towards its maximum price rather than the Primes moving to the minimum price. The value for money reports and the major projects reports indicate that the MoD usually end up paying more than it expected.

The current U.K. financial crisis has led some political commentators to question the continuation of the Future Nuclear Deterrent programme by arguing it is too costly. Hence, arguing that the MoD's maximum price is unaffordable and in a situation where it is unable to reduce the prime's minimum price, the project they argue is no longer viable.

While this has been resisted, there have been some budgeting disagreements as to how the MoD will be able to fund the project. The UK Treasury has suggested that the MoD will

have to find the funds within its own budget, though this has been rejected by the Minister for Defence, Dr. Liam Fox; he has stated this situation is under continued discussion. This has created a great deal of political uncertainty over the future of the nuclear deterrent programme.

Therefore, it is clear that defence contract negotiations may be affected not only by the transactional consideration at the contracting level, but also at the institutional level. At the process level, there will be certain considerations to make in terms of the way the contract is designed and how it can incentivise the supplier to deliver value for money projects post-bargaining under a bilateral dependency situation.

8.2.3 Supply Agreements

Supply agreements are defined in terms of the contractual arrangements being made in order to outline the requirements of the buyer and the responsibilities of the supplier. The design of the contracts will determine the requirements and responsibilities of the supply agreement. The MoD has followed a number of contract types, such as cost-plus, fixed-price, incentive-based and contracting for availability, in order to define the supply agreement.

The transaction-cost perspective in the supply agreement is in terms of the environmental turbulence caused by conditions such as uncertainty and/or complexity and behavioural

hazards such as opportunism. Crocker and Reynolds (1993) make the point this is a characteristic of the design of military procurement contracts (as discussed in section 3.2.2). The focus in this research has been to look at what the transaction-cost issues are for the MoD and its primes when designing contracts and how this will affect the achievement of value for money.

The contract negotiation within a bilateral monopoly bargaining situation can deliver a range of contract types. At the heart of the negotiations are two specific issues - payment arrangements and risk sharing. The contract types are distinct in the way the risk is apportioned and payment is made.

The contract type can be an important aspect of a bilateral monopoly; it signifies the negotiating powers of the parties by presenting their ability to ensure favourable terms, which protect their self-interests. In deciding the contract type, the MoD assesses the desired risk sharing arrangements (as explained in section 2.4.1).

Incentive-based contracting is the most commonly used contract type in the research data (see Chapter 7, Figure 7.4). The MoD has attempted to use incentive-based contracting as a means of linking performance indicators and milestones to payment, to induce desirable outcomes from the project. Milestones are a common part of incentive-based contracts. Most are linked to points in the CADMID lifecycle and some are linked to more specific deliverables in the project such as key user requirements.

The adoption of performance indicators provide the MoD with a certain amount of cost and time controls, as well as using it as a supplier monitoring mechanism. This aim is usually missed due to unrealistic performance expectations or vague and changeable customer requirements, which may lead to the MoD having to renegotiate contracts. This then creates further contract bargaining and requirement changes to lower cost and time burdens. The difficulties in incentive-based contracting in defence, identified by Williamson (1967), continue to manifest.

Gardener and Moffat (2008) highlighted in their study that there exists an optimism-bias in defence projects. They show that the presence of uncertainty creates a situation where the MoD follows an optimistic rather than a realistic strategy, when planning spending, schedules and performance requirements. These two studies are discussed at length in Chapter 3.

The solution to optimism-bias, in my view, must be in the way the MoD fully implements the 'open relationship' principle of Smart Acquisition, and seeks greater involvement from the prime on what is feasible and deliverable. Rather than the current situation where the MoD is told what it wants to hear from Industry, as was suggested is the current status quo by an informant in Kebede *et al.* (2009).

The complexity of defence transactions, the uncertainty and the lack of information transfer between the MoD and Industry plays a major role in the difficulties in negotiating

contracts. This creates a situation where the contract can be poorly structured and unrealistic, as was the case in *The Construction of Nuclear Submarine Facilities in Devonport* or *Chinook Mk3 Helicopters* contracts.

Overtly prescribed incentive-based contracting as a tool for cost and time controls can become difficult to maintain in bilateral monopoly bargaining. Since, the uncertainty and complexity (of technical factors and requirement changes) in the transaction can make it difficult to keep to milestones and renegotiation becomes the norm rather than the exception. Rather than having to renegotiate milestones and linking them to incentives to the contract, the MoD and the prime can create basic partnering agreements and deal with changes to project plans directly without contract change.

The contract negotiation can be a difficult process whether it is under a bilateral monopoly or through a competitive tender. This is because it is difficult to write a contingent claims contract under conditions of uncertainty and bounded rationality. In defence, uncertainty and complexity is ever present and the variety and magnitude of its existence further complicates predicting all or even some contingencies. As such this explains why over-prescribed incentive-based contracts can be difficult to implement.

Uncertainty results in the human-decision makers being unable to take contingent decisions; this is further exasperated where 'information transfer issues' impact the contract. The decision-makers in the transaction are impacted by a lack of information

communicated between the transacting parties, impacting their ability to make informed decisions.

This situation creates a negative impact on the contract negotiations, and the parties have to look to remedy such situations in the contract. In *The Private Finance Initiative: The Contract for the Defence Fixed Telecommunications System* the impact of information transfer issues resulted in higher priced bids during the tendering process. The uncertainty in the contract is covered by a premium in the final bid price.

In order to combat the difficulties of bargaining in the dark, the transacting parties seek improvements in information sourcing to reduce the impact of uncertainty and complexity, and to support decision-making. The MoD has sought to reduce information transfer issues by implementing historical cost trend analysis in *Providing Anti-Air Warfare Capability: the Type 45 Destroyer* project. The MoD also seeks to reduce its forecasting costs by requesting accounting data from the prime.

Sandler and Hartley (1995, p.121) point out 'demands by the government for access to contractor's accounting data will always be resisted and even where granted, accounting information is historical and does not indicate the extent of contractor inefficiency. However, the government is not powerless. It can use competition from either national or foreign firms to check on a contractor's price bid'. This situation emphasises an adversarial approach, in which sharing information is seen as undesirable.

The MoD, however, will be able to use the historical accounting data from the supplier and its own historical cost trend to improve 'realism' in cost estimation and create realistic targets in the contract. In the Type 45 Destroyer project, it is the buyer who seeks to reduce information transfer issues, whereas in the Defence Fixed Telecommunications contract, it was the supplier.

Under bilateral dependency, the contract negotiations can become adversarial, as has been exemplified. Information can be an important tool in the contract negotiation process; it can have a major effect on bid pricing and cost estimations. This is particularly the case when the contract negotiations take place in an environment of high uncertainty and complexity. Where the information transfer is more efficient, through greater communication, cooperation and partnering, a contract can be designed which reduces project risks.

8.3 Risk, Uncertainty and Complexity

8.3.1 A Question of Risk

Risk is identified as an important part of the defence acquisition process, in the data and the literature review. However, it is curious that risk is omitted from TCE considerations, since one would expect it to play a major role in transaction decisions. Williamson, however, views risk only in his assumption in the risk neutrality of the behaviour of

decision-makers. Even his idea is ancillary to the main thesis of TCE and is neglected to the extent that it makes minimal impact on the transaction-cost approach.

Risk is interesting in this research due to the discrepancies between the NAO definition of risk, and that of the Carnegie School (which is being used as a base definition). The focus here is not to define risk, instead it is to explore the way the NAO defines risk and the impact this has on understanding risk in terms of acquisition. First, the varying views of risk must be presented and understood.

Williamson (1985, p.388) defines risk in terms of 'a third behavioral assumption that is employed but to which reference is less frequently made warrants separate attention. That is the assumption of risk neutrality. Unlike the other two assumptions, this one is patently counterfactual'.

In defining risk preference in transactions in this way, I take it to mean that Williamson while accepting risk exists feels it is not important enough to consider as part of the central thesis. Williamson (1985, p.389) explains this by rationalising that risk neutrality is an approximation, a separate view, and allows for the focus to be on core efficiency features instead. Thus, he sidelines risk in favour for what he views as more critical to transactional considerations of organisation.

As Chiles and McMackin (1996, p.79) explain 'the behavioral assumption of risk neutrality has received but sparse attention in the TCE literature'. However, it places risk as a behavioural property, in which the decision-makers preference to risk is to be assumed as neutral in a transaction. The NAO perspective on risk does not specify risk in terms of the decision-makers preference; rather it looks at its impact on project success in an almost environmental definition.

The NAO (2000, p.1) outline their definition of risk in a report discussing the management of risk in government departments. 'In this report 'Risk' is defined as something happening that may have an impact on the achievement of objectives as this is most likely to affect service delivery for citizens. It indicates risk as an opportunity as well as a threat'. This definition of risk closely resembles the characteristics of the coded risk from the VfM reports. In that, the focus is on the risk to achieving the objectives of the project i.e. meeting the value for money criteria.

This definition of risk differs from that outlined by Winch and Maytorena (2011, p.357) '*Risk* is the condition where inferences from historical data using analytic techniques can provide a sound basis for decision-making because it is believed with confidence that the future will be like the past and the probability of a threat or opportunity event occurring and its associated impact can be calculated from existing data'.

The major difference between the NAO and, Winch and Maytorena definition of risk is in the time-sensitivity and the subject of risk. The time-sensitivity is shown by Winch and Maytorena, in that they specify the thread between historical data, existing data and future outcome. Whereas, the NAO studies view risk in two spectrums: retrospectively and prospectively.

The retrospective analysis of risk by the NAO is irrelevant for TCE, unless one takes the learning opportunities into account. The prospective analysis of risk, by the NAO, is synergetic to Williamson's view of Uncertainty. The NAO are, thus, identifying risk where they could equally be discussing uncertainties in future outcomes. Risk is where valid measurement is possible and uncertainty where there is not. Transaction-cost places risk as a behavioural aspect of the transaction, thus squarely with the decision-maker.

The NAO focus on viewing risk in terms of the effect it has on the future of the project rather than on the decision-maker. The future is changeable and therefore it is impossible to state its outcome and how that may be influenced. Instead, it is more logical to identify the affect risk has on the decision-maker, which then influences the future outcomes. Instead, this prospective analysis of risk is more in line with the way uncertainty is seen in the transaction-cost perspective.

The *Risk* node was recoded, post-analysis, in light of its importance to defence acquisition and the lack of application from TCE. It was coded into the differing views of risk in the NAO definition, between that of the retrospective and prospective view of risk.

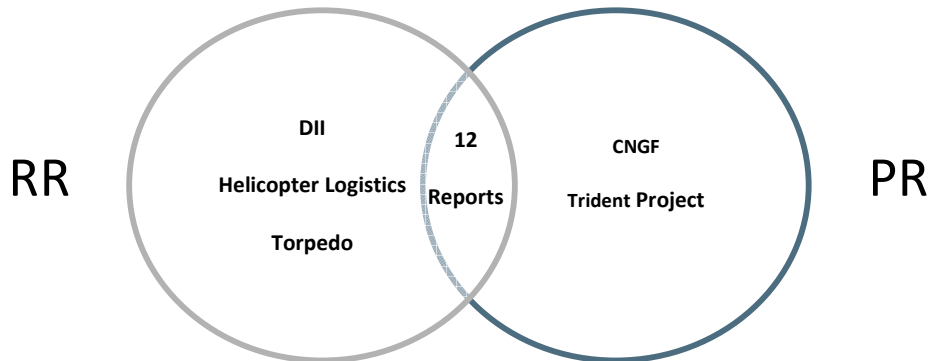
Retrospective risk is identified by the NAO as having occurred during the project, prior to publication of the report, hence as an event from the past. Prospective risk is identified as what the NAO identified as the risk to the achievement of the project criteria, hence a possible future. The results of the coding of these two perspectives of risk are shown in Table 8.1 and Figure 8.1.

Table 8.1: NVivo analysis of Retrospective Risk and Prospective Risk

	Reports	References
Retrospective Risk (RR)	15	116
Prospective Risk (PR)	14	108

Table 8.1 provides the break down for the number of reports and references made to risk retrospectively and prospectively. The results shows an almost equal number of reports make reference to retrospective risk as to prospective risk.

Figure 8.1: Venn Diagram showing the share of the risk perspectives in the VfM reports



The Venn diagram in Figure 8.1 provides the share of reports. Twelve reports make references to retrospective and prospective report, three reports (on Defence Information Infrastructure, Helicopter Logistics and the Torpedo project) make reference to risk retrospectively only, and two reports (on the Common New Generation Frigate and the Trident project) make reference to prospective report only.

These results indicate that the NAO views risk equally as a means to learn from past experiences and future uncertainties of projects. However, there is a lack of appropriate risk analysis which would satisfy the definition of risk as stated by Winch and Maytorena (2011). There is a lack of threading of the past experiences, the present occurrences and the future threats and how this impacts the decision-makers ability to make an informed decision.

The learning from risk however can play an important part in understanding how the future threats can be understood and mitigated. Risk, in the NAO sense, can play an important role in the way learning can be used to save on transaction-costs. In that by learning from past risks of a project future threats can be mitigated. This is the focus of the NAO, and the following sub-section provides a discussion of what learning is gained from risk in the VfM reports.

8.3.2 Learning from Risk

Four project risk types are identified from the VfM reports: contract risk, technical risk, delivery risk and in-service risk. Contract risk is in the form of an ineffectual contract agreement or risk which can impact the contractual agreement. This risk type can affect every aspect of the project. Technical risk is most evident in the development and production stage of the project and is mainly due to unforeseen technical difficulties or ineffective risk reduction work during the assessment phase.

Delivery risk is the risk of missing in-service target dates as a result of delays in the project arising from contract or technical risk. In-service risk is as the name suggests the risk to the project at the in-service phase. This may have resulted from the impact of all the other risks due to operational challenges or renegotiating support services.

The first step in risk mitigation is in the type of risk agreed under contract agreements. Different contract types require differing levels of risk management by the MoD. Contract agreements can place the risk on the MoD, or on the prime contractor, or share the risk. Where the risk is taken on by the prime contractor, they will charge a premium to cover the project risk in the form of a fixed price contract. The basis under which the MoD chooses its procurement and contracting process to manage risk is discussed in section 2.4.1.

In some cases the MoD are willing to absorb the risk. In *Transforming Logistics Support for Fast Jets* (HC 825, 2007) in the availability contract for the Tornado support contract the MoD took a greater degree of risk due to its satisfaction with the partnership agreement and the pre-contract work undertaken. Where there is a lack of risk reduction work and effective partnering arrangements, contract risk can be increased by an inefficient contract agreement. An example of this is the Type 45 Destroyer contract (HC 295, 2009), where there was a lack of proper risk analysis work combined with an insufficient governance arrangement.

Contract risks are created mainly due to the presence of uncertainty in the contract (this is more compatible with Williamson's views due to the focus on uncertainty). The Type 45 Destroyer employed a fixed price contract, which had undefined elements and also allowed the contractor to claim compensation. The combination of these two elements in the contract demonstrates the poor contract arrangements made in the project. Risk plays

a major role in how the MoD engages with its prime, while the MoD aims to transfer or share project risk with the prime as part of its procurement practice.

The Prime is reluctant to take on risks in the contract and if it does so it will aim to cover it by charging a premium. Therefore, risk becomes an important element in the way partnership succeeds in the project. The evidence in proposition 3 shows governance failures were predominantly due to a lack of risk management in the contract (mainly in PFI procurement).

Contract risk has been discussed in relation to the contract type, however it can manifest in other ways in the project management. In the Apache Helicopters procurement (HC 1246, 2002), contract risk arises due to a lack of stakeholder management. The MoD when directly contracting with the Apache Helicopters prime failed to realise the importance of the institutional level considerations of the transactions, in that the U.S. government are responsible for data release. This resulted in schedule delays in accessing valuable data for the Apache Helicopters, which could have easily been avoided if proper partnership arrangements were put in place.

Further problems were evident in gaining the data from the U.S. government, in that they were uneasy about transferring data to the newly privatised QinetiQ as part of the project. The concerns over the privatisation of QinetiQ could have been allayed with a confidentiality clause in the contract. Some risk reduction work can be undertaken to

ensure transaction costs do not unnecessarily increase. MPR reports' analysis has indicated the importance of project definition and risk reduction in the project's Assessment Phase (Section 5.4.1).

A key step to reducing the project risk is to adopt an effective partnership approach with the prime contractor. NAO (2006a, p.11) points out 'contracts are mostly likely to support successful project delivery if they are negotiated against a common information base and with an understanding of stakeholders' aspirations. In applying the contract it will be important that all parties understand the way in which achievement of the desired outcomes is incentivised and the position of each stakeholder is protected'.

The transition to effective partnership arrangements, shown in proposition 3 of the successful projects, has enabled the MoD to partner with its suppliers and deliver improved procurement and support contracts. Thus, in delivering effective risk management the projects referenced as being successful mention 'co-located teams' and 'communication' as key to working practices. The strengthening of the relationship between the MoD and prime, emphasised in the creation of IPTs has been an important step in improving risk management in defence projects.

An appreciation of technical risk in project development and production is a key factor to project success. A common reason for project cost and time variance discussed in the MPRs (Chapter 5) was identified as technical factors. The reasons given for the continual

presence of technical factors in the MPRs are due to a lack of risk reduction work and investment in the Assessment Phase. Defence projects involve a high level of technological complexity, where the prime contractor is responsible for the integration of systems of systems.

The MoD is sometimes able to manage the risk related to technical factors, as in the case of the DII project (HC 788, 2008). Technical risk is lowered where the procurement is of a standardised product with non-specific investment required in physical assets. However, where asset specificity is high, the technical risk may increase.

The delivery of mobile tactical internet requirement, in the Bowman project (HC 1050), proved to be a challenge for General Dynamics. However, it is one example in which the prime contractor seemed to invest time and money in order to deliver the customer requirements. The evidence in the MPR and VfM reports shows that Bowman under the partnership of the MoD and General Dynamics was a successful project (in time and cost increases at a mere 5 per cent). While General Dynamics inherited a lot of the technical difficulties from Archer's Consortium, they worked to effectively reduce the technical risk.

Delivery risks can affect the scheduling of the project and can have a negative impact on in-service dates. The MoD and its industrial partners have to work in partnership to reduce the impact of delivery risks. The rationale behind investment in the early stage of the project of the Assessment Phase is to reduce the risk of in-service delays as well as

cost increases. Delivery risk is based on unrealistic in-service dates, which impact all aspects of the project. Time pressures can reduce the amount of time spent during the Assessment Phase which impacts the effective delivery of the project.

There is a risk in the Future Nuclear Deterrent Capability programme (HC 1115, 2008) that the reported overlaps in the work strands will put greater pressure on the project schedule in the long run. The overlap in the design and construction work may save time in the short-term, but there is a risk in meeting the in-service date if appropriate time is not spent in the design phase. The reasons for delivery risk were investigated in the VfM reports by looking at two specific relationships: delivery risks as a consequence of information transfer issues and of technical risk. In both cases, there was a low frequency in the presence of these relationships in the VfM reports.

The relationship between technical risk and delivery risk is present in three reports, of which there is a single reference to the relationship in each source. The fact that there is a low frequency however does not disprove the existence of the relationship; however it may point to a lack of focus on the in-service phase in the VfM reports. It is reasonable to suggest that technical risks in the project can have an impact on the project's ability to meet its in-service date.

The risks in the in-service phase highlight the need to continue the partnership with industry post-procurement. This signifies the need for through-life management of

defence projects 'from cradle to grave'. The risks involved in the in-service phase are linked mainly to the operational requirements of projects and are significant to the customer, the Armed Forces.

As explained by NAO (2003b, p.15) 'through enhanced planning, Through-Life Management should lead to improvements in the affordability of future programmes, a reduction in the number of 'surprises' encountered by a project and better delivery of integrated military capability rather than individual items of equipment'. The NAO are pointing to the importance of planning for future costs, an important principle of Smart Acquisition: 'a whole-life approach, typified by applying through life costing techniques'. However, their focus goes beyond just the costing of individual platforms, but of integrated projects with funding for integrating new technologies.

8.3.3 Uncertainty and Complexity

Unlike risk, Williamson puts a great deal of attention on the presence of uncertainty and complexity in the transaction. While these two factors are of a different kind, in that uncertainty is a difficulty in making accurate prediction of future events and complexity is a difficulty in calculation and computation, they have the same negative effect on the transaction which usually manifests in their interaction.

Uncertainty and complexity are tested in this research, through Proposition 2, Lemma 2.1. The presence of uncertainty and complexity was proposed to be responsible, in creating transaction costs, to contribute to the failure to meet the value for money criteria of the MoD. The results for the analysis of uncertainty and complexity showed that the presence of uncertainty was the most reported environmental dimension in the transaction to cause project failure (i.e. not meeting value for money criteria).

The data supported Lemma 2.1 and the Type 45 destroyer was shown as an example of how uncertainty can lead to project failures. These uncertainties were identified as part of the planning phase, with optimism-bias identified in the costing and scheduling of the project. Where fixed-price agreements are made with compensation mechanisms, the effect of optimism-bias will be to create contractual risks in the buyer-supplier governance arrangements.

It is interesting that complexity was not as frequently mentioned when discussing project failure in the reports. This may be due to the fact that the presence of complexity creates a more immediate response in terms of looking at possible resolutions, whereas uncertainty is a more challenging factor to respond to. However, the transaction-cost effect of uncertainty is usually linked to the presence of complexity.

Slater and Spencer (2000, pp.73-76) provided a strong critique of Williamson's distinction between uncertainty and complexity. They state that in one sense Williamson inextricably

links uncertainty and complexity, however he then introduces behavioural uncertainty as a distinction to complexity. In order to understand behavioural uncertainty we can use the example of the Type 45 destroyer. In that project we observe a combination of uncertainty and optimism-bias, a relationship explored in greater detail by Gardener and Moffat (2008), (see Chapter 3, Section 3.3.3).

Williamson (1985, p.58) defines behavioural uncertainty as 'uncertainty of a strategic kind is attributable to opportunism and will be referred to as *behavioral uncertainty*'. Whether, Williamson's motive is to distinguish uncertainty from complexity this makes no difference, in my view, it does however provide us with a way to understand the relationship between optimism-bias and uncertainty.

I believe optimism-bias can be seen as behavioural uncertainty, in the transaction-cost perspective, combined with an element of opportunistic behaviour. As Gardener and Moffat (2008) point out optimism-bias has an element of poor behaviour emanating from both sides in the acquisition in order to reach their short-term gains. While this may differ from the type of uncertainty that is linked to complexity it has nonetheless the same transaction-cost effects, as shown in the Type 45 Destroyer case.

It is due to the presence of uncertainty (whether that be of the complexity or behavioural kind) that transaction governance choices must be made to reduce the possibility of organisational failure (which in the defence acquisition case would be a failure to deliver

value for money). Therefore, the focus turns to how to create governance structures which can cope with the strains placed on the transaction due to the presence of uncertainty, the asset specificity characteristics, and the frequency of the interaction.

This governance trade-off is discussed in relation to Proposition 3, in which the MoD response to failure is tested with respect to such a trade-off. The findings show the question of transaction governance (in the form of acquisition practice in MoD language) has become more important within the last ten years.

Therefore, the governance trade-off from a failed organisational choice to one more appropriate to dealing with the transaction-cost considerations, has been evident in more recent projects. In these projects the transformation has been a transition from an adversarial market-based classical contracting model to one which embraces bilateral governance with support from relational contracting approach, specifically that of the IPT mechanism.

The reason for this transition has been inferred as being due to an acceptance of the bilateral dependency between the MoD and its prime contractors. Rather than combating this bilateral dependency the MoD has in certain respects looked to move towards a more open relationship, which facilitates for the long-term nature of the relationship. The IPT mechanism is seen as the key to this evolution in defence acquisition in the UK, the following section will discuss this further.

8.4 The IPT Mechanism

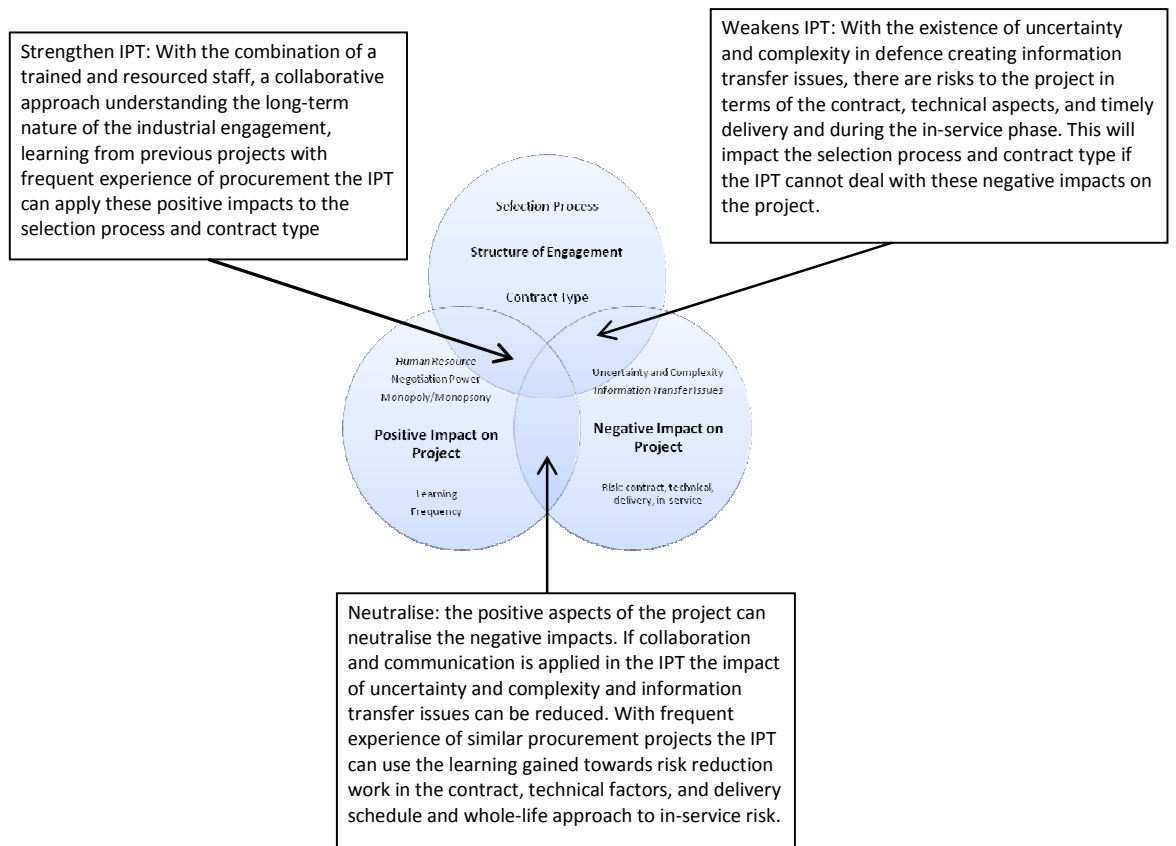
8.4.1 Partnering in IPTs

The introduction of the IPT mechanism has been one of the most tangible acquisition policies taken by the MoD to foster a close working environment with industry (sections 2.4.2 and 2.4.3). It is one of the seven Smart Acquisition principles and its implementation was fast tracked by the Smart Procurement Implementation Team (NAO 2002a) in 2000. The DE&S described it as the primary building blocks of the organisation (MoD 2007).

The aim of the IPT is to create the collaborative environment and partnering the MoD wishes to foster with industry. It is therefore an ideal candidate to test the successful realisation of this bilateral governance framework. Figure 8.2 represents the impact of the factors identified in the VfM reports on the IPT mechanism, and it provides the framework in which it can be understood in the context of this research.

There are three elements to the Venn diagram. The top circle represents the structure of engagement between the MoD and the prime in the IPT. There is a circle describing the positive impact of defence acquisition factors on the IPT and next to it the negative effects. The boxes explain the effects that the defence acquisition process factors have on the IPT mechanism. Each box corresponds to an overlapping area of the circles. The impacts are to strengthen the IPT, to weaken the IPT and to neutralise the effect on the IPT.

Figure 8.2: Venn Diagram of IPT Mechanism



The structure of the engagement in the IPT is defined by the selection process and contract type. This has been discussed in the first section, and was shown to depend on the pre-contract asset specificity involved in the transaction. When the MoD and the prime make relation-specific investments, it can improve the engagement of each party in the IPT. However, if the parties do not invest in the collaborative relationship, there can be a weakening of the IPT. This is explained in a case study of the AMV IPT:

One important idea behind the IPT was to have a co-located project team that could take advantage of team working, good communication and cooperation. This notion was to be realized through continuous interaction enabled by prescribed tasks, teams and routines. The management of relationships (customer, user, suppliers) was therefore a key tactic in this programme. However, the original bid was won through competitive tendering, and the

dynamics inherent in such a process have placed significant constraints upon the IPT's ability to collaborate, because of the constraints of a project won by competition, with "a very tight contract, budget and margins squeezed to win the work". For example, the proposed shared data environment (SDE), which would enable improved communication and coordination between industry and customer, was not effectively implemented due to cost and commercial constraints'.

(Kebede *et al.* 2009, p.323)

The selection process and the contract type are seen to have knock-on effects on the IPT mechanism. A lack of investment in the shared data environment may increase the presence of negative factors, such as uncertainty and complexity, creating information transfer issues, which may lead to risks in the project in terms of contract, technical, delivery and in-service risks.

The use of IPTs in the Helicopter Logistics support contracts (HC 840, 2002) have been identified as a successful change to governance arrangements, as part of the evidence for Proposition 3. However, there are also some concerns that not enough time and resources were provided to implement new working practices successfully.

IPTs can be a positive influence in the project management; however, there is a clear need to provide the appropriate resources to strengthen the IPT mechanism. The NAO have, in the case of the Fast Jets support contracts (HC 840, 2002), praised the effective use of the IPT mechanism. The IPTs have followed 'open book accounting and sharing of information and benefits between projects'.

Where relational contracting is utilised in the form of relation-specific investment in communication and trust, the bilateral governance can be seen as a successful transaction governance, as exemplified by the Fast Jets support contracts. However, where the IPT fails to engender the principles of IPT engagement, then the transaction costs increase and organisational failure can seem more likely.

As specified in Proposition 3, the MoD moved towards a partnership arrangement in its acquisition projects to safeguard the transactions from failure. Where there is a strong governance mechanism in the form of the IPT, the partnership arrangements will succeed in safeguarding the contract from organisational failure.

IPTs are also an effective mechanism to ensure bilateral dependency in defence transactions does not result in the more opportunistic natures of bilateral monopoly bargaining. The MoD desires the creation of a 'better, more open relationship' with industry as part of its Smart Acquisition principles. Under a bilateral monopoly situation, this will require close collaborative relationships with primes using the IPT mechanism. Therefore, the MoD will seek to ensure that relational contracting can be used to support the IPT mechanism.

8.4.2 Relational Contracting for IPTs

To ensure the successful application of the IPT mechanism, there needs to be a congruent contractual process that complements the IPT ethos. Relational contracting is a contracting process best suited to engendering the closer and open nature of defence acquisition under the IPT mechanism. While the contract type may continue to be under a fixed price or incentive-based contract, mainly the latter, the contract would follow a relational contracting agreement.

In relational contracting, there is a move from prescriptive contracting to one that is more flexible and adaptable, rejecting the classical or neo-classical approach where ultimate dispute resolution is decided in the courts. Transacting parties rather would work together to create their own conflict resolution mechanism, mainly in the form of joint-problem solving exercises. Relational contracting is explained in section 4.3.4. However, here the characteristics that make it suitable to the IPT context are emphasised.

For such relationally-governed exchanges, the enforcement of obligations, promises, and expectations occurs through social processes that promote norms of flexibility, solidarity, and information exchange. Flexibility facilitates adaptation to unforeseeable events. Solidarity promotes a bilateral approach to problem solving, creating a commitment to joint action through mutual adjustment. Information sharing facilitates problem solving and adaptation because parties are willing to share private information with one another, including short and long-term plans and goals. As parties commit to such norms, mutuality and cooperation characterize the resultant behaviour.'

(Poppo and Zenger 2002, p.710)

The MoD hopes to achieve this by replacing its traditionally adversarial relationship with industry to one with a more open and collaborative nature. The transition towards what Poppo and Zenger (2002) relationally-governed exchanges through social processes may take time, but it is aided by the use of Smart Acquisition procurement and IPTs. There will be resistance from each side to sharing information which they view are sensitive to their bargaining position, however once relational contracting is supported by improved trust between the parties such issues may be less problematic.

A relational contracting approach to IPTs may provide greater freedom for them to work more effectively, with less contractual threat hanging over the MoD and industry joint team. It would remove the perception of IPTs as a monitoring mechanism intimated by Cullen and Hickman (2001), creating a full recognition of IPTs as drivers of joint-working arrangements for the MoD and industry. It would create more opportunity for DE&S staff to examine ways of maximising the IPT mechanism, rather than spending a great deal of effort and funds on legal advice on contracts.

Artz and Brush (2000) suggest that relational contracting in itself does not remove the contractual hazard of opportunism and the like, especially at periodic negotiating stages; instead it is the relational norms that create a long-term safeguard. Artz and Brush (2000, p.341) explain 'those transactors who have established behavioural norms that can simplify and smooth renegotiation process can reasonably expect to incur lower *ex post* bargaining costs than those who have not'.

Parker and Hartley (2003, p.103) comment 'a distinctive feature of MoD's business is the requirement to provide an operational capability in peace, crisis and war and PFI/PPP projects have to meet this criterion. This increases the difficulty of writing a long-term contract dealing with all contingencies. As a result, MoD is relying more on partnership arrangements based on trust and reputation rather than using detailed contractual controls, as earlier theoretical framework predicts'.

The analysis of the data in Proposition 3, however, shows that PFI projects have yet to achieve the desired outcomes for the MoD in terms of value for money. While, partnership arrangements may provide success as a policy at the institutional level evidence at the governance and process level is not yet representative of that view. The difficulty in delivering partnership through PFI procurement seems to be focused on the risk transfer arrangements.

Until the MoD can improve the governance and process of PFI procurement, it may have to focus on other procurement processes. I suggest the use of Smart Acquisition principles, with prime contracting, the IPT mechanism and relational contracting, will do more to create partnering arrangements with industry. Since, in Smart Acquisition, the focus is on risk sharing rather than risk transfer. The MoD needs to be able to create a mechanism which makes it viable for the Prime to take on the risk of a defence contract, before it can successfully implement it as a procurement process.

8.4.3 The Importance of People in IPTs

The IPT mechanism can improve the MoD's ability to negotiate with its monopoly suppliers, enabling a better understanding of their customer requirements, where learning is gained from frequent transactions and an effective investment in human resource is made. The MoD (2005, p.139) states 'we must ensure that the appropriate training, development and professional standards are in place for all those involved in acquisition, and that staff receive due reward and recognition for their competence and for their achievements in project delivery'.

The evidence for Lemma 2.3 was quite barren; however, there was evidence to suggest that the MoD can use occasional or recurrent transactions to undertake transaction-specific learning. Transaction-specific learning can be linked to the way project managers are able to identify and catalogue lessons to be learnt specific to the project. If the MoD is able to use transaction-specific learning as a training tool for its decision makers, specifically its project managers, it may be able to achieve its aim of being an 'intelligent customer'.

Major defence projects are characterised by occasional transactions of highly specialised equipment. The MoD can apply learning where there is a close link of previous contracts to current ones, especially where the same contractor is involved. Transaction-specific learning is described in the Future Nuclear Deterrent Capability programme (HC 1115, 2008).

Since nuclear submarines must be replaced, due to decommissioning requirements, there is an almost regularity (even though at long intervals) to the procurement process. This still enables the MoD to use transaction-specific learning in the project, while also allowing for modern technology and practices. The effective use of human resource is another area which can positively impact IPTs where the MoD can apply a long-term approach, as pointed out by NAO (2004):

For MoD, the introduction of new processes and technology, such as Whole Life Costing, adds to training requirements. Also, regular movement of staff affects levels of continuity in some roles, which impacts on skill and experience levels. The availability of suitably skilled and experienced staff in MoD impacts particularly on the early stages of projects when MoD is leading on decisions affecting the scope and direction of projects, which have resonance for downstream acquisition performance. For example, the availability of MoD staff with suitable skills and experience in risk management affects the quality of early risk reduction activity.

(NAO 2004b, p.16)

As well as ensuring that MoD staff in the IPTs have the expertise required in industry, there is also a question of staff rotation in the civil service which can disrupt the team working in IPTs. Kebede *et al.* (2007) discuss the effect of staff rotation on the project team in the example of the AMV IPT.

The findings of the case study clearly show that the industry partners found staff rotation as a barrier to effective collaboration. Gray's (2010) report provides evidence that civil servant tenure is worsening not improving, with less time being spent in IPTs. These issues are raised in section 2.4.4, where the organisation of acquisition is presented.

While the MoD and Industry can ensure that they use their bilateral dependency to engage in positive contractual negotiations where mutual benefit is sought, investment in human resources is made, and where learning is gained from experience, it is possible to neutralise the negative impacts of uncertainty, complexity and risk. It is also important to ensure that the parties engage in a selection process which engenders relational contracting. Under these conditions, the IPT mechanism can thrive and the MoD can engage in the values of partnership espoused in the MoD (2005).

The MoD (2005, p.133) comments 'the emphasis on our future approach to ensuring value for money has highlighted the need to place greater emphasis on fostering better, and where appropriate, longer term relationships with our key suppliers, and the use of appropriate commercial tools, including competition of formal partnering agreements. This must be underpinned by greater openness and transparency, with a common and more explicit understanding of how to achieve best value for both Defence and industry'.

Competition may create the opposite of what is desired in a partnering agreement, as pointed out earlier by Kebede *et al.* (2009) competition created strains in the IPT mechanism which reduced its efficacy. The MoD may have to view the procurement process as a 'competition V partnership' choice prior to tender. While, competition can provide advantages in pricing and aligning the Prime to the MoD's interest. Partnership can reduce the long-term transaction costs, by reducing the project risks and creating a

more collaborative and open relationship with the Prime. In the end, the MoD may decide which procurement route it prefers on a project-by-project basis.

8.5 Summary

The selection process in defence transactions are characterised by ever increasing monopoly supplier markets. The choice between monopoly and competition is becoming more one-sided in favour of the former. The reason for this is due to the effects of the fundamental transformation in defence contracting. Competition is becoming less viable, and in some cases less effective. Therefore, the relationship is becoming characterised by a bilateral dependency between the MoD and its suppliers in major defence projects.

A major contribution to knowledge in understanding defence acquisition in terms of TCE has been to provide greater insight into the reason why the bilateral dependency has become the norm in defence. The contribution has been to show that this is due to the post-contract asset specificity resulting from the fundamental transformation and MoD investment decisions.

The transaction-specific and relation-specific investments made by the buyer, the MoD, have contributed greatly to the bilateral dependency condition in defence transactions. Its role as investor in defence projects is key to the reliance on the supplier to deliver the project to the required value for money criteria.

The MoD has tried to mitigate the creation of the fundamental transformation through pseudo-competition, contractor shadowing and capability change. However, the result has been one where post-contract asset specificity means that the original contractor still has an advantage over its competitors in the retender phase or support contracts. The MoD has instead created greater cost in the tender process which it is most likely will have to bear itself and weakened the relationship with the prime.

The introduction of Smart Acquisition in the early part of the 2000s has by the latter part of that decade become an important tool in easing the strains of the bilateral dependency situation. The use of Smart Acquisition principles has been successful mainly because it supports bilateral governance, rather than attempting to weaken it. The principles emphasise strengthening the relationship by looking at a long-term through-life approach with IPT mechanisms at the heart of the interaction between the MoD and its partners.

The fundamental transformation plays an important role on the contract negotiations, as well as the environmental dimensions of the transaction i.e. uncertainty, asset specificity and frequency. The evidence points to a greater role for uncertainty and asset specificity in defence transaction, rather than frequency.

They impact the contract negotiation and the ability of the project managers to deliver the value for money criteria of the MoD. It has been shown where MoD is unable to

manage the uncertainty and asset specific nature of the transaction failure to meet value for money becomes more likely.

Contract design is therefore important in mitigating the effects of these environmental dimensions. However, the contracts in defence using fixed-price and incentive-based contracting are characterised by an optimism-bias. The prime is unable to meet the unrealistic targets set by the MoD in the original tender; however the contractor fails to make this clear in fear of losing the contract. In the second section optimism-bias has been identified as a combination of behavioural uncertainty and opportunism, the consequences of which are that it contributes to increasing transaction costs.

The failure to meet these unrealistic targets and milestones usually results in renegotiating the contract and in some cases by retendering the contract (Bowman CIP). The former is more likely because the MoD is usually locked-in to the supplier, due to the pre-contract asset specificity, at the moment where renegotiation takes place (as was the case with the Devonport Nuclear Submarine facilities). Renegotiation favours the supplier since they can usually shift the contract to more realistic targets, while at the same time recovering their losses from the previous contract.

Information Transfer Issues can have a destabilising effect on the contract design and execution. In cases where the MoD lacks the information to outline specific elements of the project (contract contingencies) the Prime may take advantage of this information

asymmetry by refusing to deliver certain requirements. This has been a problem specifically in the transfer of technical data, since the Prime sees it as a part of its IPR.

Prime contractors have also complained of a lack of information from the MoD, which creates difficulties in the tendering process and thus increases bidding prices. Information sharing is an important part of partnership agreements; it is therefore more likely that such information transfer issues may be reduced by applying partnering.

The role risk plays in defence acquisition has been discussed with respect to the way it is presented in the data by the NAO. The NAO definition of risk is incongruent to the definition provided by the Carnegie School. This difference provides an interesting view of how the NAO discusses risk in the VfM reports.

The NAO views risk retrospectively, hence discussing past events, and prospectively, in terms of threats to achieving objectives for the future. These two perspectives have been identified as possessing an element of learning and uncertainty, respectively, in the TCE perspective. However, they do not conform to the more analytical process outlined in the Carnegie School definition of risk.

In dealing with the uncertainty and complexity evident in defence transactions, as well as the bilateral dependency, the success of recent applications of bilateral governance approach to defence acquisition has been identified. The transactions in a bilateral

governance relationship is more conducive to a relational contracting approach, which has at its core an emphasis on collaboration, cooperation and communication.

IPTs have been the main vehicle to deliver these objectives in the partnership with industry. However, there are some concerns in the effectiveness of the application of the IPT mechanism.

Where appropriate funding is available for information sharing, co-location of the teams and where trust is at the heart of the transaction the project is more likely to be successful. It is also important that the MoD is equal to the supplier through achieving its desire to become an 'intelligent customer'. Therefore, the MoD will need to invest in training its people, especially its contract negotiators and project managers, and utilise transaction-specific learning, where it exists.

9 Conclusions

9.1 Summary

Acquisition Reform has been the buzz words in the UK defence arena for the last decade. There have been major developments in defence acquisition, from privatisation to the introduction of Smart Acquisition principles. These changes have been gradual movements in defence acquisition policy over the past fifty years; however in the past decade, the pace of change has accelerated with greater focus being placed on improving the MoD's industrial relations, more specifically in acquisition management.

The policy challenge for defence acquisition has, on the whole, remained the same – how to deliver defence equipment and services on time, to budgeted cost and at the desired performance requirements. The technology has advanced but the fundamental objectives of value for money is unchanged. The MoD has implemented a number of acquisition policy reforms, in the last few decades, in order to achieve this value for money goal.

There are three key periods in recent history of defence acquisition were identified in the literature review of Chapter 2. The first marks the privatisation of UK defence production which was initiated in the 1970s and continued in the 1980s. The second period, the late 1980's to early 1990s, saw the introduction of competition and a liberalisation policy into defence acquisition. More recently, the third period is signified by organisational and

process developments in defence acquisition policy introduced in the late 1990s and continues to be a focus of the current UK coalition Government. The analysis of these three periods provides a great amount of detail on how the relationship between the MoD and Industry developed over time.

In the first period the privatisation policy resulted in the creation of powerful enterprises within the defence industry. These companies were able to strengthen their positions in the industry and gain a monopoly in their sector, by consolidating their market base through mergers and acquisition. The MoD followed a cost-plus, non-competitive approach in its acquisition policy during the early days of privatisation. This created what many commentators described as a *cosy relationship* within the defence industry.

As the Cold War era drew to an end, and resulted in the fall of the Berlin Wall and the demise of the Soviet Union, defence spending fell sharply. The MoD became less reliant on the defence industry and began its reforms of defence acquisition led by Sir (now Lord) Levene in the late 1980s. The focus of the Levene Reforms were to create greater competition in defence acquisition and a more stringent buyer, in the part of the MoD, with firm- and fixed- price contracting identified as more appropriate to achieving value for money.

The MoD liberalised the defence industry in the 1990s, creating greater competition for the national monopolies in defence, by allowing a number of European and US

companies' greater access to the UK defence market. However due to political sensitivities, the 'Buy British' mentality had not changed, and most of the major contracts were still being won by the domestic industrial base.

Given this many of the international defence companies entered into joint ventures, mergers and acquired UK companies willing to divest their defence businesses, in order to be able to compete with the national champions. The hard bargaining approach by the MoD resulted in an *adversarial relationship* with industry, which saw its profit margins threatened.

The third period represents the current situation in defence and where this research aims to contribute to knowledge. Many of the defence companies active in the 1970s have either consolidated their position in the UK market (e.g. BAE Systems) or divested their defence business (e.g. GEC). This was in response to the changes implemented in defence in the second period. Companies which saw defence as part of their core business aggressively sought to consolidate their positions in the market, whereas others decided to divest and enter the civilian market.

The result has been the creation of a defence industry of large multinational companies with monopoly powers in sectors of the UK defence market. The MoD's competition policy has, however, been unchanged and as such the situation is one where the MoD, as a monopsonist, is negotiates with a monopolistic supplier. It is clear the MoD see these

monopolistic defence companies as the preferred bidders as they are usually the only ones which can deliver these major defence projects.

The MoD has in recent times introduced a number of acquisition reforms (e.g. Smart Acquisition and IPTs) and reorganisations (e.g. creation of DE&S). It has outlined its desire to engender 'long term, open relationships' with Industry to improve defence project delivery and achieve value for money. However, these acquisition reforms are unable to fulfil their promise due to how the MoD follows its competitive pricing approach in major defence projects. This period in defence acquisition is therefore characterised by a *confused relationship* between the MoD and Industry.

This research has, as part of its objectives, the aims of understanding why defence projects still fail to achieve value for money, how defence acquisition can be improved and thus to apply Transaction Cost Economics (TCE) theory in order to provide clarity (as outlined in section 1.2.3). The effectiveness of applying TCE, compared to other economic theories of defence procurement, has been justified in terms of its focus on transactional issues. The application of theories, such as principal-agent theory, competition theory and game theory, to defence has been presented in comparison to studies which use TCE (see Chapter 3).

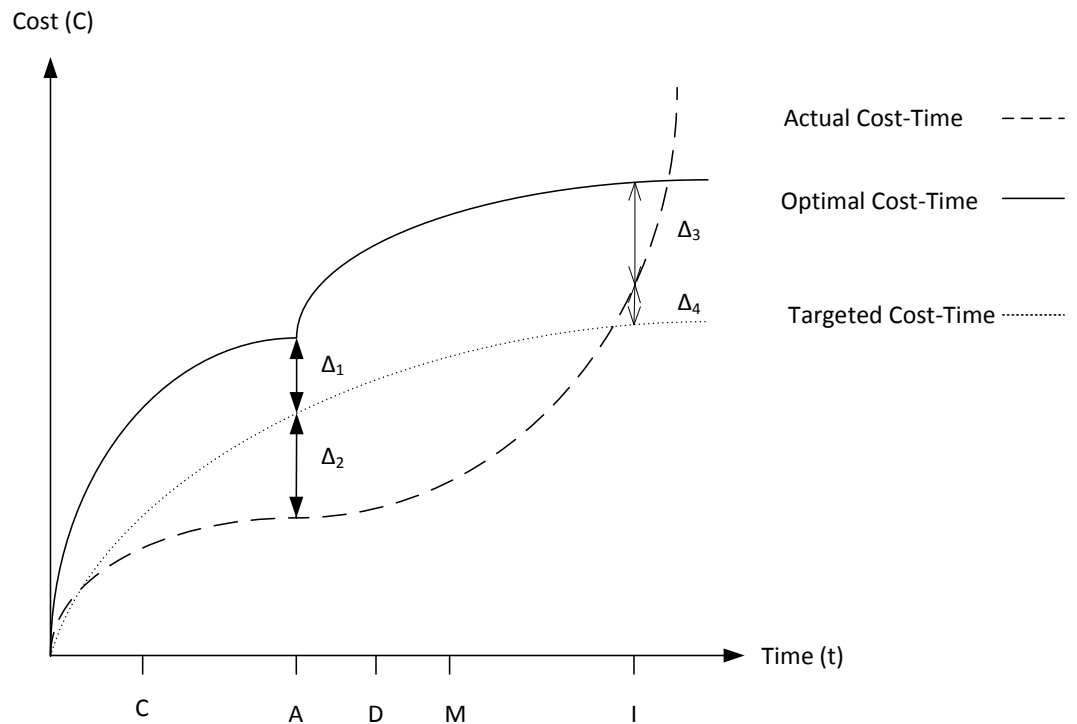
TCE provides a theoretical perspective to the exchange of intermediate goods in a variety of organisational modes in the firm to the market structure spectrum (discussed in section

4.1). The theory suggests that in all transactions of this kind, there are environmental and behavioural factors which determine the appropriate governance mode to avoid organisational failure.

The presence of any of the environmental factors - uncertainty, asset specificity and frequency - manifests human behavioural factors - bounded rationality, opportunism and learning - respectively. This creates contractual hazards which need mitigation by the safeguards in the governance mode. The transaction is also influenced by the institutional context (or as Williamson describes it 'atmosphere') in which it takes place.

To understand the current situation in defence acquisition Major Project Reports from 1993 to 2010 were reviewed in chapter 5. The main findings of these reports were that in general most defence projects go beyond the forecasted cost and time, and fail to meet some key user requirements. The reasons given for this situation are a lack of investment in the projects assessment phase, the ineffective application of acquisition reforms such as smart acquisition, and the provision of unrealistic cost and time estimations. Figure 9.1 represents a descriptive model of the cost-time progression in defence projects based on the findings from the Major Projects Reports.

Figure 9.1: A Descriptive Model of the Time-Cost Progression based on MPRs



In Figure 9.1, the intention is to capture, very generically, the findings of the Major Projects Reports (in Chapter 5) and the literature review of UK defence acquisition (in Chapter 2). I intend to show two aspects: first, the way cost progresses over time for major projects, from the concept phase to the in-service phase (CADMI-(D): the disposal phase is out of the time range of the graph), in three scenarios actual, optimal and targeted. Second, the aim is to show the differences (Δ_n) in investment (represented by cost gaps) at the assessment phase and in-service phase.

The three lines show very different trends lines. The progression of the targeted cost line represents the optimism-bias prevalent in defence project planning, in that the decision-

makers underestimate the investment required. The line represents a steady cost progression throughout the project lifecycle.

The actual cost line illustrates a rather cubic expression, with the funds for the defence project starting steadily and at the turning point (the assessment phase) the cost escalating, due to the lack of investment during the concept and assessment phases. Project costs continue to escalate at the in-service phase, due to a variety of reasons, such as user requirement changes, technical difficulties and so on.

The optimal cost progression illustrates the cost trend line for how a project could be planned in a two step investment plan. It shows greater investment during the concept phase (more funds for risk reduction and technical development work). An injection of funds (at a lower rate than the concept phase) is then expected in the second step at the assessment phase. This will ensure investment is available for the project to meet its in-service date and user requirements, resulting in the cost levelling out at the in-service phase.

The differences in funding at two points in the acquisition process, the assessment and the in-service phase, are shown. At the assessment phase there are two interesting investment differences:

1. The difference between the targeted cost and the actual cost, Δ_1 , shows a lack of investment into defining and planning defence projects, which then impacts project costs at the assessment phase (described in Chapter 5).

2. The difference between the optimal cost and targeted cost, Δ_2 , demonstrates the optimistic expectation, in investment, for effective preparation to progress to the demonstration and manufacturing phases. The difference between the targeted and optimal cost represents the total investment gap during the assessment phase.

The cost gaps at the in-service phase represent the expected costs when the project reaches its in-service date:

3. The cost of the project when following the optimal trend line is higher than that of the actual cost, as shown by Δ_3 . However, the optimal trend line levels off whereas the actual cost trend line continues to grow and surpassing the optimal line over time. This is because in the current situation unforeseen costs impact the project (identified as transaction costs in this research).
4. The cost of the project in the targeted cost line is optimistically planned to be lower than the actual cost. While Δ_4 is smaller than Δ_3 , the actual cost is still rising whereas the optimistic expectation is that it will level off. The optimal line shows that the cost can level off, but at a higher cost (due to greater investment) than the optimistic view shown by the target trend line.

While the cost of the project is higher in the optimal cost trend line it delivers a better overall cost than the actual progression of current projects. The optimal cost line takes into account two important principles of Smart Acquisition: early investment and whole-life costing. It is also expected that with experience (transaction-specific learning) these of the optimal cost plans, the timeline would improve with shorter gaps for the CADMI timeline.

The research findings are based on a content analysis of seventeen *Value for Money* Reports, using NVivo 8 software (presented in Chapter 7). The results of the quantitative analysis provide some interesting indication of the most common topics discussed by the NAO in the reports. The most commonly discussed topics were from the risk category, which suggests that risk, is a major focus of the reports (shown in Figure 7.1 and 7.3). However, the analysis of the risk node provided a difference of understanding as to what risk represents in the NAO reports and from academic definition (discussed in section 8.3.1).

However, the most indicative findings originate from the qualitative content analysis of the value for money reports. When applying TCE to the VfM references (in section 7.3) a picture of defence transactions is developed. A set of propositions based on TCE theory were tested using the qualitative results from the content analysis. The findings of these propositions, as applied to the data, provide the basis of the conclusions of this research (originating from Chapter 8).

9.2 Conclusions: The UK Defence Acquisition Process

The reasons why defence projects fail to deliver value for money under the current system of acquisition is based mainly because of the confused state in which the MoD approaches the defence industry. The MoD's industrial relations are a mix of a desire to work collaboratively with industry and an aggressive competitive pricing policy to drive

down defence costs (a policy which has on the whole failed). However, the MoD has been unable realise that it is able to achieve value for money by creating a more constructive relationship with its prime contractors from the defence industry.

These findings are proven by the TCE analysis applied to the findings of the content analysis of VfM reports stretching as far back to 1983 (Trident Project) to reports on more recent projects (Type 45 Destroyer). The advantage of having reports ranging over a long period of time, some of which have never been analysed by researchers, is that it is possible to see the progress within acquisition policy.

The findings are positive in many aspects, in that they indicate that the MoD have the right mechanisms in place to create the collaboration it desires with Industry. Smart acquisition principles and the IPT mechanism have been identified as key aspects to achieving the desire for collaboration and consequently value for money. However, it is due to the fact that the MoD have failed to properly utilise the smart acquisition policies and IPT engagement that cost and in-service date slippage was common in the early 2000s. Recently, there have been improvements however I present recommendations that the MoD can follow to ensure the IPT mechanism, along with smart acquisition principles, can deliver project success.

This research concludes that the MoD needs to strengthen its **relational contracting** mechanisms. The findings of Proposition 1 demonstrate that the bilateral dependency

between the MoD and its prime contractors is a consequence of the fundamental transformation (i.e. a lack of substitute suppliers).

Prime contractors are able to take advantage of the investments which the MoD provides in defence projects to create post-contract asset specificity in the transaction. The MoD are then left in a situation where it is locked-in to the supplier due to the high switching costs. A bilateral dependency condition then exists because the prime contractor invests in the transaction or the relationship, in order to gain pre-contract asset specificity advantages for future contracts.

This bilateral dependency creates a long-term transaction relationship between the MoD and the Prime. However, the MoD attempts to resist this through policies of pseudo-competition, contractor shadowing and requirement changes. This does not have the desired outcome; rather it creates an adversarial nature to defence transactions.

Projects thus fail to meet the value for money criteria because they are unable to adapt to the environmental factors, which create frictions in the transaction. Proposition 2 supported this theory for Lemma 1, which focussed on the presence of uncertainty, and to a lesser extent Lemma 2, the asset specificity of the transaction. The proposition of frequency creating project failure, Lemma 3, was rejected; instead it is supposed that the learning effects of recurrent transactions leads to greater project success.

In Proposition 3 it was proposed that the MoD would respond to project failure, due to the transaction-costs, by implementing organisational changes through a governance trade-off. The interesting aspect of the findings is that the more recent (smart) projects, reported within the last decade, supports the proposition and furthermore has been successful in implementing the changes from a traditional market-based approach towards bilateral governance, using an IPT organisation mechanism.

The MoD has therefore at the institutional level introduced policies such as smart acquisition and prime contracting, which has a long-term focus in its relationship with its suppliers. At the governance level, it is clear that a majority, but not all, of the MoD's transactions with its prime contractors follow a bilateral governance approach. At the process level there is an attempt to implement mechanisms, which emphasises a relational contracting approach to acquisition using the IPT mechanism.

This relational contracting approach, as described by TCE and consequent studies, is characterised by a more open relationship between the buyer and supplier, with trust as an important contractual safeguard and, communication and collaboration as a focus for the working relationship. While there have been some important steps towards following this contracting approach, there has been some indications in the analysis to show that the MoD has not fully embedded the approach in its acquisition process.

Any other organisational approach in what is evidently a bilateral governance mode is responsible for the failures, as predicted by TCE, in meeting value for money. Relational contracting provides contractual safeguards to reduce the impact of uncertainty and asset specificity in the transaction. This allows the MoD and its prime to deliver the projects according to the value for money criteria.

Competitive tendering may still be applied rigorously in projects with low asset specific investments and larger supply base. The partnering approach is not a one-size fits all policy; the MoD's acquisition team will need to assess the efficacy of competition against partnership on a project-by-project basis. However, most major defence projects display bilateral dependency acquisition characteristics and rather than enforce unrealistic competition, it may be more effective to follow a partnership approach.

If the MoD follow a competitive bidding process, where partnering should be applied, it is clear that optimistic and unrealistic contracts will be the result. This has been shown in this study, and is based on the effect uncertainty has on contracting, resulting in the optimism-bias in defence acquisition. The connection between uncertainty and optimism-bias has also been shown in a study by Gardner and Moffat (2008). In section 8.3.3 the optimism-bias has been described as being a combination of behavioural uncertainty and opportunism on the part of the buyer and supplier.

The conclusion of this current research is therefore for the MoD and Industry to enter into a new era of acquisition policy characterised by strong and effective *long-term relationships*. Some may see this as suggesting a return to the days of the cosy relationship; however this would be to misunderstand the advances made in defence acquisition over the last few decades. The balance of power in the defence industry is more or less equal nowadays between multinational defence companies and a national buyer with regulatory powers. There is more to gain through working in collaboration than adversarial engagement.

The basis of a relational contracting approach is to foster an ethos of communication, collaboration and cooperation. It is also important under this approach that the MoD and industry enter flexible contractual agreements, which provide space for unforeseen circumstances. The contractual agreements of current defence transactions are too rigid and make it difficult to respond to changes without having to renegotiate the contract.

The solution to such difficulties is to allow the IPT to resolve contractual disagreements. Since contractual disagreements are usually based on technical factors or exchange hazards (IPR and so on), the IPT is best placed to resolve issues of technical difficulties or trust issues. The IPT mechanism is important not only due to the co-location of team, but also the closer working relationships that it fosters. IPTs are also best placed to implement transaction-specific learning in order to learn from retrospective studies of project risks and reduce the impact of uncertainties on the project.

Incentive-based contracts have the best structure to provide flexibility in contracting. However rather than creating penalties where milestones and targets are missed there should be an opportunity for the parties to jointly tackle these issues by discussing ways to remove these delivery risks through trade-offs, investment in monetary or human capital, or bringing in a third party to provide support (technical, consultancy or logistics).

Fixed/Firm price contracting can be applied to support contracts where there are less contractual hazards. These should however be contracted not at the procurement phase, but as the partners move towards the in-service phase. With relational contracting, it is less likely that the hold-up problem would impact the support contract since there is a long-term objective in the relationship.

The ultimate contractual safeguard in relational contracting is reputation. Long-term partnering provides the defence companies with risk minimisation, increasing their ability to survive in the future. They would be risking their future survival if they were to act opportunistically for short-term gains.

The MoD might reach a point where it would be willing to look at the defence supply chain to promote Small to Medium Enterprises (SME) acting as second-level suppliers, where it feels there is irreparable damage to the trust with the long-term partner. However if it wants to have this possibility, it needs to improve its industrial strategy, with respect to the role SME's play in the defence market.

In turn the MoD would also have an interest in ensuring it does not endanger the partnering approach by acting opportunistically. If the MoD were to act in such a way, this would return the relationship back to an adversarial one, in which contract disputes and project failures are the most likely outcome. It will have to therefore reassess its use of some mechanisms it has used in the past, to gain competitive pricing such pseudo-competitions, contractor shadowing and unnecessary requirement changes.

The MoD should not abandon all other procurement routes in this new policy of relational contracting; it should employ PPP arrangements such as PFI (though it needs to design better governance arrangements for this procurement type) and international collaborations (with NATO or EU allies) where necessary.

Where the MoD wishes to transfer greater risk in specific projects (PFI), or where allied capability would benefit from joint-capability (international collaboration), it may be appropriate to use a separate procurement route to partnering. However, it is the recommendation of this research that in most of its national acquisition, where the MoD needs to engage bilaterally with industry, the MoD should follow a relational contracting approach.

9.3 Recommendations

Based on the report analysis, the following recommendations are put forward, though primary research would be required to make more specific recommendations of changes at the process level:

- **The Relationship:** entering relational contracting arrangements based on a long-term partnering approach with Primes (§8.4.2). The MoD needs to create a new industrial strategy, which will assess how this new approach will be embedded as part of the defence acquisition process. This could be addressed in the long awaited follow-up to the Defence Industrial Strategy White Paper. This will look at how prime contracts are identified, selected and delivered. It would also be an effective medium to communicate the MoD's desire and commitment to a new approach to industrial relations.
- **The Contract:** designing and introducing flexible incentive-based targets (§8.2.3). The NAO and MoD (with contributions from Industry) should work together to identify mechanisms which would improve the flexibility of incentive-based contracts. This should focus on how targets and milestones are assigned to contracts, and how the MoD can encourage industry to be more open in their technical capacity.
- **Conflict Resolution:** removing penalties and replacing them with joint-problem solving mechanisms which may use third party expertise, in agreement with primes, where targets are being missed (§8.4.1). Third party involvement such as consultancies, technical experts, and logistic support can provide a useful service in dealing with difficulties in major defence projects. By removing penalties and replacing them with these problem-solving mechanisms, the focus turns to solutions rather than litigation.
- **The Mechanism:** continuing to improve and promote the IPT mechanism (§8.4). The IPT Mechanism should be supported by having high-level personnel involved

from the MoD and Industry. Project managers need to be empowered in their decision-making and management of the projects.

- **The People:** investing in training and developing its DE&S staff, which are at the frontline of acquisition policy and practice (§8.4.3). If the MoD is to realise its aim of becoming an 'intelligent customer', then it needs to invest in its negotiating and technical capacity, especially in its staff.
- **Database of Learning:** creating an acquisition database, which IPT members can access to gain transaction-specific learning. Some restrictions may have to be in place where there may be IPR conflicts (§8.4.3). However, this database can be used to learn lessons from past procurement experiences.

10 Applications, Limitations and Further Research

10.1 Chapter Overview

This chapter will assess the possible applications of this research, the limitations in the research and suggest further research. The application of this research will be discussed in the first section, with a focus on the theoretical implications and the practical applications of the research. The second section will present the limitations in the research; primarily in the lack of empirical research of this study. The opportunities for further research into defence acquisition research and TCE will be proposed in the final section of this chapter.

10.2 Applications

10.2.1 Theoretical Implications

This research contributes to theory in two ways: First, the research contribution to defence acquisition research and second the contributions made to TCE theory. Defence acquisition research originates from defence economics, defence acquisition is more focused on procurement policy and buyer-supplier relationship prior to- and post-procurement. TCE is well established in economics, with a large literature base and empirical research.

Defence acquisition uses economic theory in order to provide a description of defence acquisition practice. This research continues the economic emphasis of defence

acquisition research and aims to contribute defence acquisition theory. The focus is at the microeconomic level, specifically the governance level of defence acquisition. However, there are discussions of the effects of the institutional and process levels on the governance of defence transactions.

This research applies TCE theory to defence acquisition. Previous research on defence acquisition (such as Peck and Scherer (1962) and Williamson (1967)) highlights the uniqueness of uncertainty in the contracting process. This research supports this view on uncertainty and highlights the effects of the presence of uncertainty in creating transaction-costs. The combination of behavioural uncertainty with opportunism has been identified as the optimism-bias situation in defence project planning.

The research findings present new knowledge about the reason for the bilateral dependency in defence acquisition, on major acquisition programmes. The creation of post-contract asset specificity in the transaction is identified as being due to the fundamental transformation. Furthermore, the prime contractor can then seek to make the contractual engagement long term, due to pre-contract asset specificity which makes it difficult for the MoD to seek alternative supplier in consequent transactions.

It is argued that the effective use of relational contracting is key to reducing transaction-costs in defence acquisition, under conditions of bilateral dependency. Relational contracting is a relatively under researched aspect of TCE theory. While there is some

research into its theoretical application, there is a gap in empirical research. The focus of this study is on the reasons why it would be a more appropriate form of governance for defence transactions. Further research is required to document its effectiveness and use, this would require empirical research.

10.2.2 Practical Applications

In a meeting with the NAO (November 16th 2009) Mr. Banfield explained the desire of the NAO to encompass a qualitative approach to the data analysis of their reporting. This research provides an example of how long-term reviews in defence (such as Strategic Defence Reviews) can be expanded, by collating data from a larger source of data (such as MPR, VfM etc.).

The Government has indicated the need for more regular strategic defence reviews, at five year intervals. The research method applied in this study may provide an effective way of collating, categorising and analysing large documented data.

The use of qualitative software (such as NVivo) and applying content analysis methods (such as categorisation, relationship formulation and modelling) could be useful in application to a variety of reporting (e.g. MPR, SDR, and VfM reports). The data can be presented in a number of formats (charts, graphs and summaries) which make it easier to digest for the user and easier to present trends and developments.

10.3 Limitations

The main limitation in this research is the lack of direct contact with the subjects (the subjects being the MoD and the prime contractor) in the IPT setting. In the original research plan there were provisions to gain access to IPTs in order to make observations, conduct interviews and gain feedback through workshops with IPT members. This would have provided primary data on the daily activities of IPTs and empirical research on the nature of the collaboration in IPTs.

Interviews with IPT members would have provided greater understanding of what the individuals' perspectives of the engagement are. The benefits of this type of fieldwork are shown in the findings of Kebede *et al.* (2009), in which Dr. Maytorena (co-author and researcher at NECTISE at the time) was able to identify interesting information and opinions from IPT members.

In addressing such limitations it is argued that the NAO reports provide a reliable and independent source of information in defence acquisition. However, it is acknowledged that greater learning can be gained, specifically at the process level, when the research is based on fieldwork engaging with the subject. The limitation of this research is a common difficulty of research into security sensitive areas such as defence, where stakeholder sponsorship is the best way to gain access.

10.4 Further Research

The economic crisis, which began in the early stages of 2008, has had major consequence for public spending. The coalition agreement post-election in the UK outlined public spending cuts. SDR2010 highlights the cuts to be made to defence projects and personnel. Defence is a popular target for cuts when public spending is scrutinised, especially where the public do not perceive eminent threat to the home nations.

The tectonic model (Figure 4.3) by Winch (2010) highlights that the structural changes at the institutional level impacts the actions at the governance and process level and consequently changes will emerge to the structures of the levels. Williamson (1998) points out that institutional change occur at a frequency of decades (Figure 4.4), and as such the impact of the current economic crisis may be evident as soon as 2018.

The challenge of reducing the defence budget deficit will impact the way the MoD engages with the defence industry. In my view, it makes the case for a better collaborative approach to defence acquisition more immediate. However, it will be interesting to see how the MoD will respond to these new challenges. The manner in which the contract renegotiations are undertaken for the programmes identified for cuts, will determine the way the defence industry will view its relationship with the MoD.

I believe that relational contracting is the best way to deal with the political and economic uncertainties in defence. These new challenges, from the academic point of view,

provides an opportunity for further research into defence acquisition policy with greater focus on the institutional level and its impact on the governance and process levels.

This research requires greater contact with MoD, Treasury and Industry officials for a holistic approach to this new acquisition challenge. A longitudinal approach would be most appropriate in this study in order to chart the changes in defence spending as a consequence of defence cuts, over a period of five to ten years.

Further research into TCE is required in order to strengthen its claim to empirical success. There are four specific areas which I feel could benefit from further research, these are: behavioural uncertainty, transaction-cost learning, hybrid governance and relational contracting.

Behavioural uncertainty has not received as much attention as other types of environmental uncertainty. This may be due to the fact that Williamson does not fully develop his views on behavioural uncertainty. However, as shown in this research there are examples of where uncertainty on the decision-makers' choices or motives can impact the transaction-costs. Specifically, optimism-bias is shown as a function of behavioural uncertainty and opportunism where idiosyncratic investments are involved. Further research into optimism-bias using a transaction cost perspective is needed to provide more concrete findings.

Winch (2001) identifies learning as part of the TCE framework and represents it as a function of the frequency of the transaction. Learning has been neglected in TCE research, as has frequency for that matter. There is a need to provide greater understanding on the role frequency and learning play in transaction-costs.

This research has found no support for frequency creating transaction-costs. The reason for this, in my view, is due to the transaction-specific learning opportunities in recurrent transactions which allow the decision-makers to make informed decisions. The learning in transaction-costs differs to those in production-costs (learning curves) or firm-specific learning (tacit knowledge); instead it is based on experiential learning.

The analysis of the risk category identified retrospective risk as being a learning-based factor. It would be useful to investigate how this retrospective risk can be applied to transaction-specific learning in defence acquisition in order to reduce the effects of prospective risk (more accurately described as uncertainty).

Hybrid governance was identified by Carter and Hodgson (2006) as being less researched than the other governance forms. There are more cases of joint ventures, and other alliance types, in more recent times and thus there is currently greater opportunity for further research into the hybrid form.

The telecommunications and electronic industry is a good example of using hybrid governance. Alliances are more common in this industry because of the multifunctional nature of entertainment and communication products in consumer markets for mobile phones, computers and home entertainment systems. Some companies prefer to concentrate on their core competencies and enter alliances in order to produce multifunctional products for their consumers.

The UK is looking to privatise its new build capacity in the nuclear sector, to replace the current set of nuclear power stations being decommissioned in the next few years (my Masters dissertation was on this subject). In health care there is a proposal from the current Government to allow greater involvement of the private sector in the NHS. The trend is therefore in favour of a market approach, however due to the transaction-specific investments needed in these transactions (especially in the defence and nuclear industries); bilateral governance is the favoured governance form from the TCE perspective.

Relational contracting has been identified as one of the examples of contractual means for bilateral governance relationships. However, there is a need to provide more empirical research into relational contracting and other contracting approaches which can be used to support bilateral governance. Using primary research, with a combination of observation, semi-structure interviews and relationship modelling we can expect more rigorous research into the relational contracting approach.

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12 Appendices

12.1 Appendix I – Example of References for Defence Acquisition Process Nodes

Contract Environment

Inherent complexity of the requirement when CIP was added in 2002, combined to make the programme challenging from the outset. And the requirement has evolved and been clarified over time against the background of rapidly changing communications in the civilian sector. [Bowman CIP]

Contract Negotiations

Appropriate analysis of demand and usage data is also fundamental to calculating the level of repair service required from a Prime Contractor and it is essential to achieving an affordable contract price. A lack of robust data has meant that reaching positions from which to negotiate availability contracts has been difficult and time consuming. [Logistic Support for Fast Jets]

Contract Risk

We also found that, although the Department chose a ten year contract period which can pose risks to value for money in a fast changing sector, they sought to address those risks. [Defence Communication Services]

Contract Type

The Department acknowledge the need to ensure that proposals for specification changes are closely controlled if they are to avoid sacrificing the benefits of the fixed price agreed with VSEL. [Landing Platforms for Helicopters]

Contracting for Availability

As the Department moves to contracting for availability its direct relationship with second and third tier suppliers will end and the Prime Contractors will take over management of the supply chain. [Logistic Support for Fast Jets]

Contracting Process

The Department intended to hold a separate competition for the training package but McDonnell Douglas' ownership of the design rights, and the tight timetable made the competition unattractive to other bidders. [Apache]

Defence Acquisition Process

The CNGF and many of its combat equipments will be procured through international collaboration with France and Italy, and the overall programme is likely to be one of the most complex warship procurements ever undertaken by the Ministry of Defence (the Department). When operational, the CNGF will be a very sophisticated and capable warship providing an area defence capability. [Common New Generation Frigate]

Delivery Risk

There are, however, a number of risks both to achieving these dates and to delivering the full capability in the longer term. In the short term these include integrating the destroyer and PAAMS; and trialling and operating the Combat Management System. The Department and industry have taken a number of additional steps to mitigate these risks including constructing test facilities for the many elements of PAAMS. [Type 45 Destroyer]

Fixed Price Contracts

MOD regard the fixed price obtained for the development and initial production of the two weapons as a major achievement and consider that there are other benefits from the financial and contractual arrangements agreed with the company. I agree that competitively priced contracts are to be preferred to cost plus contracts for development and initial production wherever possible to increase incentive to the contractor. [The Torpedo Programme]

Frequency

Since 1954, Lockheed Martin has built more than 2,200 Hercules aircraft, making it the most widely used military transport aircraft. It is currently operated by more than 60 of the world's air forces. The aircraft are used for a variety of purposes but primarily for movement of personnel and freight. [Hercules]

Incentive-Based Contracts

The Department devised a robust commercial structure for the DII contract. The structure includes contractor shadowing, incremental acquisition and payment on performance to

manage the risks of the Programme and drive contractor performance. [Defence Information Infrastructure]

Information Transfer Issues

Certain of the Vanguard facilities, including 9 Dock itself and the cross-site services, were completed, as planned, by the end of January 2002. However, this was only achieved after the Department agreed to fund extra measures in 2000 to recover a 23-week delay in construction. This delay arose, in part, because the Department was late in supplying DML with information on the process to be used for the decontamination of the reactors in the Vanguard submarines. This information was vital to DML's design of the facilities for the decontamination of the submarine's reactor prior to its refuelling. The Department had commissioned Rolls Royce to generate this information under a separate contract. [Submarine Facilities]

In-House Procurement

The project was to provide and maintain the Royal Air Force fleet of nearly 2,800 cars, light vans and minibuses. Operational control of the vehicles was to be retained in-house and short-term spot-hire of vehicles was to remain under existing contracts. [Non-Combat Vehicles for the RAF]

In-Service Risk

To protect against the risks of unacceptable, repair, maintenance and running costs, and of reduced availability during ships' period in service, lifecycle costing procedures and reliability/maintainability criteria must be established at an early stage of development. This risk has been recognised on the programme for the CNGF by the adoption of Integrated Logistic Support principles. [Common New Generation Frigate]

International Collaboration Projects

Eurofighter 2000 is being developed collaboratively by the United Kingdom, Germany, Italy and Spain. [Eurofighter]

Learning

Because of the similarities between the Astute project and the future submarine class which will carry the future nuclear deterrent, the Department needs to ensure that it has learnt these lessons of the Astute project and is putting them into action in the new

programme. [Nuclear Deterrent Capability]

Monopoly and Monopsony

The company, now Marconi Underwater Systems Limited (MUSL), is currently in a monopoly position for torpedo development and production in the United Kingdom, supporting MOD in the three on-going projects referred to above. [The Torpedo Programme]

Negotiation Power

The Department retained the interest of both bidders until they selected BT as preferred bidder in November 1996. This was despite BT's dominance and the fact that the Department requested two further bidding rounds after the first Best and Final Offer. [Defence Communication Services]

PPP and PFI

We found that the Department scoped the project in a way that may not have maximised the potential benefits and that they did not fully take into account the implications of changing the project to a privately financed deal during the competition. We also found that, although the Department chose a ten year contract period which can pose risks to value for money in a fast changing sector, they sought to address those risks. [Apache]

Risk

In March 2006, changes were made to the risk management regime. The processes for gathering information about key risks have been improved, and the leaders of the Programme now take greater ownership of strategic risks. [Defence Information Infrastructure]

Selection Process

To ensure the delivery of these facilities, at the same time as the sale of the dockyard and after four years of negotiation, the Department entered into a Prime Contract with DML for the design, construction, commissioning and licensing of the facilities in accordance with nuclear safety requirements. For its part, to ensure the project's successful delivery, DML adopted partnering arrangements with its key sub- contractors. The Department was

not part of these arrangements and kept its relationship with DML on a more traditional, contract-orientated basis. [Submarine Facilities]

Smart Procurement and Acquisition

The Defence Logistics Organisation has established Integrated Project Teams and introduced a number of initiatives to improve performance but it needs to ensure that project teams have the data to manage their businesses effectively. [Helicopter Logistics]

Technical Risk

Steps were taken to minimise the technical risks to the project. For example, Boeing selected Thales Limited to provide its “Top-Deck” digital cockpit which is from the same family as the cockpit fitted to the Department’s own A400M transport aircraft and the Nimrod MRA4. [Chinook]

Traditional Procurement

Financial control of major defence projects is based on MOD instructions which take account of the principles recommended in the Downey Report in 1966. These have been progressively developed to control complex and technically advanced projects throughout defined stages of their development, and to provide reliable estimates of costs as a basis for decisions on further work. [Trident Project]

Uncertainty and Complexity

Inherent complexity of the requirement when CIP was added in 2002, combined to make the programme challenging from the outset. And the requirement has evolved and been clarified over time against the background of rapidly changing communications in the civilian sector. [Bowman CIP]

12.2 Appendix II – NECTISE Poster

Poster Title: Defence Acquisition Process for NEC: Transaction Governance within Integrated Project Teams.

Presented: 21st January 2009 at the University of Loughborough.

Event: Mid-Term Review of NECTISE

- Interoperability
- Agility
- Dependability
- Knowledge
- Collaboration
- Availability
- Affordability

Defence Acquisition Process: Transaction Governance within Integrated Projects Teams

PhD Project September 2007 – September 2010



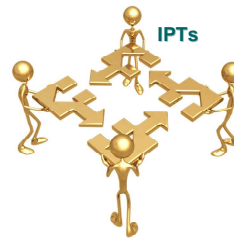
Ermias Kebede

Challenges

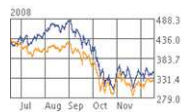
- Understanding how collaboration is engendered in IPTs
- Investigating the effect of contract design on collaboration
- What are the processes involved in IPTs

Approach

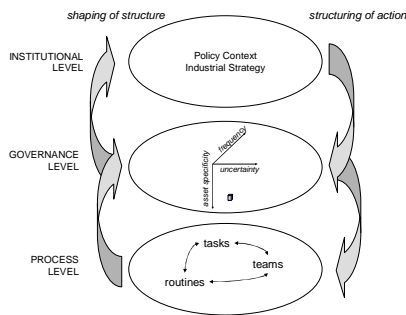
- Transaction Governance



Defence Market



Winch's (2008) Governance Model



MoD Policy

Lifecycle Process



Team Working

Value Statement

Collaboration is an important element of NEC, not only on the operational level, but also on the capability acquisition level. Using the transaction governance model we aim to identify the appropriate approach to a collaborative defence acquisition process.

EPSRC Engineering and Physical Sciences Research Council

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