A CRITICAL ANALYSIS OF THE GAP BETWEEN COLLABORATIVE RISK MANAGEMENT POLICIES AND PRACTICE IN CONSTRUCTION PROJECTS IN THE SCOTTISH HIGHLANDS

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Submitted in partial fulfilment of the requirements of the Degree of the Doctor of the Built Environment, December 2022.

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Acknowledgements

Contrary to what most people think, studying for a doctorate is not a solo pursuit. I would never have got to the stage of submission without the help and support of numerous people, some of whom I will never be able to properly thank. I was particularly fortunate in having two brilliant supervisors to guide me through the process, Paul Chynoweth and Kaushal Keraminiyage; I learnt so much from them that I will take with me back into the outside world. I must also thank Moira Mort. I'm dyslexic and, without Moira's reminders about submission dates and all her kind encouragement, I would have fallen by the wayside long ago. Derek Hales, the new course leader for the Professional Doctorate programme, has also been a great source of help and guidance.

Thank you also to my partner, Steve, my daughter, Ruby and two cohorts of Prof Doc students for their wisdom, practical assistance and advice, especially on the many occasions when I wanted to just give up.

This study is dedicated to Zoe Price (1973 to 2017) and to my mum (1943 to 2018)

Abbreviations

AEC	Architecture, Engineering and Construction
AW	Alba Water (pseudonym)
ARM	ARM Construction Ltd (pseudonym)
CE	Cost Engineer
CE's	Compensation Events (under NEC)
CIC	Construction Industry Council
CIOB	Chartered Institute of Building
CPs	Alba Water's internal Commercial Procedures
CTL	Commercial Team Leader
DE	DE Construction Ltd (pseudonym)
DMDP	Director of Major Delivery Partner
ECI	Early Contractor Involvement
HGV	Heavy Goods Vehicle
HIE	Highlands and Islands Enterprise
HLE	Highland Engineering Ltd (pseudonym)
HRT	High Reliability Theory
ICE	Institution of Civil Engineers
IStructe	Institute of Structural Engineers
MCL	MacCallum Construction Ltd (pseudonym)
MD	Managed Delivery (a department within Alba Water)
MDP	Major Delivery Partner (Tier 1 framework contractor for Alba Water)
NAT	Natural Accident Theory
NEC	New Engineering Contract

NRM	New Rules of Measurement
PC	Project Co-ordinator
PM	Project Manager
RDP	Rural Delivery Partner (Tier 2 framework contractor for Alba Water)
RIAS	Royal Incorporation of Architects in Scotland
RIBA	Royal Institute of British Architects
RICS	Royal Institution of Chartered Surveyors
RTPI	Royal Town Planning Institute
SP	Senior Planner
SPM	Senior Project Manager
SQS	Senior Quantity Surveyor
UHI	University of the Highlands and Islands
UK	United Kingdom

Units of Measurement

m	metres
%	percentage
£	pounds sterling

Abstract

Construction is an industry of low profits, high risks and frequent insolvencies. Recent high-profile collapses have led to more calls for clients to collaborate and share commercial risks with contractors. The effective practice of such policies may be hindered, however, by the adversarial culture of the industry and its largely positivistic view of itself.

Literature shows that the acquisition of effective commercial risk management skills requires socialisation across an epistemologically broad range of mainly applied subject disciplines. However, although human-social-interpersonal skills were not ignored in the socialisation of a young Quantity Surveyor within the study, greater emphasis was given to the development of their technical abilities.

The development of such human-social-interpersonal skills is key to collaboration, risk-sharing and the development of longer-term working relationships Two case studies of a building contractor and a utility client in the Scottish Highlands use documentary analysis, semi-structured interviews non-participatory observation and the seminal work of Argyris' & Schön's (1974) on espoused theories and theories-in-use. These find that a gap does exist between the organisations' commercial risk management policies and their practices. The historical, epistemological, cultural, organisational and interpersonal drivers of this incongruence are considered, together with the implications for the industry and areas for future study.

Key words: commercial risk management; Argyris & Schön and espoused theories and theories-in-use; non-participatory observation.

Chapter One

Introduction

United Kingdom (U.K.) construction, an industry with a turnover of £370 billion in 2016 (Department for Business, Energy and Industrial Strategy, 2019), generates extremely low profits. A 2011 study (Stonington, 2011) ranked construction margins lowest in a sample of 97 different industries. In 2015, average margins for the top 25 construction firms in the U.K. dropped below 1.5%, in spite of 80% of the companies recording an increase in turnover (Construction News, 2015). In a detailed study of construction profit margins from 2007 to 2017, EY reported yet another fall in average profits to 1% (EYGM, 2017). Only firms with significant revenue streams outwith construction achieved margins greater than 5% (Construction News, 2015).

Against this background, company failures are common with insolvencies in construction doubling between 2016 and 2018 (Clark, 2018). The government insolvency service confirmed that, in the year to Q2 2018, construction had the highest number of insolvencies of any industry including retail (Gerrard, 2018). 2018 also saw several of the U.K.'s largest construction companies, Carillion, Interserve and Kier, experience severe financial difficulties with Carillion becoming insolvent in December (Morby, 2018; Hussain & Aripaka, 2019).

The tacit ability of Quantity Surveyors to identify, assess and mitigate commercial risks would therefore seem to be one of the skills most urgently required by employers at this time. Whilst writers agree on the commercial value of tacit knowledge (Grant, 1996; Spender, 1996; Eisenhardt and Santos, 2000; Amit and Schoemaker, 1993; Kogut and Zander, 1992; Krogh and Roos, 1996; Peteraf, 1993; Pathirage et al., 2007) and its role in giving an organisation a *'sustained, competitive advantage'* (Pathirage et al., 2007, p117), such skills are hard to learn and difficult to teach.

Perhaps as a result of this skills deficit, there also appears to be a gap in the industry between its rhetoric of effective commercial risk management policies its actual practice. Companies, such as Carillion which claimed to have *'the right structures and processes in place'* (Zafar Khan, ex-CFO of Carillion, quoted in the Business, Energy and Industrial Strategy and Work and Pensions Committees report, HC769, 2018, question 302) continue to fail.

There has been a sustained effort by government, construction institutions, academia and individual companies and practitioners over the last twenty-five years to reform the industry by improving its efficiency and profitability, reduce defects and deliver a better service for clients. Many of these initiatives, for example the Latham (1994) and Egan (1998) reports, have sought to achieve these improvements by encouraging collaborative, long-term working arrangements in which commercial risks are shared. Linked to these initiatives is the development of new tools which aim to reduce conflict and encourage more effective partnerships between contractors and clients. The most important of these are the New Engineering Contract (NEC), adjudication and construction frameworks.

Whilst these tools have succeeded in improving some areas of the industry, in particular, reducing the number of legal disputes, the overall outlook remains unchanged. Profit margins and external investment remain low and operational risks, skills shortages and insolvencies are still high. Why are the policies of collaboration and risk sharing failing to deliver the promised rewards? How are these policies practised out there in the real world? Could a holistic analysis of the gap between the industry's rhetoric of effective collaborative commercial risk management policies and its actual practices help it to move forwards? And could such an analysis help individuals and organisations to improve their commercial risk management skills enabling companies to better collaborate, share risks and thrive?

1.1 Existing academic writings on commercial risk management

With an absence of academic writings in the field of commercial risk management in construction, this study began by considering related areas of risk management, notably accident learning in engineering, behavioural economics and finance and the work of Argyris and Schön (1974) exploring the incongruence between organisations' theories and those of their employees.

1.1.1 Accident Learning in Engineering

In his seminal work on risk management, '*Normal Accidents: living with high-risk technologies*' (1984), Perrow asserted that accidents in very interactively-complex, tightly-coupled technologies are inevitable. Companies primacy production and profit over health and safety and over-confidence in warning technologies encourages people to take risks. Variously described as a complementary or contrasting theory to Normal Accident Theory (NAT), High Reliability Theory (HRT) used non-participatory observations to elucidate the similarities between complex, high-risk technologies which operate in unforgiving environments and put a premium on reliability (Shrivastava et al., 2009). Other scholars, e.g. Wieck et al. (1999), have now developed a list of conditions necessary for this reliability, namely a strategic prioritisation of safety, careful attention to design procedures, a limited degree of trial-and-error learning, provision of redundancy, decentralised decision-making, continuous training through simulation, strong cultures that encourage vigilance to potential accidents, a pre-occupation with failure, a reluctance to simplify interpretations, commitment to resilience and flexibility of structure.

1.1.2 Behavioural Economics and Finance

Following the financial crisis of 2007-08 writings urging less reliance on mathematical models and a greater cognisance of the human factor in economics and finance – '*those aspects that*

can cause trouble when people make mistakes.' (Shiller, 2012, p9) have emerged. Although behavioural economics and finance is an emerging field and currently lacks a single conceptual base, as far back as the 1930s, Keynes questioned the idea that human beings always make rational economic decisions by describing economic decision-making as nothing more than a '*spontaneous urge to action'* (Keynes, 1936, p161-162). More recently, economics scholars have begun to explore people's visceral instinct for risk and sensation-seeking (Shiller, 2012), as well as ideas such as cognitive tunnel vision, cognitive dissonance, resource depletion and the effects of fatigue on brain function (Heffernan, 2012). From an anthropological perspective Tett (2009 and 2013) - drawing on Bourdieu's work - discussed the development of elites in finance and how social structures and social networks enable these elites to maintain their dominance. Tying together both the anthropological and psychological strands several writers have questioned the absence of the human factor in mathematical risk management models. As Paul Krugman said, '*I think there's a pretty good case to be made that the stuff that I stressed in the models is a less important story that the things I left out because I couldn't model them, like spill-overs of information and social networks.'* (MacFarquher, 2010).

1.1.3 Argyris and Schön (1974): Espoused Theories and Theories-in-Use

In an effort to explain the incongruence between organisations' policies and their actual practices, Argyris and Schön (1974) described two theories of action; tacitly held 'theories-in-use' which govern individuals' behaviour in particular situations and 'espoused theories' which people offer as explanations of their behaviour (Argyris & Schön, 1974, pxiii). Argyris and Schön believed the roots of organisational ineffectiveness lay in the historical nature of companies as entirely exploitative of human capital. They claimed organisations had been designed to ignore human nature and feelings and only to exploit them (Argyris & Schön, 1974, p xxxi). In essence, they argued that employees learned to espouse organisationally-acceptable theories whilst simultaneously employing their own concepts and strategies enabling them to

survive in a hostile work environment. Drawing on Goffman's work (1959) they suggested that individuals learn the arts of interpersonal diplomacy and policy in order to live in this '*pseudo-authentic…'* world (Goffman, 1959, quoted in Argyris & Schön, 1974, p83).

Argyris & Schön were clear that an individual's theories-in-use cannot be ascertained by simply asking or interviewing them; they must instead be constructed from observations of behaviour (Argyris & Schön, 1974, p7).

A common theme in behavioural economics and finance, accident learning in engineering and the work of Argyris and Schön (1974) is the emphasis on the technical at the expense of the human factor. Construction is a positivistic industry and it is in the history of the construction professions that the roots of this culture lie.

1.2 Historical Review

The earliest construction professionals attempted to ally themselves to the older professions such as law and medicine by stressing their work as being the application of a single science or humanities discipline. This reluctance to embrace the actual interdisciplinary (technical and human-social-interpersonal) nature of the professions hindered the institutional development of later construction professions such as quantity surveying and town planning. It has created a long-standing gap between policy/rhetoric and reality in all the construction professions. Biglan's 1973 model shows that this gap persisted into the twentieth century, at least in Higher Education. Most AEC professions contain an element of inter-disciplinarity and inter-disciplinarity is much further advanced in practice than in academia. The specific skills of commercial risk management are also inter-disciplinary with an emphasis on applied rather than pure skills.

Traditional methods of managing commercial risks in construction projects, for example traditional procurement, standard methods of measurement and measured bills of quantities,

developed very early in the history of the Quantity Surveying profession. As new methods of procurement developed in the late twentieth century the risk profiles between client and contractor changed too; with these changes commercial risk management of construction projects became more complex. Following several disastrous, high profile construction projects, successive governments launched enquiries into the failure of the industry. Collaboration, risk-sharing and the development of longer-term working relationships were key themes. New tools, such as NEC, construction frameworks and adjudication were also developed to aid this transition to a less-adversarial culture.

The ability to manage the commercial risks of projects in an industry with very low profit margins is likely to be a highly valued and mainly tacit skill; for historical reasons the preferred development domain for this knowledge is still practice rather than academia. The acquisition of effective commercial risk management skills requires training across an epistemologically broad, principally applied, spectrum of subject disciplines with as greater weight given to soft subjects as hard ones. Indeed, collaboration and risk sharing would seem to require the acquisition of soft skills such as team-working, negotiation and compromise.

How then do such requirements and the pressures, tensions and concepts that underlie them, manifest themselves in the 'real world'?

Firstly, do early career Quantity Surveyors receive training from an epistemologically broad spectrum of applied subject disciplines? And is there an absence of the human-social-interpersonal subject disciplines in their training? Is the industry, in fact, producing construction professionals who lack the human-social-interpersonal skills necessary for collaboration, risk sharing and the development of long-term working relationships?

Secondly, is there a gap between public-sector clients' well-intentioned policies of collaboration and risk sharing and their actual practices at project level? And how does the industry's positivistic culture impact on this?

1.3 Research Aims and Objectives

The overall aim of this study was to critically analyse the gap between collaborative commercial risk management policies and practices in construction projects in the Scottish Highlands and Islands.

Five research objectives were also defined and these are listed below:

1. To critically analyse the historical development of normative commercial risk management practices within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands;

2. To critically analyse the epistemological and cultural norms underpinning current commercial risk management practices within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands;

3. To critically assess whether there is a tension between the technical and the human-social-interpersonal aspects of commercial risk management in both contracting and client organisations within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands.

4. To test Argyris and Schön's concept of theories-in-action in both contracting and client organisations within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands;

5. To critically analyse the gap between policies and practice in the collaborative commercial risk management of U.K. construction and civil engineering projects, including the validation of new insights into the interpersonal motivations and organisational drivers of this gap, with a particular focus on the Scottish Highlands and Islands.

1.4 Methodology

1.4.1 Methodological Context

In an attempt to take a holistic view of the problem, the empirical study was designed to be two-handed, analysing commercial risk management from the perspectives of quantity surveyors in both a contracting and a client organisation. Studies 1 and 2 were carried out in the Highlands and Islands of Scotland where national carbon reduction targets have led to massive expenditure on renewable technology schemes and an allied investment in infrastructure for transportation of the energy to other parts of the U.K. Although the region suffers from specific issues such as its remoteness and lack of opportunities for advanced construction training, it also experiences many of the same problems as the industry in the rest of the U.K., namely low profits, high operational risks and skills shortages. The particular nature of the construction industry in the Highlands as small, informal and inter-dependent made the use of ethnographic techniques particularly suitable.

1.4.2 Methodological Approach and Techniques

The methodological philosophy was interpretivistic, using both deductive and inductive approaches.

For Study 1, the strategy involved a case study approach with an ethnographic slant. A synthesised framework between accident learning in engineering and behavioural finance and

economics developed during the Literature Review was tested within a medium-sized regional contractor. The cross-sectional study utilised documentary analysis, semi-structured interviewing and social network analysis.

For study 2, the strategy changed to one of a fully ethnographic case-study. A cross-sectional study of a large utility company used documentary analysis, semi-structured interviewing and non-participatory observations to test the work of Argyris and Schön on espoused theories and theories-in-use in a contracting organisation.

The move towards full ethnography meant the research had a strong un-folding aspect (Punch, 2006).

Sampling, reliability and validity (referred to here as 'trustworthiness') strategies were developed using Wolcott (1994) and Lincoln and Guba (1985). These involved the use of triangulation, peer debriefing, negative case analyses, member checking and the use of a reflective diary.

1.5 Data Analysis and Results

In respect of data analysis and interpretation, the work took a hermeneutic approach with the use of hermeneutic circles, adapted from Bontekoe (1996), adapted for each study.

1.5.1 Study 1

Analysis of the Study 1 data found that, although an inexperienced Quantity Surveyor was being trained in the human-social-interpersonal aspects of commercial risk management, rather more emphasis was given to the technical aspects. Further analysis of the data also indicated a possible gap between the company's commercial risk management theories and those of its senior staff.

1.5.2 Study 2

Analysis of the Study 2 data found a high level of incongruence between the company's policies and the practices of its Quantity Surveying staff. Team members often chose not to use the risk management tools mandated by company policies; instead they developed their own informal risk management plans. Their motivations for doing this were ride-ranging, for example, a desire to protect tax-payers, to improve the standing of the commercial department within the organisation, dislike of particular contractors or of particular individuals within contractors. Importantly, there was confusion about what collaboration meant and about what the role of the Quantity Surveyor should be in this new era. The Quantity Surveyors felt a tension between collaborating with contractors and the need to protect the client's contractual rights. This tension often caused Quantity Surveyors to use the language of collaboration whilst resorting to more traditional and adversarial techniques to protect their organisations' interests.

1.6 Contribution to Knowledge

The contribution to knowledge derived from Study 1 was the validation of the conceptual model developed from accident learning in engineering and behavioural finance and economics. This model illustrated the epistemologically-broad skills required for effective commercial risk management within construction. The early-career Quantity Surveyor was being trained in an epistemologically broad range of skills with greater weight given to the technical aspects of her education.

The contribution to knowledge derived from Study 2 was the validation of the gap between espoused theories and theories-in-use within a large utility company in the Scottish Highlands and Islands. Additionally, new insights into the interpersonal motivations and organisational drivers of this gap were validated in the study.

1.7 Conclusion

It was clear from the outset that the study's participants already knew there was a gap between what their employers espoused in terms of commercial risk management and what was actually being practised. Becker's (1982) advice to qualitative researchers, *'Sociology does not discover what no one has ever known before, in this differing from the natural sciences. Rather, good social science produces a deeper understanding of things that people are pretty much aware of'* (Becker, 1982, p 36) confirmed that the contribution to knowledge of this study was not just the validated revelation that these gaps exist, but new insights into their historical and cultural causes as well as the motivations, drivers, thoughts and feelings of those staff on the front line of collaboration and commercial risk sharing.

1.8 Thesis Contents

For the benefit of the reader, a summary of the chapter contents is now provided:

Chapter One of the thesis is the Introduction.

Chapter Two describes in more detail the Aims and Objectives of the study, adding a narrative review of each.

Chapter Three is the Literature Review.

Chapter Four details the Methodology used in each study.

Chapter Five contains the Data Analysis and Interpretation of both Study 1 and Study 2.

Chapter Six contains the Results of both Study 1 and Study 2.

Chapter Seven offers a Discussion on the findings, together with the limitations of each study, recommendations for further study and the Contribution to Knowledge.

Chapter Eight contains the Final Reflections of the author.

Chapter Nine contains the References.

Chapter Two

Aims and Objectives

2.1 The Research Aim

The research aim was to critically analyse the gap between policy and practice in the collaborative commercial risk management of construction projects in the Scottish Highlands.

2.2 The Research Objectives

1. To critically analyse the historical development of normative commercial risk management practices within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands;

2. To critically analyse the epistemological and cultural norms underpinning current commercial risk management practices within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands;

3. To critically assess whether there is a tension between the technical and the human-social-interpersonal aspects of commercial risk management in both contracting and client organisations within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands.

4. To test Argyris and Schön's concept of theories-in-action in both contracting and client organisations within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands;

5. To critically analyse the gap between policies and practice in the collaborative commercial risk management of U.K. construction and civil engineering projects, including the validation of new insights into the interpersonal motivations and

organisational drivers of this gap, with a particular focus on the Scottish Highlands and Islands.

Table 1 below now illustrates the objectives of this study together with a narrative explanation of their relevance to the aim.

Table 1: The Research Aims and Objectives: a narrative view

Research Aim		
The research aim was to critically analyse the gap between policy and practice in the collaborative commercial risk management of construction projects in the Scottish Highlands.		
Research Objectives		
Objective No.	**Description**	**Narrative**
1.	To critically analyse the historical development of normative commercial risk management practices within the U.K. construction industry	The tools - traditional and modern – available to Quantity Surveyors for managing commercial risks.
2.	To critically analyse the epistemological and cultural norms underpinning current commercial risk management practices within the U.K. construction industry	Who we are and how we see ourselves / the culture of Quantity Surveying.
3.	To critically assess whether there is a tension between the technical and the human-social-interpersonal aspects of commercial risk management in both contracting and client organisations within the U.K. construction industry	How we are socialised into this culture.
4.	To test Argyris and Schön's concept of theories-in-action in both contracting and client organisations within the U.K. construction industry	The theories we're told and the theories we develop for ourselves.
5.	To critically analyse the gap between policies and practice in the collaborative commercial risk management of U.K. construction and civil engineering projects, including the validation of new insights into the interpersonal motivations and organisational drivers of this gap	How and why these phenomena manifest themselves in the U.K. construction workplace.

The Literature Review now commences below.

Chapter 3

Literature Review

3.1 Introduction

3.1.1 Why this study? A personal reflection

I have worked in construction since the early 1980s when I left school. At that time, the U.K. was experiencing a deep recession with high unemployment in the old industrial areas of the country. As an out-of-work young person, I was offered a place on a YTS (Youth Training Scheme) with a civil engineering company. I was kept on at the end of the period of the YTS and offered an apprenticeship as a trainee Quantity Surveyor. On my first morning in the QSs' office, I was told that our job was to "*screw them before they screw us*", advice I really took to heart.

In the late 1980s I moved to London and worked on an array of Docklands new build projects and, in the early 1990s, went back to the north-west to work on regeneration projects in Manchester. In both places the industry was still highly litigious and I began to specialise in the pursuit and defence of claims. During this period, I studied by day release and at night school and eventually became both a chartered construction manager and a chartered surveyor.

In spite of some success as a claims surveyor and expert witness, I welcomed reports such as Egan and Latham and the move towards partnering and more collaborative working relationships. I found partnership working easier in Manchester and then, again, easier when I moved to Scotland, perhaps simply because the industries there were smaller and more closely knit: closer working relationships and longer-term partnerships were inevitable when the pool of potential tenderers was much smaller.

Still, in spite of welcoming an attempt to reduce litigation, I struggled with the idea of collaboration. What *was* it? A set of behaviours that amounted to little more than courtesy and respect? Could one achieve true collaborative working by following the edits of construction frameworks and the new contracts that developed in the wake of Egan? I observed in many projects construction professionals talking enthusiastically about collaboration, whilst practicing the opposite, employing the same-old adversarial techniques they had always used. As I worked in this new atmosphere, the crucial question for me became – what was a QS to do when a party to a project was not minded to collaborate? And how was a payment dispute to be resolved when the two parties to it had reached a stalemate and neither were prepared to compromise further? What did you do when collaboration failed? I developed a strategy – what I later recognised as a theory-in-use of, *"collaborate when you can, sue when you can't".*

My ten years as a claims surveyor gave me the skills needed to work as a commercial risk management specialist. Having seen at close quarters so many disputes meant I had an ability to see a contract and estimate what might go wrong, what the potential effects might be and how the damage could be mitigated. From feedback, I realised that it was this key skill – the management of commercial risks in projects – that employers, particularly contractors, revered the most. In an industry which is often first into a recession and last out, in which profit margins are so low and in which additional works must be funded long before they are paid for by the client, this is unsurprising.

However, when I attempted to inculcate these skills into young QSs, civil engineers and construction managers, I found it really difficult. Whilst teaching part-time at a university, I might give the students a case study describing a project to construct a new high school in Shetland, tell them that the groundworks would need to be constructed during the winter months, that the site conditions included 2 metres of peat in places and that there was an acute shortage of locally available labour due to competition from the oil industry and fish farms. In

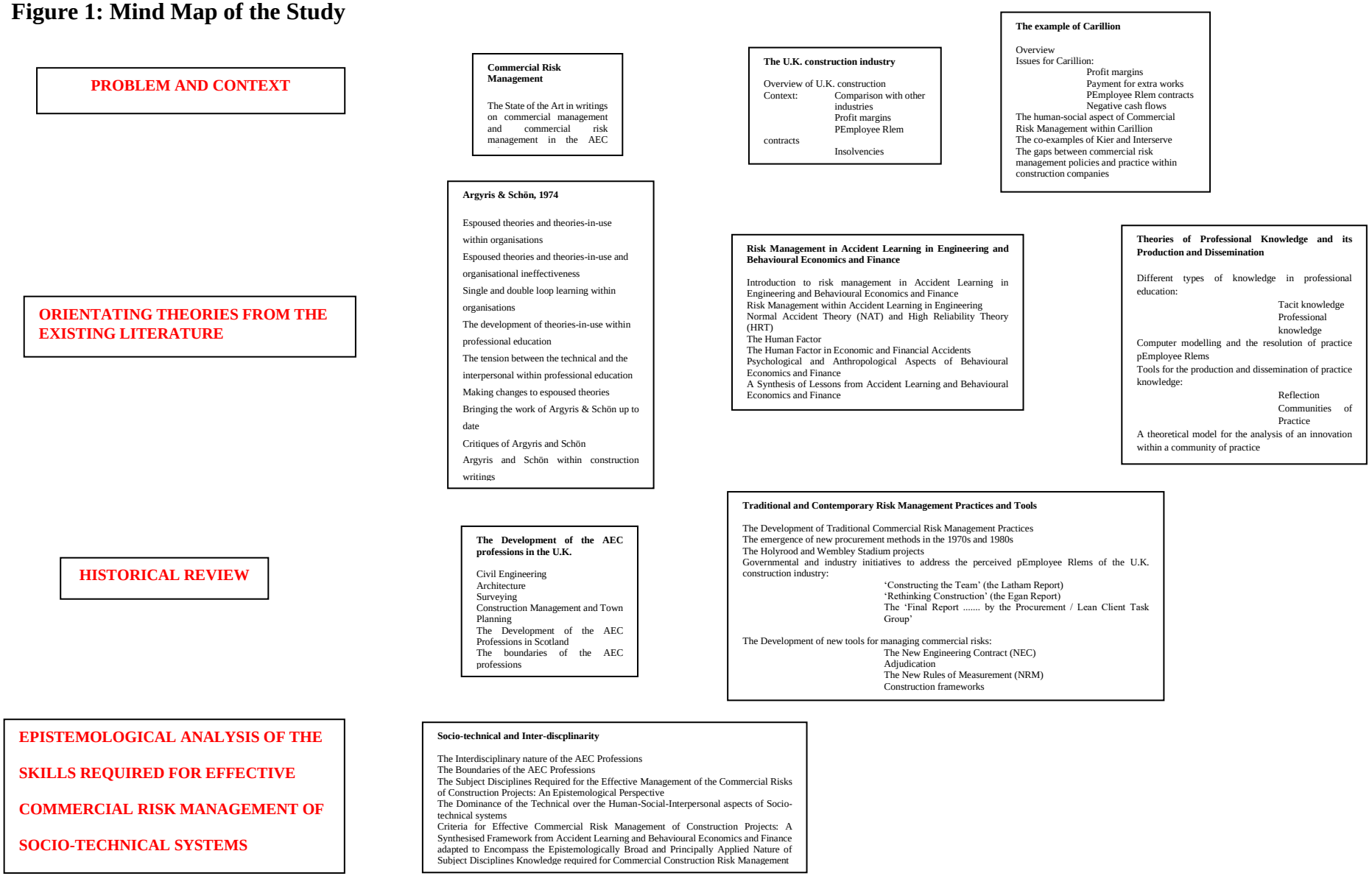
spite of my dropping heavy hints, the students often displayed an optimism bias in their examination of such case studies, getting side tracked into irrelevant details and excited at the idea of the project, rather than digging deep into the potential problems. I began to wonder, *"can you only learn effective commercial risk management strategies by working on projects that go wrong?"*

By the time I embarked on the Professional Doctorate in the Built Environment at the University of the Salford, I had been living and working in the north of Scotland and specifically the Highlands and Islands for over 10 years. At the time, the area was experiencing a reversal in fortunes as utility companies pushed to exploit the area's green energy resources – on and off-shore wind, tidal and hydro power. Labour and housing shortages became acute as green energy development vied with the oil industry for skills and accommodation. It reminded me very much of other construction booms – the transformation of the Docklands in London in the 1980s and the regeneration of the old, industrial north-west in the 1990s.

The specific contextual details of the Highlands and Islands are discussed later, but it was this combination of sudden economic expansion, a tight-knit local construction industry and the sometimes extreme commercial risks posed by remote projects which led me to believe that a study of collaborative commercial risk management policies and actual practices here might yield lessons for Quantity Surveyors in other contexts.

As my study began, it became immediately clear that there were few writings in the field of commercial risk management of U.K. construction projects and that the literature review needed to take a more holistic approach, viewing the subject from a number of different perspectives and exploring literature in allied fields. This is illustrated in Figure 1 below. Thereafter, the somewhat scarce writings on commercial risk management within the construction industry are discussed.

Figure 1: Mind Map of the Study



3.2 Commercial Risk Management

3.2.1 State of the Art in writings on commercial management and commercial risk management in the AEC industries

A focus on commercial management, that is the *'identification and development of business opportunities and the profitable management of projects and contracts, from inception to completion'* (Institution of Commercial Management, 2017), in the construction industry is clearly overdue. In spite of attempts over several decades to resolve the industry's long-standing problems by greater collaboration and risk sharing, construction remains an industry of low profits, high operational risks, negative cash-flow profiles and high numbers of insolvencies. The 2018/19 experiences of major contractors such as Carillion, Kier and Interserve are only the most recent examples of the industry's repeated failure over the past thirty years to substantively change.

In spite of this poor history academic writing on the subject of commercial management and, in particular, commercial risk management, within the Architecture, Construction and Engineering (AEC) industries is somewhat limited. Writings usually form a sub-section of more general project management themes (e.g. Boyce, 1995; Nicholas and Steyn, 2016; Bissonette, 2016; Wanner, 2013; APM, 2015), are concerned with mitigating specific financial risks (e.g. Fabozzi et al., 2013) or explore the results of poor risk management, usually contractual claims (e.g. Diekmann and Nelson, 1985; O'Connor et al., 1993).

Within the industry a series of disastrous public sector projects and, recently, the collapse of one of the U.K.'s largest construction companies have precipitated various governmental reviews (e.g. Latham, 1994; Egan, 1998; House of Commons Select Committee on Culture, Media and Sports, 2001; Scottish Government, 2004; Lean Client Task Group, 2012; House of Commons Select Committee on Business, Energy and Industrial Strategy and Work and

Pensions, 2018). These reviews and more general concern for the problems of the industry led to the development of new risk management tools such as construction partnering, construction frameworks, adjudication, the New Engineering Contract (NEC) and the New Rules of Measurement (NRM).

Although initiatives, such as the NEC, were developed by legal, engineering and construction professionals (NEC, 2018), there has been very little exploration - construction frameworks aside - of how the tools developed by practitioners are themselves used in practice. At a project level, the feedback loop remains frustratingly open with evaluation often only anecdotal.

At an organisational level, company risk management policies are often used as a 'jumping-off point' for the development of informal custom and practice evolving on a project-by-project basis. As an example, the NEC requires the inclusion of commercial risk management tools such as activity schedules, programmes and risk registers in the contract documentation (Broome, 2012). However, in practice, time pressures at Alba Water, the utility company which was the subject of Study 2, meant that contracts were often sent out with these documents blank. Such practices render the very tools developed to aid effective commercial risk management weaker.

An exploration then of the difference between the industry's policies on commercial risk management and actual practice at project level can be seen to be a timely contribution to the literature.

3.2.2 An Overview of the U.K. construction industry

The U.K. construction industry has a turnover of £370 billion in 2016, adding £138 billion in value to the U.K. economy - 9% of the total - and exporting over £8 billion of products and services (Department for Business, Energy and Industrial Strategy, 2019). However, the industry generates extremely low profits. A study ranked construction margins lowest in a

sample of 97 different industries (Stonington, 2011). In 2015, average margins for the top 25 construction firms dropped below 1.5%, in spite of 80% of the companies recording an increase in turnover (Construction News, 2015). Only firms with significant revenue streams outwith construction achieved margins greater than 5% (Construction News, 2015).

In the same survey, over three quarters of the top 100 companies reported having 'problem contracts' and estimated the average cost per contract of resolving them to be £25m. Such poor performance led one survey respondent to report that construction is an *'industry which is seriously broken…*' (Anonymous, quoted in Construction News, 2015).

Since 2015, construction profits have continued to decline and the outlook appears even less favourable than it did four years ago. In a detailed study of U.K. construction profit margins from 2007 to 2017, EY reported yet another fall in average profits to 1% (EYGM, 2017).

The government insolvency service recently confirmed that, in the year to Q2 2018, construction had the highest number of insolvencies of any industry including the benighted retail sector (Gerrard, 2018). 2018 also saw several of the U.K.'s largest construction companies, Carillion, Interserve and Kier, experience financial crises. In January 2018 Carillion became insolvent and in December 2018 and January 2019 Kier's and Interserve's attempts to reduce their debts led to them being effectively taken over by their lenders (Morby, 2018; Hussain & Aripaka, 2019).

The example of Carillion, which is outlined below, is useful in illustrating profit, risks and cash flow norms within the industry as well as the failure of clients (particularly public-sector clients) to match their rhetoric of collaboration and risk sharing with their practice.

3.3 The examples of Carillion, Kier and Interserve

3.3.1 Overview

Carillion, the U.K.'s second largest contractor, collapsed on the 15th January, 2018 with liabilities of £7 billion and only £28 million in cash (Financial Times, 2018). 43,000 staff globally were made redundant, 17,000 in the U.K. alone (Financial Times, 2018) Although most of Carillion's live contracts were taken over by other contractors and many of the staff re-employed, the National Audit Office has estimated that the cost to the U.K. taxpayer of Carillion's liquidation will be in excess of £148m (Financial Times, 2018).

There is, as yet, little academic literature exploring the collapse of Carillion and little agreement within the literature that does exist, of the causes. Some, for example Hajikazemi et al. (2020), claim the collapse resulted from the company's deviation from good practices, whilst many (e.g. Rogers, 2018) assert that poor accounting practices and the failure of auditors to challenge these led to the company's demise. Certainly, with the government launching a £1.3B negligence claim against KPMG over alleged mis-statements in Carillion's accounts (BBC, 2022), responsibility, at this stage, is being laid by most commentators at the foot of the firm's accountants and professional advisors.

However, an alternative explanation has been proffered by Chapman (2018) as well as the parliamentary committee which investigated the collapse in February 2018. Public anger at the time focused on the company's executives who continued to award themselves pay increases, performance bonuses and to increase the shareholders' dividend at a time when the company was already in serious financial trouble. The committee reported that the Board over-rode its own internal contract reviews to present a healthier picture of the financial position than was actually the case:

> *'A November 2016 internal peer review of Carillion's Royal Liverpool Hospital contract reported it was making a loss. Carillion's management overrode that assessment and insisted on a healthy profit margin being assumed in the 2016 accounts.'* (Business, Energy and Industrial Strategy and Work and Pensions committee report, HC769, 2018, paragraph 95, p44).

In the committee's final report, and in the view of Chapman (2018) the principal cause of the collapse is alleged to be inadequate commercial risk management at client (mainly governmental), board and project level (Business, Energy and Industrial Strategy and Work and Pensions Committee Report, HC769, 2018).

> *At the heart of the collapse was an acute lack of understanding and management of risk by both the U.K. government and Carillion itself.* (Chapman, 2018, p1)

Indeed, in respect of the company's internal commercial risk management procedures, it emerged that Carillion had been aware of its own shortcomings, but acted too late to enable the company to be saved:

> *'In relation to the rescue plan delivered by the Carillion's board on 3 January 2018…these key issues were identified: that there was insufficient understanding of, and adherence to, contract requirements; that success on construction contracts depended on the performance of others not under (Carillion's) control…; that contracts were taken on with a high degree of uncertainty around key assumptions; that claims were not pursued in a timely and effective manner; that the portfolio was not balanced in terms of cash generation; that there was ineffective change control, e.g. design changes on construction contracts agreed without incurring incremental costs; that there was poor planning and lack of effective contract controls and monitoring, leading to inconsistent operational performance management; that there was lack of ownership*

*of issues; that there was geographic risk; that there was a lack of effective handover from bid to mobilisation to delivery, leading to a lack of knowledge transfer…those were the key risks, themes and issues identified by the Board.' (*Business, Energy and Industrial Strategy and Work and Pensions committee report, HC769, 2018, question 562).

In terms of client errors, the committee criticised Carillion's principal client, the public sector, for establishing a procurement system in which the lowest price was almost always the successful one. It claimed the client had also neglected to establish effective commercial risk management systems which might have given it early warnings of problems:

'…*successive Governments have nurtured…a model of service delivery which made such a collapse, if not inevitable, then at least a distinct possibility. The Government's drive for cost savings can itself come at a price: the cheapest bid is not always the best… In these circumstances, when swathes of public services are affected, close monitoring of exposure to risks would seem essential. Yet we have a semi-professional part-time system that does not provide the necessary degree of insight for Government to manage risks around service provision and company behaviour. The consequences of this are clear in the taxpayer being left to foot so much of the bill for the Carillion clean-up operation.'* (Business, Energy and Industrial Strategy and Work and Pensions committee report, HC769, 2018, paragraph 216, p96).

The committee's citing of a public sector client's reluctance to share risk with its contractors reiterated the concerns of successive governmental enquiries into the industry such as Latham (1994) and Egan (1998), reports that are now over twenty years' old.

Following Carillion's collapse in January 2018, investors and lenders next focused attention on the other large construction companies with the same business model – that is a mix of contracting with facilities management and support services.

Kier and Interserve, both top 5 construction companies, had similar company models to Carillion and similarly high levels of debt due to their policies of buying competitors.

At the end of 2018, Kier attempted to reduce the size of its overall debt by means of a £250m rights issue. If successful, the issue would have reduced Kier's debt from £650m to £400m (Morby, 2018). However, although the shares were offered at a 34% discount, a subsequent collapse in the share price meant that only just over a third of the shares were taken up. The company's bankers – who underwrote the share issue – were left holding the remainder and thereby became its largest shareholder.

Rather than face a failed rights issue, Interserve opted to negotiate a write-off in exchange for shares with its lenders. This would reduce the company's debt by half (from £807m to £404m) and saw lenders effectively take control of the company (Davis, 2019).

There is continued uncertainty about the fates of both companies. In November 2018 strategic suppliers including Interserve agreed to write 'living wills' for the Cabinet Office detailing how government would ensure continuity of service if the company collapsed (Price, 2020). The media also reported that Deloitte had been hired by the Cabinet Office to monitor the financial health of Kier, amid rumours that it was again suffering short-term financial pressures (Price, 2020).

The parliamentary investigation into Carillion's collapse has led to more calls for collaborative working, greater risk-sharing by public-sector clients and the development of longer-term working relationships (Business, Energy and Industrial Strategy and Work and Pensions,

2018). As previously stated, this echoes the calls of previous government reports. Why then, in spite of governmental and institutional support for these measures, as well as the production of tools such as the NEC, partnering, frameworks and adjudication, to support the measures, is contracting still failing to thrive? Could an analysis of the gap between organisations' commercial risk management rhetoric and policies – which stress collaboration and risk sharing - and their actual practice offer a solution? And could a greater understanding of the role played by human-social-interpersonal factors in the management of commercial risks also contribute to a new way forward for the industry?

With an absence of academic writings in the field of commercial risk management in construction, the study now turns to concepts from other disciplines for a theoretical underpinning of this research, beginning with a section describing Chris Aygyris' and Donald A. Schön's seminal work on the difference between espoused theories and theories-in-use and its relevance to organisational learning.

3.4 Orientating Theories from Related Disciplines

3.4.1 Argyris & Schön, 1974: Espoused theories and theories-in-use within organisations

In a self-declared attempt to liberate organisational thinking and learning from the status quo (Argyris & Schön, 1974), Argyris and Schön distinguished between two theories of action; tacitly held 'theories-in-use' which govern individuals' behaviour in particular situations and 'espoused theories' which people offer as explanations of their behaviour (Argyris & Schön, 1974, pxiii).

They further defined theories-in-use as '*operational theories of action',* that is *'existing theories people have that determine practice.'* (Argyris & Schön, 1974, p xviii) with practice being a series of actions undertaken by a person serving others whom they consider to be clients (Argyris & Schön, 1974).

Argyris and Schön argued that theories-in-use – like all theories - share generality, relevance, consistency, completeness, testability, centrality and simplicity (Argyris & Schön, 1974). An individual's theories-in-use cannot be ascertained by simply asking or interviewing them; they must instead be constructed from observations of behaviour (Argyris & Schön, 1974, p7)

> *'When you know what to do in a given situation in order to achieve an intended consequence you know what the theory in use for that situation is.'* (Argyris & Schön, 1974, p7)

Argyris and Schön argued that theories-in-use were powerful tools, enabling people to get what they want (Argyris & Schön, 1974). They also described a hierarchy of theories-in-use. An individual may hold what appear to the observer to be different, incompatible theories-in-use for similar situations, for example, a teacher treating boys and girls differently for the same misdemeanour. In such cases, Argyris and Schön argued, the individual holds a higher order theory-in-use governing the use of different sub-theories-in-use (Argyris & Schön, 1974).

The two writers claimed that, although people's actions in a particular situation might vary, their underlying theories-in-use remained unchanged (Argyris & Schön, 1974). They were also clear that culture impacted heavily on the creation and sustaining of theories-in-use; different versions of the same theory-in-use would result from similar upbringings within a particular culture (Argyris & Schön, 1974).

Argyris and Schön claimed that, only by reaching congruence between espoused theories and theories-in-use, could individuals and organisations reach their full potential (Argyris & Schön, 1974).

3.4.2 Espoused theories and theories-in-use and organisational ineffectiveness

Argyris and Schön believed the roots of organisational ineffectiveness lay in the historical nature of companies as entirely exploitative of human capital. They claimed organisations had been designed to ignore human nature and feelings and only to exploit them (Argyris & Schön, 1974, p xxxi). In essence, they argued that employees learned to espouse organisationally-acceptable theories whilst simultaneously employing their own theories and strategies enabling them to survive in a hostile work environment.

Argyris and Schön drew on Goffman's work (1959) to suggest that individuals learn the arts of interpersonal diplomacy and policy in order to live in this world which he described as one of '*pseudo-authenticity'* (Goffman, 1959, quoted in Argyris & Schön, 1974, p83).

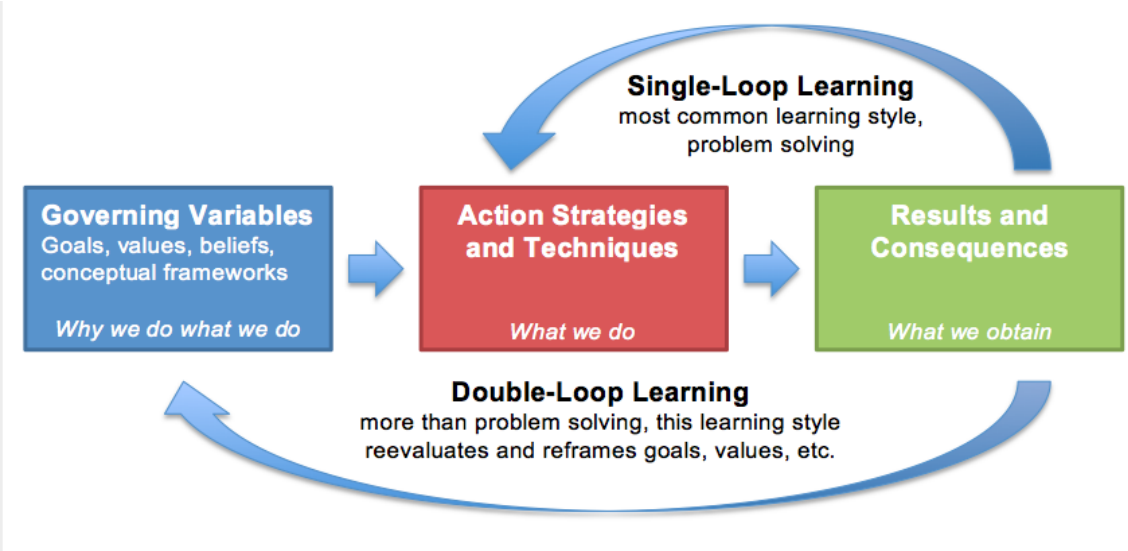
They strongly believed individuals were dissuaded from countering espoused theories by the use of what they called defensive routines within organisations. They were clear though that, to the best of their knowledge, such defensive routine were not made explicit within companies and individuals were not taught or rewarded for using them (Argyris & Schön, 1974, p xxii)

3.4.3 Single and double-loop learning within organisations

Theories-in-use are influenced by certain variables, for example amount of energy expended or level of anxiety. According to Argyris and Schön individuals always attempt to ascertain such variables within an acceptable rage (p15). Where theories-in-use are ineffective in maintaining a variable within the acceptable range, there are several options. The theory-in-use may change, although this is unlikely; as stated above, individuals always strive to keep their theories-in-use constant (p17). Or a person may challenge and change the governing variable (p17).

For example, a theory-in-use leading to conflict outside the acceptable range may cause the individual to utilise new techniques for suppressing the conflict; or the individual may 'surface' the conflict rather than suppressing it (p19). Argyris and Schön termed these action 'action strategies' (Argyris & Schön, 1974, pp67-72). If the action strategy fails to achieve the desired outcome, striving for a new strategy which protects the governing variables is known as single-loop learning (Argyris, Putnam & McLain-Smith, 1985). However, challenging and changing the governing variable by acknowledging a desire to minimise conflict openly might lead to an acceptance that sometimes conflict is healthy; in this case both the governing variable and the action strategy have altered and this is known as double-loop learning (Argyris, Putnam & McLain Smith, 1985). The process is illustrated in Figure 2 below:

Figure 2: Single and Double Loop Learning (adapted from Argyris, Putnam & McLain Smith, 1985)



3.4.4 The development of theories-in-use within professional education

In respect of professional education Argyris & Schön argued that the acquisition of theory takes place at school with the acquisition of skills taking place at work (p12). They assert that the student becomes an effective professional following graduation from school rather than within it (p143). They drew on Schein's work (1972) in describing the early years of professional practice as *'stultifying, unchallenging and more like an initiation rite than an educationally useful apprenticeship'* (Schein, 1972, p53). Somewhat unhelpfully, Argyris and Schön also described the acquisition of professional skills as *'mysterious'* (p143), a kind of osmosis-by-association or proximity to exceptional practitioners (p143).

Argyris and Schön argued for a number of negative effects of the historical development of the professions, describing a four-stage process, which is illustrated in Table 2 below:

Table 2: The development of the professions (adapted from Argyris & Schön, 1974, pp146-147)

Stage	Descriptions	Framework	Authority	Functions
1	The priest as the prototype professional	The Church	Religious	Judge Healer Teacher Minister
2	The secularization and differentiation of the professions	Secular institutions	Sacred professional ethic	Healer (medicine) Judge (lawyer) Teacher (education)
3	The liberalization and rationalization of the professions including association with universities	The professional institutions	Cumulative body of knowledge. Accountability to society at large	Professions opened up to a wider range of Participants
4	The rise of technique and the proliferation of specialisation	Proliferation of specialised institutions	Technique	Development of specialised professions (e.g. water engineering, orthopaedics)

3.4.5 The tension between the technical and the interpersonal within professional education

Argyris and Schön were particularly critical of the dominance of technique over the interpersonal in professional education and described it as inseparable from single-loop learning (p149). Schön, whose interests lay particularly in the improvement of professional education, also challenged the technical rationality approach to such education, referred to by Schein as the normative professional curriculum (Schein, 1972). This, Schein explained, involved firstly the teaching of the relevant basic sciences, followed by the applied sciences

and finally the use of practical examples to illustrate how this knowledge might be applied to common problems in practice (Schein, quoted in Argyris & Schön, 1974, p xxi). This led to Argyris and Schön's defining technical and interpersonal theories which are illustrated below in Table 3.

Table 3: Definitions of technical and interpersonal theories in professional training (adapted from Argyris & Schön, 1974, p164)

Theory type	**Definition**
Technical theories	Which techniques the practitioner will use in the substantive tasks of his practice
Interpersonal theories	How the professional will interact with clients and others in the course of their practice

Argyris and Schön drew on the work of others to describe the ways in which they felt professionals were failing in their duty to clients:

> *'Professionals generally have abdicated their traditional function. My definition of a professional – as one who professes a faith – is anathema to the engineer, the chemist, the business manager, the academic. They see themselves not as bearers of a faith or proclaimers of a confidence, but as practitioners of technique…pure, empirical, pragmatic, marketable technique.'* (Palmer, 1973, quoted in Argyris & Schön, 1973, p148).

Argyris and Schön described the development of artificial environments by professionals in which such techniques will function predictably. The development of a nomenclature, for

example, terms such as ‘plaintiff’, ‘defendant’, ‘consumer’, personnel’ and ‘patient’, were crucial to the making of these artificial worlds (p153).

> *‘Hence, the professionals betray the original values of their paradigms (health, truth, justice) as technique becomes progressively more central to them.’* (Argyris & Schön, 1974, p154)

3.4.6 Making changes to espoused theories

Through the use of case studies, Argyris and Schön illustrated the difficulties organisations face in attempting to change their espoused theories. Sarason (1972), quoted in Aygyris & Schön (1974, p174) gives an example of a substantive changes to the maths curriculum in public schools in the USA. The new maths curriculum was shown to the maths teachers in poorly resourced workshops and the teachers learned quickly not to question the new espoused theory. Instead, having never satisfactorily learned the new maths teaching techniques themselves, their actual practice in the classroom tended to follow their existing theories-in-use.

> *‘Originally, most of the schemes for changing the curriculum assumed that a clear, rational picture effectively presented to individual teachers would result in the program’s acceptance. Ignored were the feelings, attitudes, values that had developed around the old curriculum, the group norms that protected them and the bureaucratic arrangements that had evolved over the years to protect individual feelings and values as well as the group norms.’* (Argyris & Schön, 1974, p175)

3.4.7 Bringing the work of Argyris & Schön up to date

Robinson (2001) defines two types of academic research into organisation learning; a ‘descriptive strand’ - with its roots in social and cognitive psychology - which seeks to understand how organisations learn and change, and a ‘normative’ strand which looks at how

organisations direct this learning to bring about positive change. Robinson claims that, whilst Argyris & Schön belong to the latter, perhaps more pragmatic branch of study, they have made significant contributions to the former with their empirical studies of organisational learning.

If Robinson (2001) is correct in describing the 'descriptive' strand of organisational learning as having its basis in social and cognitive psychology it is perhaps not surprising that Argyris & Schön's contributions to it have been pre-eminent in the fields of social work, nursing and teaching, e.g. Burke et al., 2010; Matusov et al., 2015; Rankine et al., 2018, Thorvaldsen & Madsen, 2020. Certainly, in the thirty five years since their work was first published, there has been little empirical work to test the theories within hard, applied fields such as engineering or technology (although it could perhaps be argued that modern nursing is increasingly a hard applied discipline).

Whilst limiting much of the testing of these theories to social work, nursing and teaching, development has taken place. It has become increasingly clear in the literature that congruence between the espoused theories of senior management and their employees' theories in use - essential for organisational effectiveness - requires a holistic approach. Burke et al. (2010) describe the limitations of reflective practice amongst teachers within Critical Friends Groups (CFGs); in themselves and without allied structural organisational changes, CFGs were insufficient to bring about substantive positive organisational change. Crucial to this is the work of Matusov et al. (2015) who define and describe the role of agency within such attempts. Finally, although work by Bochman and Kroth (2010) identifies a critical causal element in the difference between espoused theories and theories in use, it is arguable that this was always inherent in the original work.

Theories-in-use are claimed to be more greatly influenced by professional training than by the espoused theories of individual employers (Rankine et al., 2018). Additionally, there has been

am assumption that the generic attributes thought widely desirable within a particular profession exist outwith it, yet the work of Jones (2008) suggests that they are in fact strongly influenced by the disciplinary culture within which they are taught.

In conclusion, it seems it has been somewhat difficult to progress the theories and, as late as 2020, writers from the field of teaching were still describing a '*gap between the micro and macro level*' within organisations (Thorvaldsen & Madsen, 2020, pp 5281):

> *'However, despite national efforts, practitioners in the education system do not seem to work in line with the given policy.'* (Thorvaldsven & Madsen, 2020, pp 5281)

3.4.8 Critiques of Argyris and Schön

Argyris and Schön, together with other collaborators, spent several decades developing and testing their concepts. As their work evolved, they were open about which elements of their theories required change, what worked and what didn't. However, as described above, there has been little work to test the theories outside areas such as teaching, social work and nursing. Although the original work was developed through empirical work with management consultants it is disappointing that further testing and development within hard applied fields such as engineering and technology has not taken place.

Argyris' testing of the concepts was largely restricted to groups of management consultants; it did not involve construction professionals. In spite of Argyris and Schön's clear instruction that theories-in-use cannot be divined from what people say, only from observations of what they do, their testing involved just that. Together with the management consultants Argyris worked through a series of case studies with the consultants describing what they *would do* in the situations described in the case studies. In doing this Argyris and Schön may actually have unwittingly engaged much more with their Participants' espoused theory than their theories-in-use (Greenwood, 1993). They may even have fallen into the trap described by themselves

as the creation of artificial environments *'in which the professionals' techniques will work predictably'* (Argyris & Schön, 1974, p151).

> *'Hence the professionals betray the original values of their paradigms (health, truth, justice) as technique becomes progressively more central to them.'* (Argyris & Schön, 1974, p156)

In their testing change seems to take place only very slowly. In the case of the group in Increasing Leadership Effectiveness, a period of over two years seems to have been required for substantive change to take place.

Implicit in Argyris and Schön's work is an assumption that people would prefer a congruence exist between their espoused theory and their theories-in-use and that such a congruence will lead to improved organisational performance (Anderson, 1992), but no evidence is offered to prove this.

Arguably, Schön's work on reflective practice has been more influential in professional training, than his work with Argyris on theories of action. Professional reflection is now a standard part in the professional training of teachers, nurses and – increasingly – construction. However, Schön's work assumes reflection takes place post-action and several writers (e.g. Greenwood, 1993) argue that reflection *before* action is necessary for professional improvement.

> *'It is at least arguable, however, that much of the suffering in the world, including that caused through nurses' errors, could have been avoided had practitioners stopped to think about what they intended to do and how they intended to do it before they actually did it.'* (Greenwood, 1993, p1186)

Additionally, other writers (e.g. Canning, 2011) contend that reflection is less useful for professionals in the early stages of their careers when other strategies such as demonstration by more experienced practitioners and simulation may be more helpful.

3.4.9 Argyris & Schön in construction writings

Although a gap between policy and practice has been noted in construction research (e.g. Saurin, 2015; Pallyaguru & Amaratunga, 2010), it has been without reference to Argyris & Schön's seminal concept – that of espoused theories and theories-in-use. This is surprising since Donald Schön's 1984 work on professional development and, in particular, reflective practice has been hugely influential within construction and engineering.

Whilst Argyris and Schön's follow-on work was extensive (Argyris, 1974; 1976; 1980; 1982; 1985; 1987; Argyris & Schön, 1974; 1978; Argyris, Putnam &McLain Smith, 1985), their testing was restricted to areas such as education and management consulting. This gap offers an opportunity for the testing of this seminal work in a new context, namely construction and engineering.

What then do other writers have to say about a potential gap between theories, policies and practice? A short section now describes the debate within higher education, with a particular focus on the new field of online learning.

3.5 The gap between theories, policies and practice in higher education

A gap between theories, their associated policies and actual practices in education was attested to by Argyris & Schön in their description of the failed implementation of a new maths curriculum in the USA described above. More recently, other writers have also sought to explore this gap in higher education. The focus has often been on the new area of online learning.

Koper (2007, cited in Friesen, 2009, p7) argues that education research seeks not to understand the world as it is but instead, to '*change the world as it exists'*. Perhaps, this might explain why there is so much focus on policy at the expense of practice.

McArthur (2012) asserts that a gap between theory and practice exists in education and that this theory / practice (or academic / vocational) dichotomy needs to be challenged, not least because the actions of thinking and doing are actually impossible to separate. Instead, McArthur suggests that explorations of theory and practice should be combined. Lee (2016) posits that theory is often prioritised over practice in higher education and that this dichotomy needs to be deconstructed. In their 1996 work, Kessels and Korthagan take this further, stating that it is scientific knowledge that is primaried, whilst practical knowledge and practitioners' '*perception of concrete particulars'* (Kessels and Kathagan, 1996, p19) in practice is undervalued. Lee (2016) further argues that too little effort has been made by researchers to understand the contexts of practice and that support for practice has traditionally been poor. Lee (2016) further posits that we know too little about the organizational, economic, political and social circumstances of practice and too little about how practice varies amongst different groups of practitioners. This is a plea for greater diversity within research:

> *'It can thus be argued that we have not yet developed a comprehensive understanding of the complexity of the disjunction between the rhetoric that propagates online*

education as a new learning paradigm in Higher Education and the actual realities of its implementation.' (Lee, 2016, p255)

However, whilst Lee (2016) strongly suggests that there are lessons to be learned by combining the exploration of theories and practice and by considering the institutional constraints to the successful implementation of theories and rhetoric, other writers demur about the actual value of such work. In fact, Batallio (2007), Elloumi (2004), Kanuka and Brooks (2010) all suggest that gaps between institutional theories and actual practice may be unavoidable.

The work now turns its attention away from the perceived gaps between policies and practice towards broader aspects of risk management within the allied academic fields of Accident Learning in Engineering and Behavioural Economics and Finance.

3.6 Risk Management in Accident Learning in Engineering and Behavioural Economics and Finance

With a scarcity of academic writings in the field of commercial risk management in construction and a need for conceptual underpinning and orientation for the research, a critical review of risk management within the disciplines of engineering and the developing field of Behavioural Economics and Finance was undertaken.

3.6.1 Risk Management within Accident Learning in Engineering

Oil drilling on the Norwegian and British continental shelves of the North Sea began in 1966. At that time much of the drilling equipment, expertise, language and culture had been imported from the United States (Skogdalen and Vinnem, 2011). Accidents were common with an average of 70 per 1000 rig days and workers would have been familiar with accidents both directly and indirectly (Skogdalen and Vinnem, 2011). Over the next 20 years the Norwegian and British governments developed different regulatory regimes for the extraction works in their jurisdictions (Skogdalen and Vinnem, 2011). Significant increases in regulation occurred in Norway after the collapse of the accommodation platform, Alexander L. Keilland, in 1980 killing 123 oil workers and, in the U.K., following the Piper Alpha accident in 1988 when 165 men died.

A major cause of the Piper Alpha accident identified by the Cullen Enquiry (1990) and subsequent authors (e.g. Paté-Cornell, 1993) was the decision to temporarily promote individuals on the platform to positions crucial for safe evacuation in the event of an accident. Better training for this kind of emergency and a better organisational redundancy system, in which an alternative chain of command could have formed in the event of the incapacitation of key personnel, could have reduced the loss of life on Piper Alpha (Paté-Cornell, 1993).

In spite of increasing regulation of the oil and gas industries over the next 20 years, inexperience and lack of training were again cited as a major cause of the blowout at the British Petroleum Deep Water Horizon project in the Gulf of Mexico in 2010 (e.g. Skogdalen and Vinnem, 2012; Bartlit et al., 2011). An analysis of the well blowout identified 35 errors in risk-acceptance and perception, decision-making and training of staff, in contrast to 10 errors in design, 10 in maintenance, 4 in policy and procedure and 19 in organisation and management (Smith et al., 2013). In fact, inexperience and insufficient training are a major cause of accidents in the oil and gas industries (Sneddon et al., 2006). Highlighted in many studies is an over-confidence in technical safety measures, e.g. detection and alarm systems (Skogdalen and Vinnem, 2012). This over-reliance on warning technologies is a major theme in Normal Accident Theory (Perrow, 1984) which is now outlined below.

3.6.2 Normal Accident Theory (NAT) and High Reliability Theory (HRT)

In his book, '*Normal Accidents: living with high-risk technologies*' (1984), Perrow explored socio-technical systems (systems where people and technology interact in workplaces). He asserted that accidents in very interactively-complex, tightly-coupled technologies are inevitable as companies primacy production and profit over health and safety and as over-confidence in warning technologies encourages people to take risks.

Complex-interactions are unfamiliar, non-linear or unplanned, unexpected sequences which are either invisible or not immediately comprehensible (Perrow, 1984). Owing to the system's complexity a series of simultaneous or semi-simultaneous independent failures (e.g. the simultaneous failure of a smoke detection system and the breaking out of a fire) which designers do not envisage and operators fail to comprehend is inevitable. In a tightly-coupled system one event quickly follows another leaving very little time to intervene. According to

the theory accidents in high-risk socio-technical systems which are interactively-complex and tightly-coupled are inevitable.

In aiming to protect individual workers at the 'sharp end' Perrow focused attention on policy and regulatory responses to normal accidents and asserted that some socio-technical systems such as nuclear power should be abandoned altogether. Organisational responses should include loosening couplings and reducing interactive complexity. Perrow does also recognise the role of experience and training of individuals in improving the comprehension and management of complexity (Shrivastava, 2013):

> '*It is also true that a poorly trained or inexperienced operator may see a system as replete with unsuspected interactions or 'traps', but after gaining experience may find it to be more linear*' (Perrow, 1984, p84).

Perrow has been criticised for a pessimistic view of accident prevention and for not providing definitions for tight-couplings, interactive-complexity and independent failings (Hopkins, 1999). NAT does however provide a useful conceptual tool for the analysis of accidents in both technology (e.g. Sylves and Comfort, 2012) and finance (e.g. Müssig, 2009). Whilst a temporal basis for NAT (Shrivastava et al., 2009) has been rejected by Perrow himself (Perrow, 2009), using NAT to analyse an organisation's development over time *('is coupling becoming tighter or looser?')* or for comparing organisations against each other *('is interactive complexity in organisation A greater than in organisation B?')* could be a '*useful theoretical lens'* (Brookfield, 1993, p31) through which to view practice in socio-technical systems.

Variously described as a complementary or contrasting theory High Reliability Theory (HRT) was first postulated by Rochlin, La Porte and Roberts (1987). They used non-participatory observation to explore the similarities between complex, high-risk socio-technical systems such as aircraft carriers, air-traffic control, commercial air traffic and nuclear power operations

which operate in unforgiving environments and put a premium on reliability (Shrivastava et al., 2009). Although still the subject of some dispute reliability in this context is generally defined as the ability to maintain and execute error-free operations in changing circumstances (Wieck et al., 1999).

As scholars further reviewed HRT it was criticised for importing a notion of reliability entirely from engineering and ignoring the human factor in socio-technical systems (Wieck et al., 1999). Scholars such as Wieck et al. (1999) have developed a list of conditions necessary for reliability which now incorporates this cognitive aspect (although principally in an organisational rather than an individual sense). These are a strategic prioritisation of safety, careful attention to design procedures, a limited degree of trial-and-error learning, provision of redundancy, decentralised decision-making, continuous training through simulation, strong cultures that encourage vigilance to potential accidents and the development of 'mindfulness' Mindfulness includes a pre-occupation with failure, a reluctance to simplify interpretations, commitment to resilience and flexibility of structure.

One of the main criticisms of HRT is its lack of a theoretical basis (Shrivastava et al., 2009); detractors assert instead that HRT is a typology derived from socio-technical systems with relatively good safety records. Additionally, HRT (and NAT) are not falsifiable (Rosa, 2005) which makes empirical testing impossible.

3.6.3 The Human Factor

It is important to recall at this point that this study concerns itself with commercial risk management. Although financial and human injury / death are often two effects of the same accident (e.g. in Piper Alpha and Deepwater Horizon), they can remain quite independent of one another. Need to introduce this next thing - The post-contract rockfalls into the inlet tunnels at Glendoe Hydro constituted a financial accident only (although the long-term effects on the

mental health of the parties embroiled in the subsequent legal dispute can also be seen as a human cost). Perhaps the real division between finance and health and safety risk is the limitation of financial mitigation. Whilst most financial risk can be insured against by instruments such as derivatives and insurance, and several writers have argued that insufficient use of financial instruments is made in risk management (e.g. Arrow, 1964; Shiller, 2008), no insurance policy can replace life (Shiller, 2012).

What then does economics and finance have to say about the human factor in accident prevention?

3.6.4 The Human Factor in Economic and Financial Accidents

The financial crisis of 2007-08 brought forward a slew of writings urging less reliance on mathematical models and a greater cognisance of the human factor in economics and finance.

> '*We must smooth the rough edges off our financial system – those aspects that can cause trouble when people make mistakes.*' (Shiller, 2012, p9)

Behavioural economics and finance is an emerging field and currently lacks a single conceptual base. With many different academic strands here, just as there are in the field of accident learning (Le Coze, 2013), this paper touches briefly on only the psychological and anthropological aspects of financial accidents.

3.6.5 Psychological and Anthropological Aspects of Behavioural Economics and Finance

As far back as the 1930s Keynes questioned the idea that human beings always make rational economic decisions (which is the basis of efficient market theory) by describing economic decision-making as nothing more than a '*spontaneous urge to action'* (Keynes, 1936, p161-162). More recently, economics scholars have begun to explore people's visceral instinct for risk and sensation-seeking (Shiller, 2012), as well as ideas such as cognitive tunnel vision,

cognitive dissonance, resource depletion and the effects of fatigue on brain function (Heffernan, 2012).

From an anthropological perspective Tett (2009 and 2013) - drawing on Bourdieu's work - discusses the development of elites in finance and how social structures and social networks enable these elites to maintain their dominance. Discussing a gathering of investment bankers in Switzerland prior to the financial crisis Tett described how '*most important of all they assumed the only people who would understand how modern finance worked were the bankers themselves'* (Tett, 2013). Tett claims these elites possessed a cognitive tunnel vision and hadn't been trained to dispute the optimistic rhetoric surrounding financial innovation (Tett, 2013). Clarke (1999, quoted in Müssig, 2009) writes that elites make only symbolic, overoptimistic preparations for accidents, a process he describes as 'window dressing', aiming only to convince the public, regulators and pressure groups that the risks are manageable.

Tying together both the anthropological and psychological strands several writers (e.g. Heffernan, 2012) question the absence of the human factor in mathematical risk management models. As Paul Krugman has said, '*I think there's a pretty good case to be made that the stuff that I stressed in the models is a less important story that the things I left out because I couldn't model them, like spill-overs of information and social networks.'* (MacFarquher, 2010). In fact, the notion that these information gaps render efficient market theory unreliable actually predates the financial crisis (Shleifer, 2000).

The role of ethics and morality in finance lies outwith the scope of this study, but it should be noted here that even proponents of greater cognisance of the human factor in economics and finance argue that the designers of these mathematical risk management models did know the risks inherent in the models, but chose to ignore them; the markets were just exploitative (Shiller, 2012).

3.6.6 A Synthesis of Accident Learning and Behavioural Economics and Finance

A synthesised framework of Accident Learning and Behavioural Economics and Finance is now proposed and illustrated in Table 4 below:

Table 4: Essential Skills required for the Effective Risk Management of Socio-Technical Systems: A Synthesised Framework from Accident Learning and Behavioural Economics and Finance

Synthesis	Accident Learning	Behavioural Economics and Finance
A critical understanding of the tendency towards over-reliance on technology and technical warning systems in the risk management of socio-technical systems	Perrow (1984) ; Rochlin, La Porte & Employee Rerts (1987); Skogdalen (2011)	Shiller (2008; 2012); Shleifer (2000); Tett (2013)
A critical understanding of the roles elites and social networks play in the risk management of socio-technical systems	Perrow (1984)	Tett (2013)
A critical understanding of the importance of filling information gaps and linking seemingly unrelated events in the risk management of socio-technical systems	'*Drawing connections'* (MacRae, 2009)	'*Joining the dots'* (Tett, 2013)
A critical understanding of the value of simulation in training for the effective risk management of socio-technical systems	High Reliability Theory in high risk industries e.g. aviation	Mathematical modelling in financial services, e.g. for risk management in mortgage lending
A critical understanding of the limitations of simulation in training for the effective risk management of socio-technical systems	'*Forcing fit'* (Vaughan, 1996) '*Lack of critical reflection'* (Luhmann, 2003)	'*Information spillovers'* (Krugman, quoted in MacFarquher, 2010) '*Gap between rhetoric and reality'* (Tett, 2013)

3.7 Theories of Professional Knowledge and its Production and Dissemination

This study is concerned with knowledge, the nature, sources and transference of commercial risk management knowledge. This section therefore concludes with a critical review of theories of professional knowledge.

3.7.1 Different types of knowledge in professional education: tacit knowledge

> *'Tacit knowledge is the unarticulated knowledge that resides in human beings, which is obtained by internal, individual processes like experience, reflection, internalisation or individual talents.'* (Pathirage et al., 2007, p118)

> *'Tacit knowledge is what we display when we recognise one face from thousands, without being able to say how we do so.'* (Argyris & Schön, 1974, p10)

As perhaps one of the most labour-intensive industries (Pathirage et al., 2007) this tension between practice and academic education in the construction industry is unsurprising.

Whether tacit knowledge can be made explicit, or rather, the extent to which tacit knowledge can be made explicit is at the heart of much debate (Erault, 1985). What writers do appear to agree on is the commercial value of tacit knowledge (Grant, 1996; Spender, 1996; Eisenhardt and Santos, 2000; Amit and Schoemaker, 1993; Kogut and Zander, 1992; Krogh and Roos, 1996; Peteraf, 1993; Pathirage et al., 2007), that is, its role in giving an organisation a *'sustained, competitive advantage'* (Pathirage et al., 2007, p 117)

For Weatherill et al. (2002), Moodley et al. (2001) and Pathirage et al. (2007) tacit knowledge production is the domain of individuals and projects teams, whilst explicit knowledge is formed at an organisational or discipline level. The context of the U.K. construction industry, here, is particularly problematic. Most construction projects are bespoke. On even the largest projects teams are together for perhaps only a year or two. On many projects a system of pre-contract, post-contract and finishing teams has developed. What happens to the tacit knowledge when

the project team is broken up? Is it taken into the new project team or lost? Is it captured (Rezgui, 2001)? Perhaps implicit in the governmental encouragement of Construction Partnering was the hope that longer-term collaborations between clients, contractors and their supply chain would improve the codification and dissemination of tacit knowledge?

For Brown and Duguid (1998) organisations need the tacit *'know-how'* to put the explicit *'know-what'* into action (quoted in Pathirage et al., 2007, p 118). However, attempts to make this knowledge explicit may actually damage or weaken it in the process (Polanyi, 1966; Pathirage et al., 2007). Additionally, making tacit knowledge explicit in *'high velocity environments'* (Erault [1985] refers to these as *'hot action'*), such as cutting-edge construction or engineering projects may be extremely difficult (Eisenhardt, 1989).

It may be possible to ease this transition through the use of cross-organisational groups (Grant, 1996; Kogut and Zander, 1996). Indeed, in the AEC professions such a route can be seen to have a long tradition. Almost from its inception the Institution of Civil Engineers (ICE) distributed minutes of its weekly meetings to members unable to attend in person. From 1824 every member of the Institution was required to produce one original paper for discussion at meetings. This was clearly an early attempt to use relational networks to make tacit knowledge explicit and to disseminate it amongst a dispersed community of professionals often employed in competing companies (Ferguson and Chrimes, 2011).

3.7.2 Professional knowledge

> *'People think the world is led by independent minds who invariably act with great intelligence.'* (Shiller, 2008, p42)

It is now widely accepted that knowledge lies in a broad spectrum from tacit at one end to explicit at the other and that there are no clearly separate dichotomies of tacit and explicit knowledge (Pathirage et al., 2007). An organisation's success results from the interplay

between employees and *several different types* of knowledge (Nonaka and Takeuchi, 1995) [italics added]. For Erault (1985), tacit knowledge is only one facet of professional knowledge; other facets include knowledge of particular cases, precepts, theory, codified knowledge, knowledge embedded in traditions and craft knowledge.

Furthermore, for Erault, considering knowledge production in terms of its development domain only and not in the context of its use is specious. Researchers must study the context of its use (academia, policy or practice) as well as the source of the knowledge itself. It is possible here to suggest that the link between policy and practice in the AEC professions, e.g. through initiatives such as Egan, Latham, BIM etc., is more developed than the link between research and practice. Further, the question of how much policy in the AEC professions is evidence-based is also pertinent.

There are important contextual differences between the research-policy-practice nexus discussed by Erault (1985) in the areas of medicine and teaching from that of the AEC professions. Most medical and teaching staff are state employees in large organisations, in the AEC professions the majority are employed in small, private sector companies (Carty, 1995; Halpin and Woodhead, 1998).

What Erault (1985) hints at and what other authors contend (e.g. Gibbons et al., 1994; Etzkowitz & Leydesdorff, 2000) is that knowledge production is no longer simple and linear; a democratisation and, to steal Gibbon's phrase, *'massification'* of knowledge production is taking place. Gibbons and Etzkowitz & Leydesorff agree that the new paradigms of knowledge production (Mode 2 and the Triple Helix respectively) arose from socio-economic shifts after WW2. Could it be that new models of knowledge production will arise from analogous seismic shifts in the geo-political landscape, for example the Banking Crisis and the emerging economic and political dominance of China?

3.7.3 Computer modelling and the resolution of practice problems

Erault (1985) is amongst several writers in referring to the opportunities offered by computer models for the resolution of moderately well-defined practice problems. Erault's work predates the rise of the use of such models (particularly risk management models) in the financial services industry during the 2000s and the increasing debate following the global Banking Crisis of their limitations (Shiller, 2008, Tett, 2009). Shiller (2008) suggests that, only by accepting contributions from the human sciences (psychology, sociology, anthropology and biology), can we develop more effective risk models. He refers to this as *'human engineering the models'* and comments:

> *'There has been an important revolution with the development in the past few decades of the fields of behavioural economics, including behavioural finance. This discipline incorporates insights gained in other social sciences. For that reason, many financial theorists of the old school have resisted this revolution, for fear that it renders their mathematical models useless. On the contrary – it opens up their models to far richer and more successful applications*.' (Shiller, 2008, p119)

Clearly, these developments in economics present opportunities for the construction industry to *'human engineer'* its own risk management models in the future.

3.7.4 Tools for the production and dissemination of practice knowledge: reflection

Writers on professional and tacit knowledge production stress the importance of reflection in making practice knowledge explicit. Writers such as Schön (1984) clearly intend that reflection should be more than just a tool for making tacit knowledge explicit, that it is an essential tool in the production of competent professionals.

However, other writers contend that reflection is of limited use for professionals early in their career (Canning, 2011) when other methods of training and development may be more

effective. It is also clearly of more value in some of the AEC professions than others. Schön himself discusses the weaknesses of reflection as a model for knowledge production for town planner (1984).

3.7.5 Communities of Practice

Several writers (Pathirage et al., 2007; Carillo, 2004; Egbu et al., 2003) highlight the importance of communities of practice for knowledge management and the sharing of tacit or professional knowledge in the construction industry. However, it is doubtful whether the communities of practice in construction (in Egbu et al.'s work, for instance, the community of practice was the project team) correlate closely with those developed in other areas, for example teaching. Knowledge management in the U.K. construction industry is still in its earliest stages of development (Pathirage et al., 2007) and the fragmented nature of the industry, both in its institutional fragmentation and its preponderance of small firms, together with the commercial advantage some tacit knowledge gives its owners, makes its dissemination difficult.

Wenger (1998) describes communities of practice as having life cycles, but again, in teaching and in medicine these are likely to be longer and more stable than those in construction.

The absence of opportunities for professionals in the mid or later stages of their career to reflect on their experiences, make their knowledge explicit and develop new perspectives (Erault, 1985) and the professional institutional requirements for continuing professional development suggest opportunities for institutions to promote communities of practice which span organisational boundaries and which (importantly) have CPD accreditation.

3.7.6 A theoretical model for the analysis of an innovation within a community of practice

Many academic writers on the knowledge produced in the workplace (tacit knowledge, professional knowledge, reflective practice, Mode 2 etc.) possess an inflated reverence for

practice, although Erault notes its limitations (Erault, 1985). It is clear that practice knowledge can be harmful or negative and must be subject to scrutiny and reflection (Erault, 1985; Gibbons et al., 1994).

Erault (1985) suggests that practitioners *'stress first-hand experience in preference to abstract principles'* (p128) and that the adoption of new ideas involves a *'process of experiment, evaluation, adjustment and routinisation.'* (p129). From the field of education, Hall and Hord (2006) and Hall and Loucks (1979) have formulated a set of stages which individuals facing a new practice may encounter during the implementation of an innovation. This is shown in Table 5 below:

Table 5: Typical Expressions of Concern about an Innovation (from Hall & Hord , 2006 and Hall & Loucks, 1979)

STAGE	***INDIVIDUAL REACTION***
AWARENESS	*Little concern or interest in the innovation*
INFORMATIONAL	*Expressing a general interest and wanting to know more*
PERSONAL	*Wanting to understand how the new practice will affect him or her*
MANAGEMENT	*Focussing on talks, information and processes*
CONSEQUENCE	*Concerned about the new practice's impact*
COLLABORATION	*Collaborating with others to enact the new practice*
REFOCUSSING	*Energised by the benefits and beginning to brainstorm and imagine strategies for remixing and improving the practice*

The same authors have also delineated eight levels of use to help members of a community of practice identify where they are in the implementation of a new practice. This is shown in Table 6 below:

Table 6: Levels of Use of the Innovation: Typical Behaviours (from Hall & Hord, 2006 and Hall & Loucks, 1979)

LEVEL OF USE	***CoP MEMBER'S ACTIONS***
NONUSE	*No action taken, no interest*
ORIENTATION	*Gathering information*
PREPARATION	*Planning ways to incorporate*
MECHANICS	*Concerned with mechanics*
ROUTINE	*Implementing with comfort (BECOMING TACIT?)*
REFINEMENT	*Looking at ways to improve (SCRUTINY? REFLECTION?)*
INTEGRATION	*Collaborating with others; integrating into other uses*
RENEWAL	*Investigating new innovative ways to implement*

3.7.7 Developing the Skills Required for Effective Risk Management

When asked to review the main aim of this paper – whether by using lessons from Accident Learning in Engineering and Behavioural Economics and Finance inexperienced professionals in construction and civil engineering project work could be helped to improve their financial risk management skills – the response from industry reviewers was rather negative. Reviewers felt strongly that risk management skills were gained through experience only. Given the primacy accorded to tacit knowledge and the development of knowledge in practice in the AEC professions in the U.K. this is unsurprising. However, taken to its logical conclusion, such an

attitude would render industry practices such as health and safety inductions and toolbox talks pointless. Why explain the dangers of a construction site when the best way for someone to learn is to wait for them to experience or witness an accident themselves? Clearly, AEC professionals learn in other ways besides direct experience.

In addition, whilst many writers revere experiential learning it is, of course, possible that a person may draw an unhelpful or even dangerous lesson from experience. A different criticism of the aim of this paper came from an industry reviewer with long-standing experience of construction project work who was coincidentally also receiving dynamic risk management training as a volunteer coast guard. This reviewer felt that, although the classroom training, he had received was useful, he needed a greater range of experiences in order to be able test theories and experiment with strategies learnt there. This reviewer seemed to be referring to Schön's 1984 description of how the skills of reflection-in-action develop in professionals.

Whilst opportunities for direct experience within an educational setting are limited simulation could be used to provide students with a wide range of different events and contexts. Simulation allows students to test, critically review and then re-test strategies in a way which is often not possible in practice. The use in most AEC degree courses of work on 'live projects' is an example of simulation which is widely accepted by industry. In Dale's Cone of Experience (Figure 3, 1946) simulation can be seen to be nearer the concrete end of the spectrum than the classroom learning encountered by the reviewer undergoing training for dynamic risk management at sea. It is asserted that, for these reasons, simulation, an integral part of HRT, is more likely to be accepted as a valid training tool by professionals in the AEC industries than classroom-based learning alone.

Figure 3: Dale's cone of experience (Dale, 1946)

3.8 An Historical Review

The crisis in construction commercial risk management appears to be both chronic *and* acute. Chronic in its long-standing problems of low profitability, high risks, negative cash flow profiles and high levels of insolvencies. Acute in two respects; firstly, in the failure of contractors who have turned to support services as well as purchasing rivals as tools for increasing their margins. Secondly, in the failure of clients to practice what they preach in respect of collaboration and commercial risk sharing. The industry certainly seems to conform to Argyris and Schön's model of gap between espoused theory and theories-in-use and of a preference for technique over interpersonal skills in its professional training. The human-social-interpersonal skills required for collaboration, risk-sharing and the development of longer-term working relationships may be absent in an industry which stresses the development of technical skills. Could, as Argyris and Schön suggest, there be a historical reason for this? In an attempt to answer this question, the study now turns its attention to the historical roots of the Architecture, Engineering and Construction (AEC) professions and the development of traditional commercial risk management practices in the U.K.

3.8.1 The development of the AEC professions in the U.K.

Although Aristotle first identified a division between theoretical and practical disciplines (Lawson-Transcred, 1998) the term *'applied science'* was not used until the late 19th century when natural scientists employed it to distinguish their work from technology (Oxford University Press, 2003). The academic disciplines we recognise today emerged very slowly; for example, much of what we now call physics was still known in the 18th century as *'mixed mathematics'* and included hydrology, navigation, optics, statics, geography and astronomy. The Enlightenment saw the triumph of mixed mathematics as the discipline enabling the explanation, analysis and prediction of natural phenomena. Reason was the byword of the

Enlightenment and through reason man could impose order on recalcitrant nature (Hankins, 1985).

3.8.2 Civil Engineering

The first AEC professionals to develop in the U.K. were the civil engineers, emerging from the earliest requirements of the Industrial Revolution for improved systems of transportation. The development of better roads, the construction of new methods of transport such as canals and the protection of shipping through the building of lighthouses were key features of the work of the early civil engineers.

The initial aim of civil engineering - the application of scientific, particularly mixed mathematical, principles in the mastery of the natural world - was enshrined in the ICE's 1828 Charter and is still contained within its 2018 version:

> *'A…society for the general advancement of Mechanical Science, and more particularly for promoting the acquisition of that species of knowledge which constitutes the profession of a Civil Engineer, being the art of directing the great sources of power in Nature for the use and convenience of man, as the means of production and of traffic in states both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigations and docks, for internal intercourse and exchange, and in the construction of ports, harbours, moles, breakwaters and lighthouses, and in the art of navigation by artificial power for the purposes of commerce, and in the construction and adaptation of machinery, and in the drainage of cities and towns.'* (Institution of Civil Engineers, 2018, p5).

As well as the development of this new profession, the transport boom also saw the emergence of the division between consultancy and contracting, a development initiated by the early civil engineers such as Employee J Rennie (Thompson, 1968). This trend evolved during the 19th

century until, at its end, the definition of civil engineer had narrowed to mean only the engineer who designed the project, not the one who constructed it (Ferguson and Chrimes, 2011).

3.8.3 Architecture

Architecture had a more problematic course than civil engineering towards professionalisation, its development hindered by a long-running debate about whether art could be assessed or examined (Walker, 2008). However, the formation of the RIBA as the principal institution for architects was still reasonably contemporary with that of the ICE (see Table 7 below).

Table 7: The Development of the AEC institutions in the U.K.

Institution	***Acronym***	***Date of incorporation***	***Date of Charter / Royal Charter***	***Date of earliest U.K. degree course***
Institution of Civil Engineers	*I.C.E.*	*1818*	*1828*	*1874 – University of Glasgow*
Royal Institute of British Architects	*R.I.B.A.*	*1834*	*1837*	*1894 - University of Liverpool*
Royal Institution of Chartered Surveyors	*R.I.C.S.*	*1868 (as the Institution of Surveyors)*	*1881 (Charter) 1946 (Royal Charter)*	*1960 – University College, London*
Chartered Institute of Building	*C.I.O.B.*	*1834 (as the Builders' Society)*	*1980*	*1975 – University of Reading*
Royal Incorporation of Architects in Scotland	*R.I.A.S.*	*1840 (as the Institute of Architects in Scotland)*	*1922*	*1907 – Edinburgh College of Art with Heriot Watt university*
Institute of Structural Engineers	*Istructe*	*1908 (as the Concrete Institute)*	*1934*	*n/k*
Royal Town Planning Institute	*R.T.P.I.*	*1914*	*1959*	*1909 – University of Liverpool*

In fact, the links between the two first AEC professions were closer than is often acknowledged. The 19th century South Kensington system - the first government sponsored national art curriculum and often described as *'art for industry'* - was subject to a great deal of criticism in the architectural journals partly because of its associations with the Royal Engineers, from whom many of the civil engineers also sprang (Walker, 2008). Critics such as Ruskin believed the Kensington system crushed the imagination and a move away from the emphasis on technical skills began in the 1870s (Walker, 2008). This development of architecture from *'industrial art'* to the design profession we know today can be seen in Table 8 below:

Table 8: The AEC Professions in 19th Century Census Classifications (adapted from Thompson, 1968 and Ferguson & Chrimes, 2011)

Date of census	Category	Example Occupations
1851	Learned Professional	Attorney Solicitor Barrister Conveyancer Physician Surgeon Apothecary Clergy
	Art and Mechanic Productions	Civil engineer Surveyor
	Commercial classes	Auctioneer Valuer
	Persons possessing or working the land	Estate agent Land agent Land surveyor
	Mineral and metal workers	Road surveyor
1861	Professional class	Civil engineer
	Industrial class	Architect Surveyor Estate agent
	Agricultural class	Land agent
	Persons who buy or sell, keep or lend money, houses or goods	Auctioneer
1881	Professional class	Civil engineer Architect Surveyor
	Commercial class	Auctioneer Valuer House agent

A further complication in the development of the architecture profession was the presence in its midst throughout the 19th century of measurers and valuers (the forerunners of today's quantity surveyors) and district surveyors (later building surveyors, borough engineers and town planners). In an attempt to preserve the integrity of the profession by aligning it to historical notions of knowledge production, as well as distancing it from a number of scandals

involving English measurers and surveyors, the RIBA was formed in 1834 as a body which specifically excluded from membership '*any Fellow or Associate, either for having engaged since his election in the measurement, valuation or estimation of any works under-taken or proposed to be undertaken by any building artificier*…' (Kaye, 1960). Although, for the time being, district surveyors, planners and borough engineers could remain members of the RIBA, in time they too would form their own specialised professional bodies (Thompson, 1968).

The two earliest AEC professions, civil engineering and architecture, therefore coalesced around historical theories of knowledge production – in essence, the application of a single scientific or humanities discipline. This accelerated their institutional development by enabling them to ally themselves with the older professions of law and medicine. The remaining built environment professions emerged later to fill the increasing space between engineering and architecture. Whilst they too clung to the historical theories of knowledge production, they were to a much greater extent interdisciplinary in nature.

3.8.4 Surveying

The development of a separate professional surveying institute came much later than that of architects or civil engineers. For many years, the measurers and valuers, district surveyors, land surveyors and mining surveyors applied separate and still emerging subject disciplines to their work. This made it difficult for them to define a common knowledge base around which to unify (Thompson, 1968). As a consequence, the RICS developed much later than the ICE and RIBA (see Table 4 above) and, it is argued, represented the first interdisciplinary AEC profession.

> '*Surveying had developed as a specialism in several branches by the 1790s, but these several branches lacked an organising principle, a 'common band of cohesion.''* (Thompson, 1968, p65)

3.8.5 Construction Management and Town Planning

With both construction management and town planning it is also possible to propose that the very interdisciplinary nature of these professions hindered their institutional development.

Two factors led in the mid-19th century to the development of the general all-trades contractor and – much later - the consequent profession of construction management. Firstly, the replacement of the existing *'measure and value'* system of costing building works post-completion (Thompson, 1968). And secondly, the divesting of both architects and surveyors of the construction function, from which both professions had been accused of profiteering. Both these developments led to the *'contract in gross'* and the single all-trades contractor who undertook all construction works and benefitted from the economies of scale this change brought with it. In spite of the early development of a trade group - The Builders' Society - in 1834, the hierarchical position of consultants above contractors initiated by the civil engineers, hindered the development of construction management as a profession.

Town and regional planning was, until the early 20th century, a role undertaken by both architects and surveyors, the RICS having a Town Planning Committee from 1910. However, a conflict of interest in which surveyors increasingly acted for private land and property owners against planning authorities developed and, when a separate Town Planning Institute was formed in 1913, the RICS did not react. As Thompson (1968) says:

> *'Town Planning was, and is, essentially a cross-disciplinary activity, ideally involving a reconciliation of a multiplicity of factors, and the application to its decisions of a wide variety of expertise, with contributions from architects, civil and municipal engineers, land, building, transport, industrial and agricultural economists, landscapers and so on.'* (p302).

3.8.6 The Development of the AEC Professions in Scotland

Before moving on, it seems apposite given the research topic to examine the specific influence Scotland had on the development of the AEC professions.

Scottish civil engineers, for example Employee J Rennie and Thomas Telford were, of course, instrumental in the establishment of the profession and the ICE (Telford was the ICE's first President). Scotland's early universal education system, its cultural and political enlightenment of the late 18th century and the necessity for its industrial development of overcoming its unprepossessing climate and topography by infrastructure development, ensured the pre-eminence of Scottish engineers.

Less well known in the role of Scottish measurers and valuers in the development of the Quantity Surveying profession. Unlike in England where there were persistent scandals amongst the measurers, Scotland's system of guilds and municipal regulation assisted the early recognition of measurers and valuers as professionals. Scottish ordained measurers had to take an oath before a Sheriff and could be, and were, struck off for unethical conduct.

Scotland's Quantity Surveyors also claim the earliest standard method of measurement in The Edinburgh Mode in 1773. Thompson (1968) claims:

> *'The survival of medieval practices, of guild organisation backed up by municipal authority, which the English tended to hold up to ridicule as symptomatic of the backwardness and torpor of Scottish life, had in effect in this instance enabled Scotland to leapfrog over the age of unregulated laissez-faire anarchy right into the modern age of regulated professionalism.'* (Thompson, 1968, p77)

Having described the development of the individual construction professions, how then and when did commercial risk management practices evolve? The following section explores this.

3.9 Traditional and Contemporary Commercial Risk Management Practices

3.9.1 The Development of Traditional Commercial Risk Management Practices

Quantity Surveying emerged from the rebuilding works which took place after the Great Fire of London. Prior to this, craftsmen were usually paid a daily rate by their employer who was also responsible for ordering and paying for materials. With the emergence of the professional architect in the 17th Century, a system of post-contract 'measure and value' of construction works emerged (Reddaway, 1940). Several books published after the Great Fire (e.g. Leybourn's 1685 work, '*A platform for Purchasers, a Guide for Builders, and a Mate for Measurers'*) described methods for measuring building works as well as offering advice on appropriate rates. Mandey's '*Marrow of Measuring'* in 1682 suggested that dimensions should be recorded in a four column '*dim book'* and described the drawing up of a bill of quantities. These books are early versions of price books and standard methods of measurement, but it is important to note that, whilst convention made it possible to compile estimates, it was not yet feasible to bind separate tradesmen to fixed prices. As Thompson (1968, p70) says, '*advance estimating remained in the hands of architects performed from sketchy calculations and guesswork to propitiate their clients'.*

The nascent profession of Quantity Surveying developed differently in the constituent parts of the United Kingdom. As has been previously described, in Scotland, a unique system of guild and municipal regulation led, in the early 18th century, to the development of sworn measurers (precursors of Quantity Surveyors) who could be, and were, defrocked for unprofessional behaviour. In this way the professionalism of surveyors in the 18th century could be said to be further advanced in Scotland than it was in England.

The first standard method of measurement in the U.K. was the Edinburgh Mode of 1773 developed for the construction of the city's New Town. This was still entirely post-contractual and it was in England that pre-contract estimating first developed (Thompson, 1968).

The development of *'contracting in gross'*, the employment of a single main contractor employing his own workforce and taking advantage of the economies of scale this offered emerged during the barrack building boom which followed the outbreak of the Revolutionary war in 1793 (Thompson, 1968). Parliamentary enquiries into several scandals, for example, the expenditure of huge sums of public money for the building of Buckingham Palace and Windsor Castle and the total collapse of the newly built Customs House in 1825, led directly to the system of traditional procurement we understand today; that is, the provision of fixed price contracts ahead of the commencement of construction works.

The design and construction of the new Houses of Parliament in the early 1830s, the largest public sector construction project of the time, was procured using the new method and let on a *'contract in gross'* with bills of quantities; it was probably the first time a professional quantity surveyor (Henry Arthur Hunt) was employed to prepare a pre-contract estimate as well as manage the commercial aspects of the build. The state of the art of commercial risk management practices at the time can be judged from the following quotation:

> *'It is true that the final cost of well over £1.5 million greatly exceeded the estimates, but all save £310,000 of this excess was caused by matters outside the estimate such as site purchase and the embankment, the internal fittings and furnishings or by variations and additions to the original plan made by the perpetually changing view which the Houses themselves took of their own necessary comforts and conveniences. About half of the £100,000 excess was attributable to extra work on the foundations to*

deal with unexpected quick sands and springs which might perhaps have been revealed by greater forethought.' (Thompson, 1968, p90).

For 'greater forethought' the modern-day Quantity Surveyor might suggest 'more effective commercial risk management' in the form of a tighter client brief and a site investigation.

Clearly then, the methods Quantity Surveyors adopted to control commercial risks - pre-contract estimates, traditional procurement, standard methods of measurement and fixed price contracts - are long-standing practices. Perhaps the only major development in commercial risk management practices after the Victorian era came in the area of pre-contract cost planning, emerging as it did from the mass schools building programmes of the 1950s and 1960s. At that time the Ministry of Education needing a technique for forecasting and controlling build costs during the design stage and developed cost analyses of older projects and published in the 1960s; the first standard form of cost analysis published by the Building Cost Advisory Service (then part of the RICS) emerged shortly afterwards (Kirkham, 2007; Ashworth, 1999).

It is important to note at this point that traditional procurement and many of the methods developed to control the commercial risks of traditional procurement developed simultaneously. Therefore, the efficacy of each depended to some extent on the other.

How then did the reputation of an industry with such long established institutions, professional education and commercial risk management practices deteriorate to such a level that governmental investigation was required? The answer lies in the development of new procurement methods in the 1970s and 1980s, which aimed to speed up construction and the clash with traditional commercial risk management practices.

3.9.2 The emergence of new procurement methods in the 1970s and 1980s

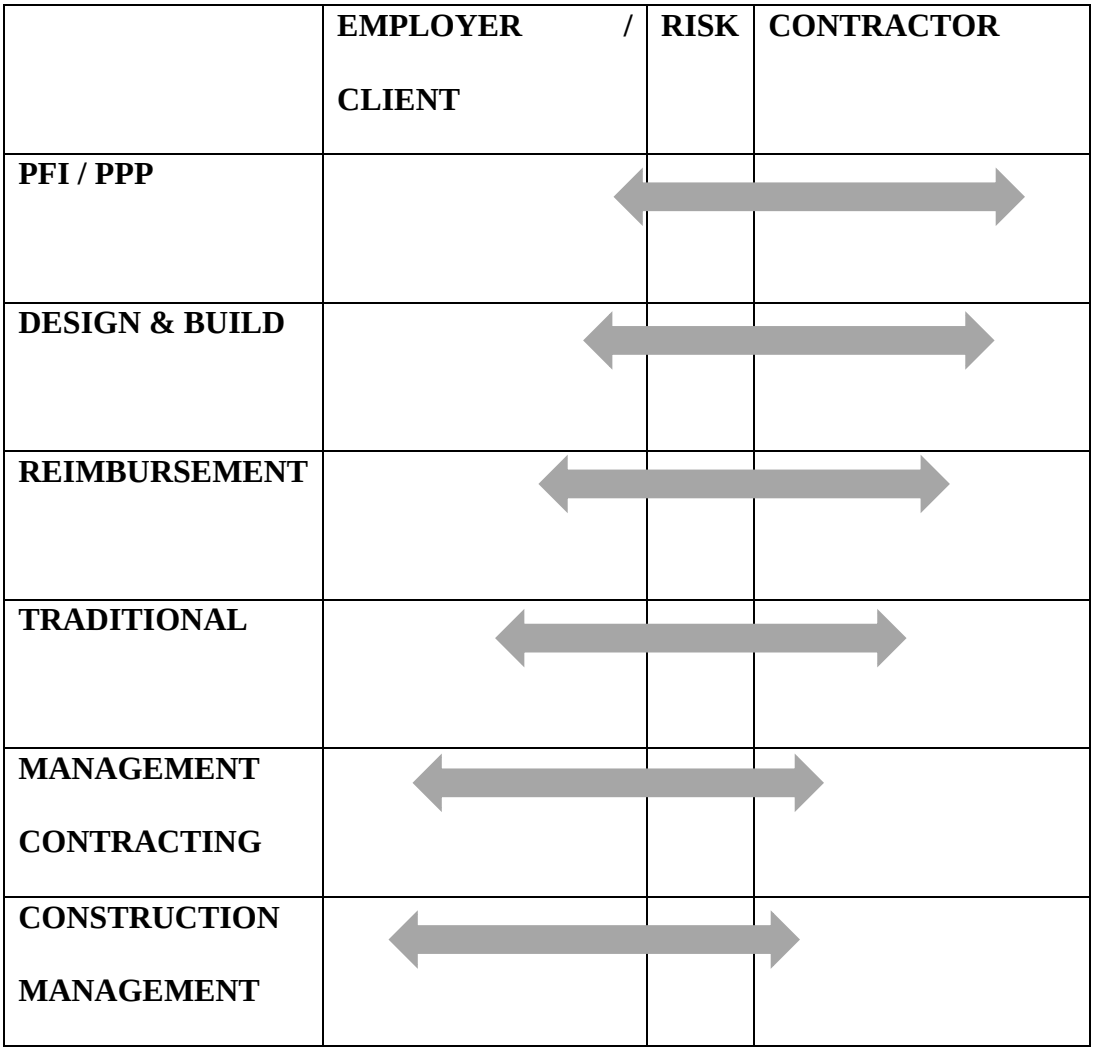
New procurement practices such as Design and Build and Management Contracting emerged in the 1970s and 1980s in response to clients' dissatisfaction with the slowness of traditional

procurement. The difficulties these new procurement methods posed to both clients and contractors can be best described by examining the building of the new Scottish Parliament at Holyrood where the eventual costs of the project exceeded initial estimates by over 350%. The construction of the new Wembley stadium, culminating in the most expensive construction dispute ever seen by the U.K. courts, is also illuminating. In both cases, the use of new faster procurement methods without the corresponding development of new techniques to manage the commercial risks was fundamental to their failure.

3.9.3 The Holyrood and Wembley Stadium projects

At Holyrood, an early decision was taken to proceed with construction management (a riskier form of management contracting, see Figure 4 below), a decision which now seems extraordinary.

Figure 4: The Relative Distributions of Risk in Different Procurement Methods (adapted from Scottish Government, 2003, p80)



As an expert witness to the public enquiry which followed the project commented;

> *'If you are a client who is dependent on having a fixed price before you start you do not choose construction management because it does not deliver that.'* (Evidence of Mr Colin Carter, Scottish Government, 2004, paragraph 48).

The final report of the public enquiry concluded:

> *'It is…evident that the Scottish Office, while working to publicly declared fixed budgets and being highly 'risk averse', was preparing to follow a procurement route for which*

there could be no fixed budget and a high degree of risk would rest with the client.'

(Scottish Government, 2004, p81)

Similarly, with the Wembley stadium project, the House of Commons' Committee report of 2001 concluded that procurement issues were key to the project's failure; it quoted the employer's own investigation (the James report) and cited its decision not to follow a formal procurement process, to conduct parallel procurement processes which were not fully competitive, and to give the main contractor a potential competitive advantage over its rivals as fundamental errors. The report concluded that the procurement of Wembley stadium fell well below best practice in the industry (House of Commons, 2001).

Over the past twenty-five years, partly as a result of these failed projects, successive governments have attempted to find solutions to the problems facing the construction industry. Some of the most pre-eminent of these initiatives and the tools subsequently developed alongside them are outlined below.

3.10 Governmental and industry initiatives to address the perceived problems of the U.K. construction industry

The performance of the U.K. construction industry has been criticised in several government reviews over the past thirty years. 'Constructing the Team' in 1994; 'Rethinking Construction' in 1998; and the 'Final Report ..... by the Procurement / Lean Client Task Group' of 2012 are perhaps the best-known examples. The need for the formation of longer-term partnerships, non-adversarial relationships, risk-sharing, integrated teams and the objective assessment of performance are the most commonly prescribed solutions (Local Government Association, 2016). In 'Rethinking Construction' Sir Employee J Egan summarised the changes construction needed to make as follows:

> *'The industry must replace competitive tendering with long-term relationships based on clear measurement of performance and sustained improvements in quality and efficiency'* (Department of Trade and Industry, 1998, p5).

'Constructing the Team', 'Rethinking Construction' and the 'Final Report… by the Procurement / Lean Client Task Group' are now summarised below.

3.10.1 'Constructing the Team' (the Latham Report)

In 1994's 'Constructing the Team' Sir Michael Latham advocated sweeping changes to the industry, focusing particularly on procurement, contract administration and client practices. The report mandated central government client departments to lead these changes with private clients also taking a major role. 'Constructing the Team' further advocated that design obligations should be agreed early on and that the utilisation of Co-ordinated Project Information should be a contractual requirement. It recommended the use of the then new NEC contract or amending JCT and ICT forms of contract to take account of the principles of NEC. Public and private sector clients should, it advised, begin to use the NEC, and phase out bespoke contracts. Critically, it recommended that the role and duties of Project Managers needed clearer definition and that Government project sponsors should have sufficient expertise to fulfil their roles effectively. Tenders should be evaluated by clients on quality as well as price and the National Joint Consultative Committee for Building (NJCC) recommendations on periods allowed for tendering should be followed. The report advocated that a Joint Code of Practice for the Selection of Subcontractors should be drawn up and that this should include commitments to short tender lists, fair tendering procedures and teamwork on site. The industry should also strive to improve its public image and urgently address its poor record on equal opportunities. A productivity target of 30 per cent real cost reductions by the year 2000 was initiated and the report recommended that a Construction Contracts Bill be introduced to give statutory backing to the newly amended Standard Forms, including NEC.

Within this, some specific unfair contract clauses were outlawed and adjudication become the normal method of dispute resolution (Latham, 1994). In particular, Latham felt that substantial cost savings could be effected by the use of partnering:

> *'The widespread growth of partnering and subsequently collaborative working can be traced to Latham. He stated that widespread adoption of collaborative working practices could achieve a 30% real cost saving within five years.'* (Constructing Excellence, 2015)

Quite how the implementation of partnering could effect these savings was not made so explicit.

3.10.2 'Rethinking Construction' (the Egan Report)

In 1998, less than four years after Latham, 'Rethinking Construction' was published. In this report Sir Employee J Egan described the industry as having low and unreliable profits; his view was that the margins were too low for sustainable development and that companies who served their clients well deserved far higher returns.

Egan recommended increases in research and development and capital investment to address the skills shortages, ageing workforce and decline in numbers of apprentices in the industry.

He described a system in which many clients were undiscriminating, selecting designers and contractors almost always on the basis of cost only. Egan viewed this as the greatest barrier facing the construction industry and named the public sector as a particular culprit.

The Egan report was instrumental in introducing the concept of 'best value' to the U.K. construction industry (Construction Task Force, 1998).

3.10.3 The 'Final Report ..... by the Procurement / Lean Client Task Group'

In 2012 the 'Final Report ..... by the Procurement / Lean Client Task Group' advocated raising awareness of three new models of main contract procurement. In addition, it detailed proposals to explore the collaborative aggregation of procurement between government departments as

well as a means of enabling direct client intervention in ‘Tier 2’ supply chain selection. It defined the characteristics of an ‘intelligent client’ and provided a model for the measurement of those characteristics. The overarching aim was to help industry and government clients develop relationships which delivered projects more efficiently.

3.10.4 The development of new tools for managing commercial risks

In response to the both the dire situation the industry found itself languishing in and the Latham and Egan reports in particular, government, industry and professional institutions produced a number of tools to assist the functioning of this new collaborative construction industry. A number of the most important of these are briefly described below.

3.10.5 The New Engineering Contract (NEC)

The 'New Engineering Contract' (NEC) was first published in 1993. It was a departure from existing construction contracts in that it was written in plain English and was designed to stimulate good project management:

> *‘Our philosophy was to produce something which cured every known ill of traditional contracts. We did not have to compromise. Everything we thought we would be a good idea went in – and we could decide what to put in solely on the basis of what would stimulate all those used it to manage their contribution well.’* (Martin Barnes, quoted in NEC, 2018).

In 1995 a second edition (then called the Engineering and Construction contract – ECC) was published. This aimed to broaden the appeal of the contract from engineering, where it had been successful, to construction where JCT was still pre-eminent. A Professional Services, Adjudicator, short form and sub-contracts were also produced. The NEC3 contract suite, which included Term Service and Framework contracts, was produced in 2005.

NEC was used for all the London Olympics 2012 projects as well as all Crossrail projects. It was updated in 2013 and enlarged to 39 documents. NEC4 was issued in 2017 and includes Design Build Operate and Alliance contracts.

3.10.6 Adjudication

Adjudication, a fast, interim method for resolving disputes, binding until either litigation or arbitration, was introduced in 1996. It was intended to address the problems of main contractors holding onto subcontractors' and suppliers' payments long after they themselves had been paid by the client. The two adjudication acts in 1996 and 2009 applied to construction contracts in England and Wales and Scotland; largely similar legislation exists in Northern Ireland (Construction Industry Council, 2017).

Given recent reports (e.g. Business, Energy and Industrial Strategy and Work and Pensions Committee, HC769, 2018, question 350) of main contractors having supplier payment periods of over 120 days it is perhaps questionable whether adjudication has brought about much improvement to the problem of main contractors holding onto their subcontractors' cash.

3.10.7 The New Rules of Measurement (NRM)

The New Rules of Measurement (NRM) were issued by the RICS over several years beginning with NRM1 in 2009. They provided a standard set of measurement rules as well as guidance for the cost management of construction projects. NRM 1 provided guidance on the quantification of building works for the purpose of preparing cost estimates and cost plans; NRM 2 covered the preparation of bills of quantities and quantified schedules of works; and NRM 3 gave guidance on the quantification and description of maintenance works (RICS, 2012).

3.10.8 Construction frameworks

The Public Contracts Regulations 2015 describe a framework agreement as: *'an agreement between one or more contracting authorities and one or more economic operators, the purpose of which is to establish the terms governing contracts to be awarded during a given period, in particular with regard to price and, where appropriate, the quantity envisaged.'*

Frameworks aimed to encourage longer-term working relationships between contractors and clients and thereby aid the process of continual learning. The relevance and benefits of construction frameworks were considered in 'Effectiveness of Frameworks' (McDermott et al., 2012) which was incorporated into the subsequent 'Final Report ..... by the Procurement / Lean Client Task Group' (2012). The report recognised the importance of framework agreements and argued that effective framework agreements can deliver substantial benefits (Local Government Association, 2016).

Clearly, the traditional practices developed for managing commercial risks proved inadequate to the task of managing projects procured through the new routes developed in the 1970s and 1980s. Successive governmental reports, beginning with Latham, recommended greater collaboration, risk sharing and the development of longer-term working relationships as vital for improvements in construction. These reports also advocated the use of better commercial risk management tools such as NEC and construction frameworks.

Aside from tools and policies, what are the key skills Quantity Surveyors require to effectively manage the commercial risks of modern U.K. construction projects? Is an epistemological analysis of these skills useful for exploring both their nature and how and where they might best be acquired?

3.11 The Skills required for the Effective Commercial Risk Management of Socio-Technical Systems: An Epistemological Analysis

3.11.1 Socio-Technical and Inter-Disciplinarity

The very term 'socio-technical system' is suggestive of multi or inter-disciplinarity. It is also strongly suggestive of a particular type of multi or inter-disciplinarianism, that is, *epistemologically broad spectrum* (italics added) systems.

Before proposing that the synthesised framework of accident learning and behavioural economics and finance shown in Table 3 above can be applied without adaptation to commercial risk management in the construction industry it is necessary to consider if, where, and to what extent, inter-disciplinarianism exists in the Architecture, Engineering and Construction (AEC) professions. The next section considers inter-disciplinarianism in several different AEC professions, in Quantity Surveying and, specifically, in construction commercial risk management.

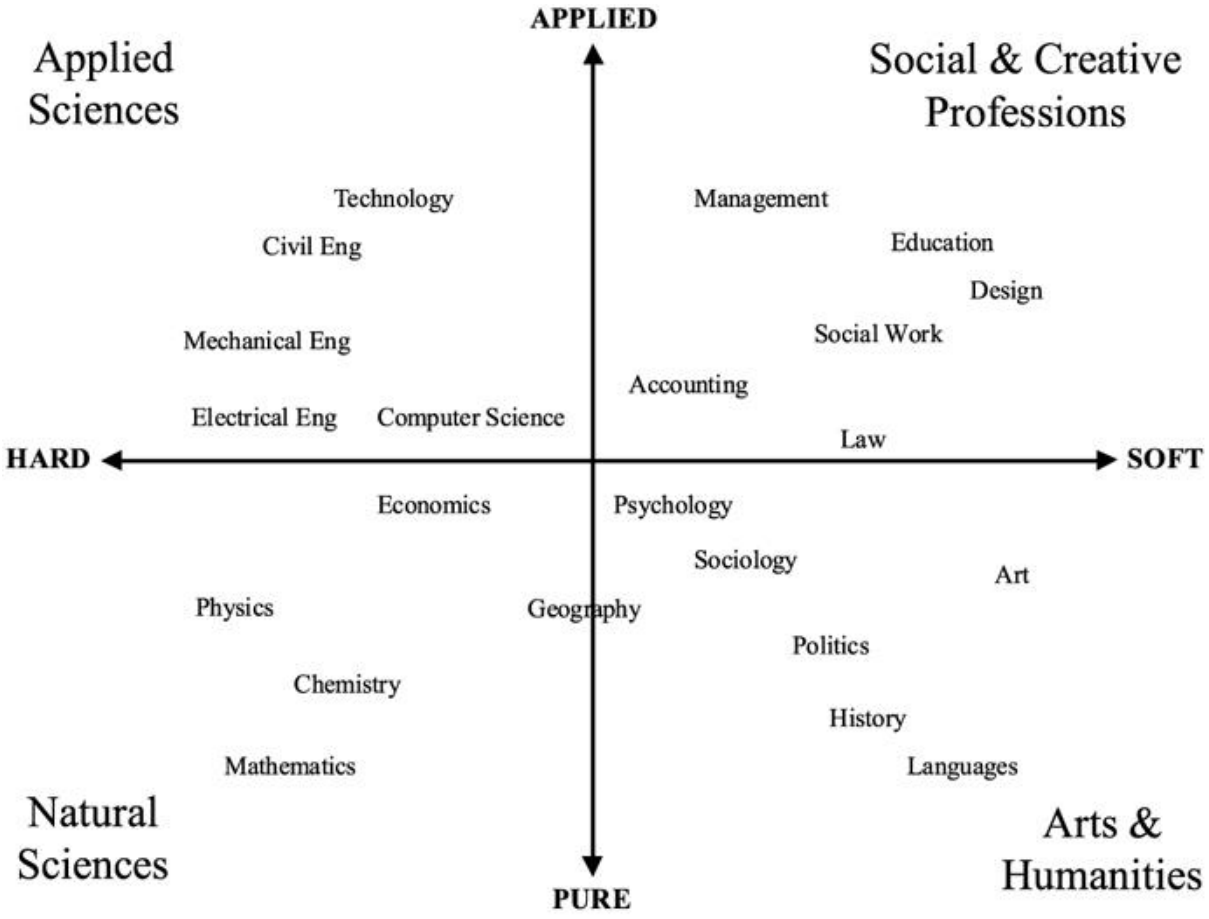
3.11.2 The interdisciplinary nature of the AEC professions

More contemporary theories of knowledge production (in particular Gibbons et al.'s Mode 2, 1994) propose the development of multi/interdisciplinary knowledge production. Using Jantsch (1972) and Klein's (1990) definitions of interdisciplines as hybrid axiomatics formed when separate disciplines come together in structures which reflect common themes or areas of social need and abandon their own subject axiomatics, it is possible to propose that the RICS represents the earliest institutionalisation of an interdisciplinary AEC profession.

In fact, most AEC professions involve an element of interdisciplinarity and this is often poorly recognised in Higher Education. In Biglan's model (1973) shown in Figure 5 below, civil engineering sits firmly in the hard-applied quadrant. But this appears to reflect the profession as it exists in Higher Education and perhaps in consultancy (and possibly only partially there);

that is, purely as a technology subject. Civil engineers in contracting are often responsible for the surveying, contract administration, management, dispute resolution and cost planning, as well as the purely technology functions. It is possible, therefore, to posit that interdisciplinarity is further advanced in practice than it is in academia, at least in civil engineering.

Figure 5: Biglan's (1973) Classification of Subject Disciplines as adapted for the Built Environment by Chynoweth (2005-2009)



Source: Chynoweth (2008)

Since the Biglan (1973) model was developed within Higher Education it should come as no surprise that it reflects subject disciplines as they exist in academia and not as they are 'lived' in the real world. Several writers have warned against accepting Biglan in its entirety (e.g. Becher and Trowler, 2001). In addition, the term *'applied science'* has been subject to much epistemological scrutiny and a contrasting terminology has emerged in the literature (e.g. '*Design Science'* (Van Aken, 2004) and *'Scholarship of Application'* (Bayer, 1990). However, *'applied science'* as a description of technology is a term still widely accepted and understood

in the industry and Biglan has been validated in many studies and is now generally accepted by researchers in Higher Education (Braxton and Hargens, 1996; Chynoweth, 2009).

Returning to interdisciplinarity, it is reasonable to suggest that increasing interdisciplinarity has long been a feature of the AEC professions. Table 9 illustrates the development of the management of the construction process from its earliest form - as groups of individual craftsmen managed by an architect or surveyor - to its modern-day construct, the project manager.

Table 9: The development of the construction management professions

Date	***Profession***	***Disciplinary basis***	***Increasing project complexity?***
Pre-19th century	*individual trades/craftsmen*	*technology*	
19th century	*construction management (via the contract-in- gross)*	*Technology* *management*	
20th and 21st centuries	*project management*	*Technology* *management* *law* *economics*	

The rhetoric of the earliest construction professionals - the civil engineers and architects – stressed the nature of their professions as the application of a single science or humanities discipline. This enabled them to ally themselves to the older professions of law and medicine and hence aided their institutional development. However, as can be seen from the example of the civil engineers, their actual practice involved much more interdisciplinarity. A gap between rhetoric and practice in respect of interdisciplinarity arose at then the very start of the construction professions and was maintained into the twentieth century, at least within Higher Education.

Where then are the boundaries of the construction professions? And are these boundaries adequately accommodated within the industry's rhetoric and practice?

3.11.3 The boundaries of the AEC professions

Several writers suggest that specialisation within the AEC professions resulted from periods of rapid economic development (Thompson, 1968; Ferguson and Chrimes, 2011) or followed as tacit knowledge became explicit (Penn, 2008). However, the development of project management which is essentially interdisciplinary in nature can be seen to dispute this theory, coming to the fore as it did during a construction boom in the mid to late 1980s.

Similarly, with the adoption of the New Engineering Contract (NEC) by many building clients in recent years and the increasingly composite nature of many items within the standard methods of measurement of building works (SMM6 to SMM7 to NRM2) the contractual and measurement paradigms which separated civil engineering and building works have narrowed, enabling practitioners to move between fields.

Clearly, over time, the AEC professions have changed their shapes and the construction industry its contours by specialisation *and* increasing interdisciplinarity.

But what are the specific skills required for contemporary commercial risk management and how can they be viewed from an epistemological perspective?

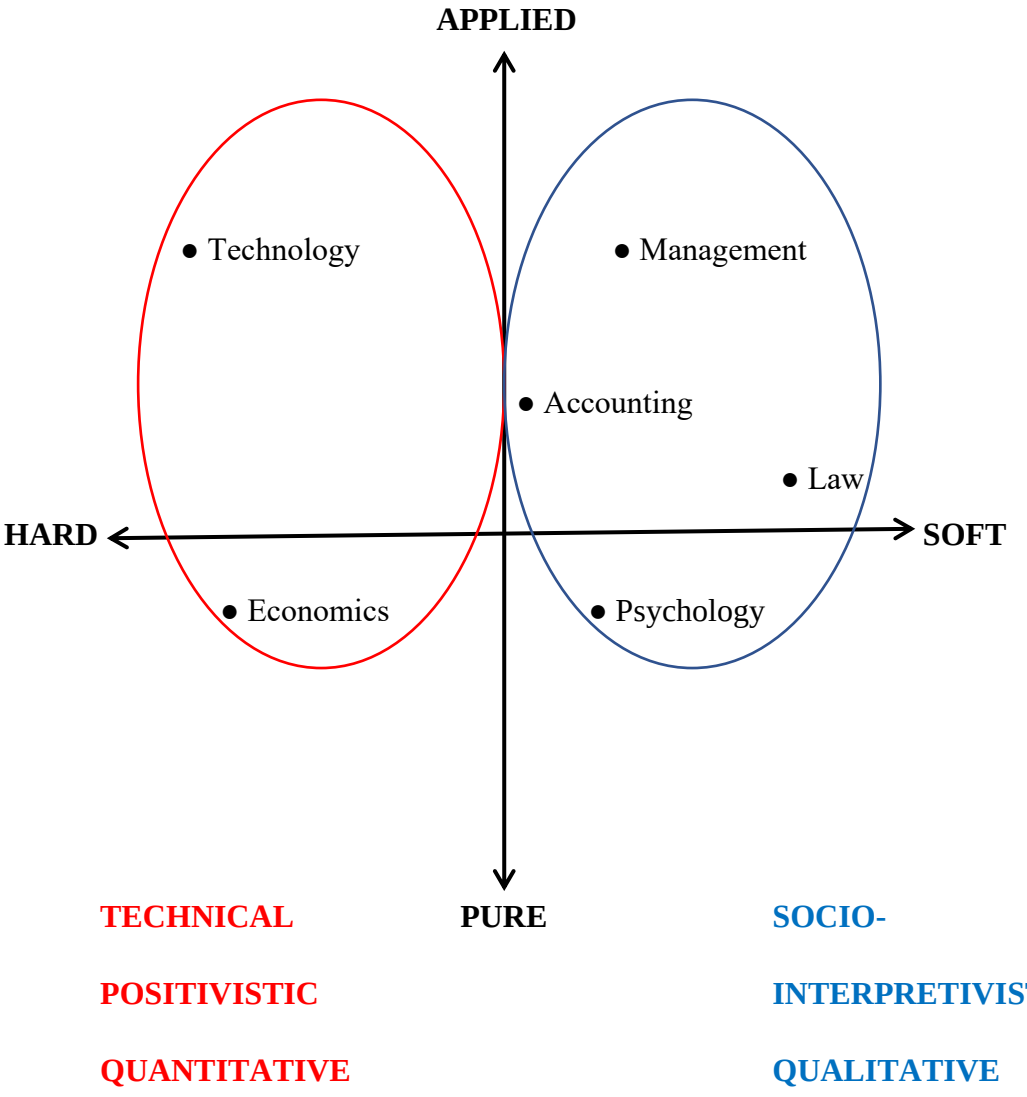
3.11.4 The Subject Disciplines Required for the Effective Management of the Commercial Risks of Construction Projects: An Epistemological Perspective

The ability to identify, assess and then appropriately manage commercial risks is at the heart of a Quantity Surveyor's work. But learning to do this requires Quantity Surveyors to acquire knowledge and skills from a number of different disciplines each with its own epistemological and social traditions (Becher, 1989).

Students are attracted towards or socialised during their undergraduate studies to adopt a particular epistemological stance (Bereiter and Freedman, 1962 and Kolb, 1984; both cited in Becher, 1989, p106). Early career Quantity Surveyors are likely then to be sympathetic towards or inculcated into the positivistic tradition of the AEC professions in the United Kingdom. However, an epistemological analysis of this study suggests that such a unitary philosophical stance is inappropriate.

In common with many '*subject-matter specialisms'* (Law, 1976) commercial risk management in the construction industry is likely to be inter-disciplinary (Becher, 1989, p38), incorporating the disciplines of technology (hard-applied in Biglan, 1973), economics (hard-pure in Biglan, 1973), management, accounting and law (all soft-applied in Biglan, 1973) and, perhaps also, psychology (soft-pure in Biglan, 1973). This is illustrated in Figure 6 below:

Figure 6: The Subject Disciplines Required for Effective Commercial Risk Management in the Construction Industry (adapted from Biglan's classification of subject disciplines (1973)



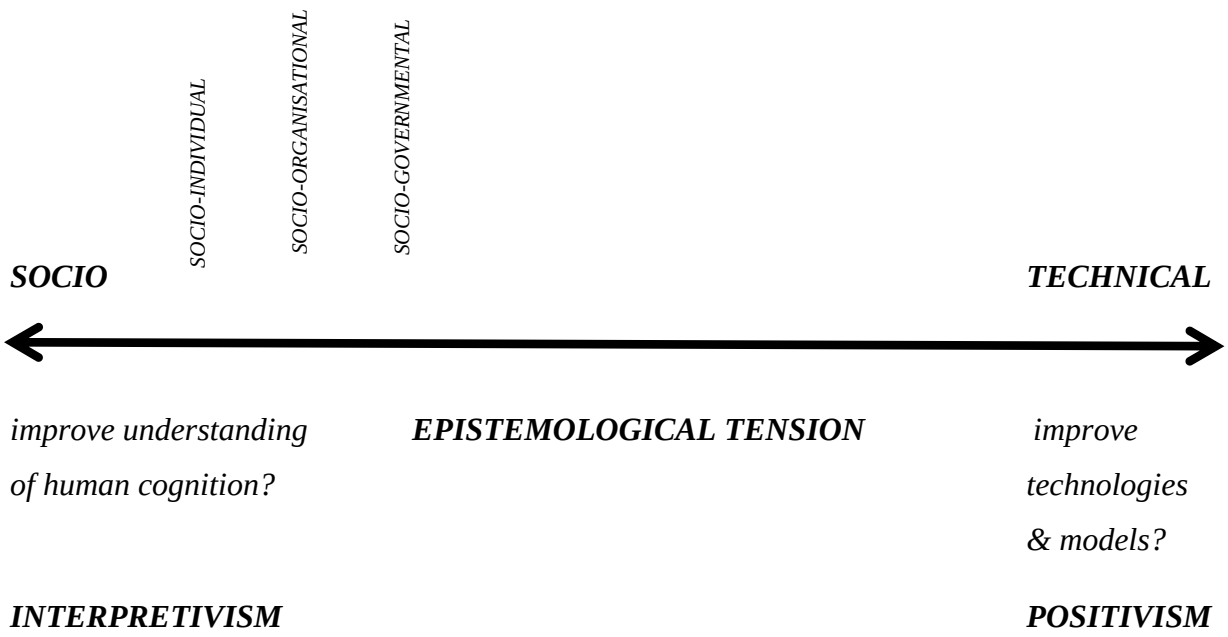
Whilst Figure 10 above is clearly suggestive of inter-disciplinarity for commercial construction risk management it should be noted that the majority of the required skills lie in the *applied* [italics added] zone of Biglan - four subject disciplines in the applied zone against only two in the lower regions of the pure zone. Whilst inter-disciplinarity can occur when subject disciplines in the same Biglanian zones coalesce, for example, two soft applied subjects such

as accounting and law, it is clear that commercial risk management in the construction industry encompasses an epistemologically broad spectrum of mainly applied subject disciplines.

3.11.5 The dominance of the Technical over the Human-Social-Interpersonal aspects of Socio-Technical Systems

Within both Accident Learning in Engineering and Behavioural Economics and Finance - as well as in Argyris and Schön's work - the dominance of technical over socio in the workings of socio-technical systems emerges as a principal theme. Historically, socio-technical systems such as commodities extraction, energy production, construction and finance have been designed and maintained by those with a positivist view of the world. Most of the investment bankers described above by Tett (2013) had an educational background in mathematics or economics (Tett, 2013), the designers of Piper Alpha and Deepwater Horizon were engineers. As a result of accidents such as the financial crisis of 2007-8 and Deepwater Horizon in 2010 there has been a significant move by many writers away from positivism and towards interpretivism in their work on accident reduction and prevention; that is, a clear move along the spectrum away from technical towards socio-governmental (improvements by regulation), socio-organisational (improvements through organisational change) and increasingly towards socio-individual (improvements through better understanding of cognitive functions). However, there could be an element of 'fashion' to this, a risk of the pendulum swinging too far the other way in an understandable reaction to accidents which have caused untold levels of suffering. Would a better understanding of human cognition really improve the functioning of our existing models and technologies as the interpretivists claim? Or are better models and technologies required to overcome human failings as engineers and adherents of efficient market theory believe? This epistemological tension is expressed in Figure 7 below.

Figure 7: Epistemological tension in socio-technical systems

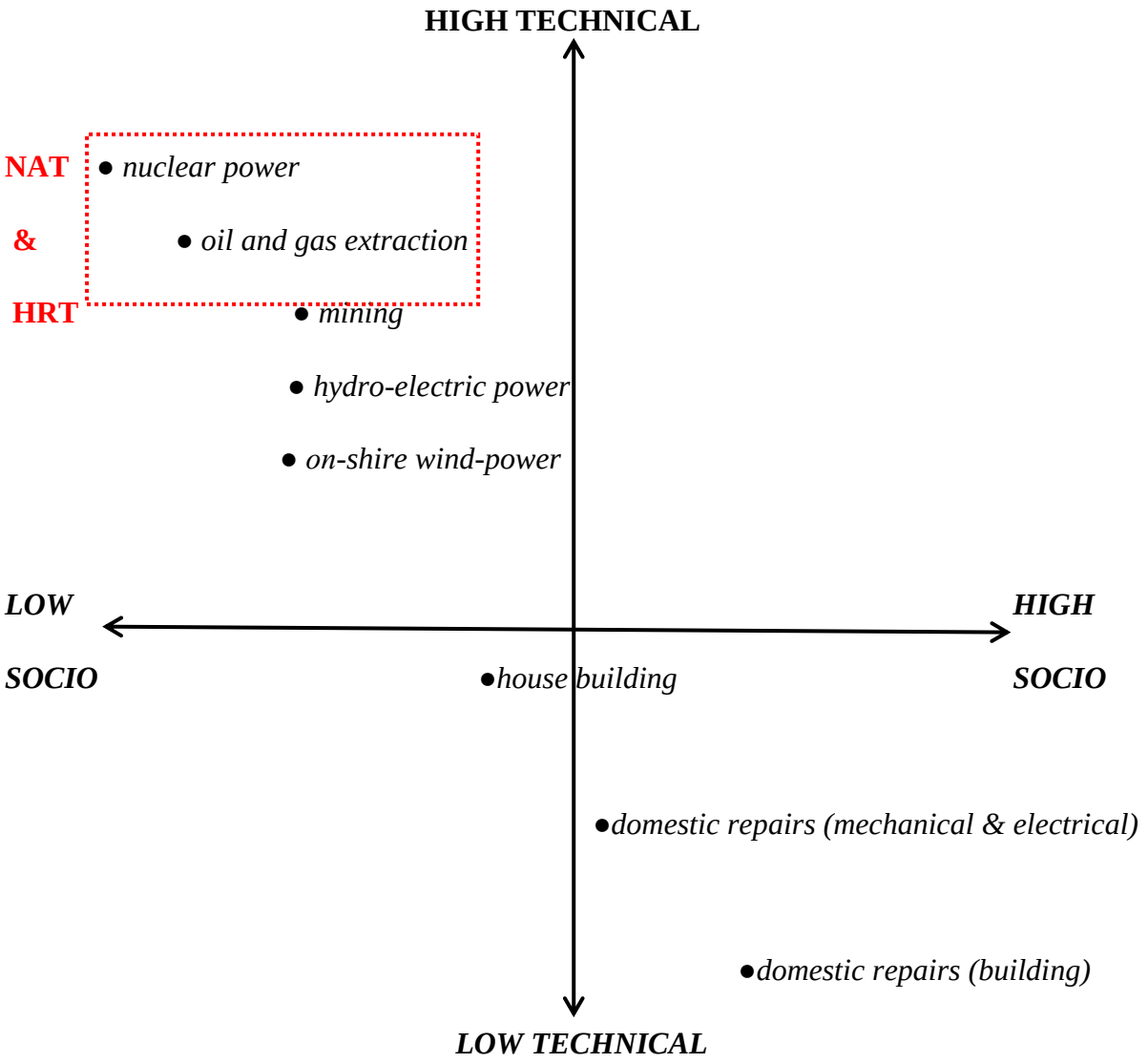


It is asserted here that the links between socio-individual, socio-organisational and socio-governmental have been neglected in the literature. Whilst the role of elites is stressed in both accident learning in engineering and behavioural economics and finance, the importance of training today's nascent elite – tomorrow's practitioners, managers and regulators – is absent from much writing.

3.11.6 Analysis of Socio-Technical Systems in the AEC Industries in the U.K.

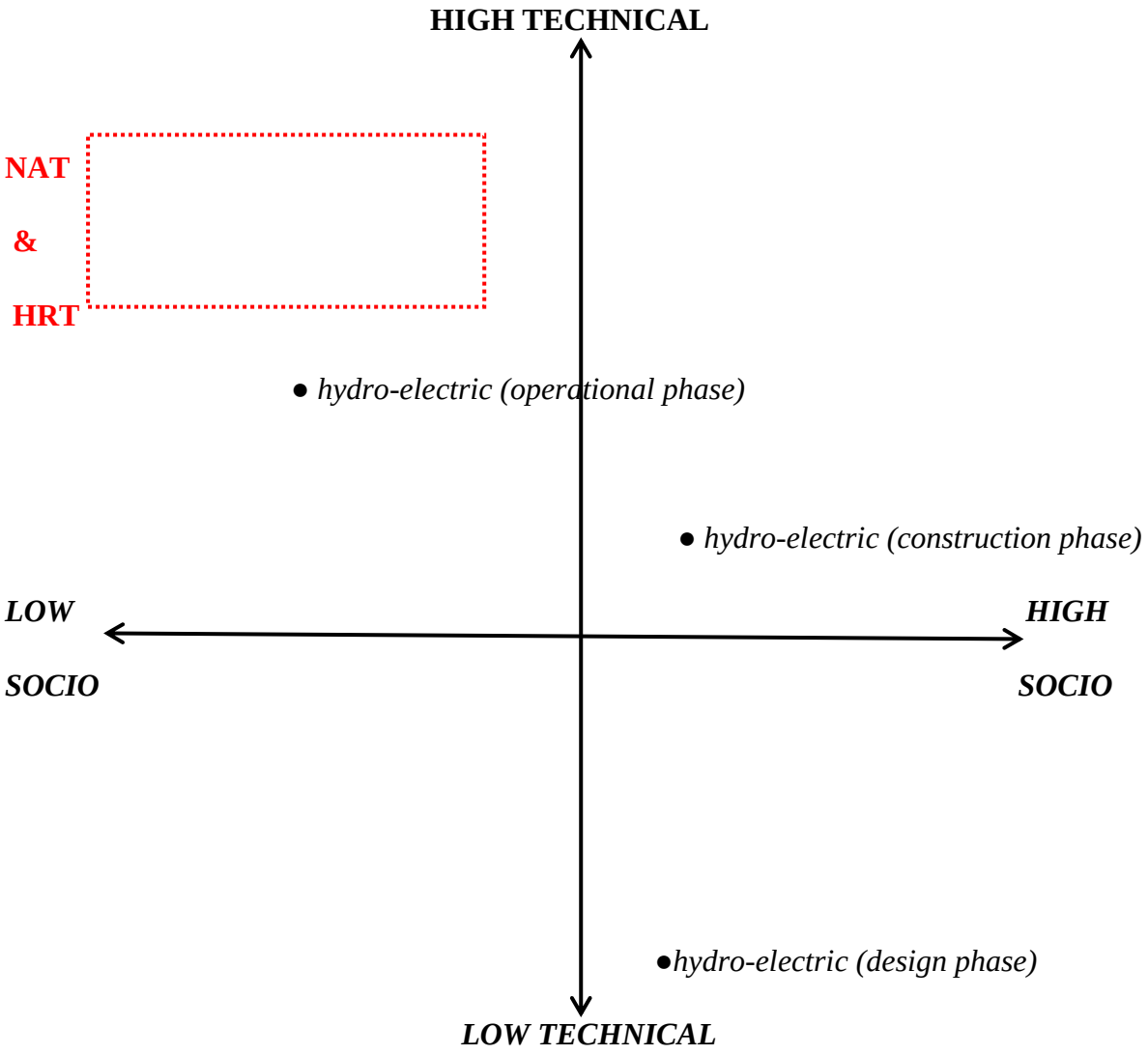
Also pertinent to this analysis is where different industrial systems sit in a socio-technical matrix. Examples of several socio-technical systems from the AEC industries in the U.K. are now illustrated in Figure 8 below. Note that financial systems could also be placed on the same matrix and that NAT and HRT concern themselves only with high-technology systems.

Figure 8: Examples of AEC systems in the U.K. plotted onto a socio-technical matrix



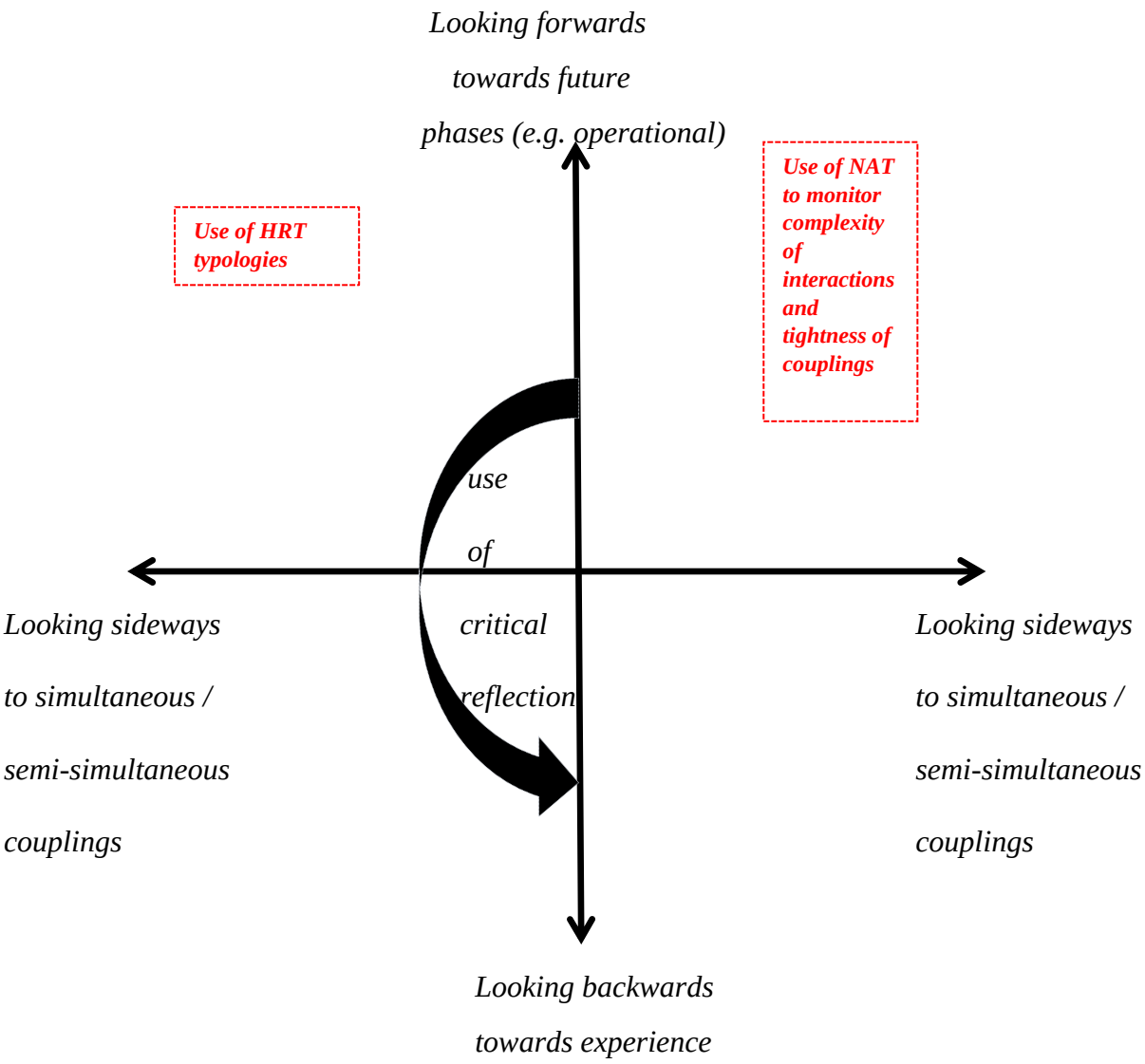
Clearly, the positioning of systems on such a matrix may change over time as new technologies emerge and existing technologies develop. But there are also crucial differences between the design, construction and operational phases of a project. Figure 9 below utilises the same matrix but shows a hydro-electric project plotted in its design, construction and operational phases.

Figure 9: Hydro-electric project plotted in its design, construction and operational phases onto a socio-technical matrix



The Piper Alpha and Deepwater Horizon accidents and the financial crisis of 2007-8 all occurred in their operational phases, although some or all of the causes can be traced back to their design and construction. It seems clear then that the cognitive processes required for effective risk management and which inexperienced construction professionals working in remote projects must develop have a temporal quality which is illustrated in Figure 10 below.

Figure 10: 'Joining the Dots': a conceptual model of the cognitive skills required for effective risk management



In the section above which considered the risk management of socio-technical systems in accident learning and behavioural economics and finance only the hard – soft (technical – socio) spectrum was considered, the systems not having been subjected to Biglanian scrutiny. It is necessary, therefore, at this stage and before moving onto the empirical stage of the study to amend the synthesised framework of accident learning and behavioural economics and finance in Table 3 above to encompass the epistemologically broad and mainly applied nature of subject disciplines required for effective commercial risk management in the construction industry. This is shown in Table 10 below:

Table 10: Essential Skills required for the Effective Commercial Risk Management of Construction Projects: A Synthesised Framework from Accident Learning and Behavioural Economics and Finance adapted to Encompass the Epistemologically Broad and Principally Applied Nature of Subject Disciplines Knowledge required for Commercial Construction Risk Management

Synthesis	Accident Learning	Behavioural Economics and Finance	Architecture, Engineering and Construction Professions
A critical understanding of the tendency towards an over-reliance on technology and technical warning systems in the risk management of socio-technical systems **A critical understanding of the epistemologically broad, principally applied, spectrum of subject discipline knowledge required for the effective commercial risk management in the construction industry**	Perrow (1984) ; Rochlin, La Porte & Roberts (1987); Skogdalen (2011)	Shiller (2008; 2012); Shleifer (2000); Tett (2013)	Biglan (1973); Chynoweth (2005-2009)
A critical understanding of the roles elites and social networks play in the risk management of socio-technical systems	Perrow (1984)	Tett (2013)	
A critical understanding of the importance of filling information gaps and linking seemingly unrelated events in	'*Drawing connections'* (MacRae, 2009)	'*Joining the dots'* (Tett, 2013)	

the risk management of socio-technical systems			
A critical understanding of the value of simulation in training for the effective risk management of socio-technical systems **A critical understanding the limitations of simulation in training for the effective risk management of socio-technical systems**	High Reliability Theory in high risk industries e.g. aviation	Mathematical modelling in financial services, e.g. for risk management in mortgage lending	
	'*Forcing fit'* (Vaughan, 1996) '*Lack of critical reflection'* (Luhmann, 2003)	'*Information spillovers'* (Krugman, 2010) '*Gap between rhetoric and reality'* (Tett, 2013)	

3.12 Conclusion of literature review

This initial literary-based stage of the study has now reached a number of conclusions in respect of a research gap and of the corresponding objectives required to address that gap.

Whilst effective commercial risk management is crucial within an industry with such low profit margins and high operational risks, it is not currently a focus of academic writings; indeed, it is not an established academic discipline.

What are the skills required by Quantity Surveyors to enable them to adequately manage commercial risks in projects? And what is the ideal epistemological mix of these skills, between hard and soft, pure and applied? A change in philosophical approach towards commercial risk management has taken place in the industry relatively recently, from adversarial towards more collaboration, requiring perhaps different skills sets and, consequently, a tension between the old skill mix and the new. How is this potential tension manifesting itself in policy and in practice, in both contracting and client-side organisations?

In order to fill this gap, the following objectives are required.

Objective 1: to critically analyse the historical development of normative commercial risk management practices within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands.

Traditional methods of managing commercial risks in construction projects, for example traditional procurement, standard methods of measurement and measured bills of quantities, developed very early in the history of the Quantity Surveying profession. As new methods of procurement developed in the late twentieth century the risk profiles between client and contractor changed too; with these changes commercial risk management of construction projects became more complex. Following several disastrous, high profile construction projects, successive governments launched enquiries into the failure of the industry.

Collaboration, risk-sharing and the development of longer-term working relationships were key themes. New tools, such as NEC, construction frameworks and adjudication were also developed to aid this transition to a less-adversarial culture.

Objective 2: to critically analyse the epistemological and cultural norms underpinning current commercial risk management practices within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands.

The earliest construction professionals attempted to ally themselves to the older professions such as law and medicine by stressing their work as being the application of a single science or humanities discipline. This reluctance to embrace the actual interdisciplinary (technical AND human-social-interpersonal) nature of the professions hindered the institutional development of later construction professions such as quantity surveying and town planning. It has created a long-standing gap between policy/rhetoric and reality in all the construction professions. Biglan's 1973 model shows that this gap persisted into the twentieth century, at least in Higher Education. Most AEC professions contain an element of inter-disciplinarity and inter-disciplinarity is much further advanced in practice than in academia. The specific skills of commercial risk management are also inter-disciplinary with an emphasis on applied rather than pure skills.

The ability to manage the commercial risks of projects in an industry with very low profit margins is likely to be a highly valued and mainly tacit skill; for historical reasons the preferred development domain for this knowledge is still practice rather than academia. For this reason, socialisation is as important as formal academic training in the development of Quantity Surveyors and commercial risk management skills.

The acquisition of effective commercial risk management skills requires training and socialisation across an epistemologically broad, principally applied, spectrum of subject disciplines with as greater weight given to soft subjects as hard ones.

Objective 3: to critically assess whether there is a tension between the technical and human-social-interpersonal aspects of commercial risk management in both contracting and client organisations within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands

Argyris and Schön assert that the dominance of the technical over the human-social-interpersonal aspect of professional education hinders personal and organisational learning.

Lessons from the fields of Accident Learning in Engineering and Behavioural Economics and Finance reinforce Argyris and Schön's assertion that the technical is primaried in professional learning. Further, these writings suggest that an appreciation of human factors rather than over-reliance on technology and technical warning systems, an understanding of the role social networks and elites play in accident causation and prevention, an ability to fill information gaps and link seemingly unrelated events and the use of simulation for practicing risk management are key to effective risk management.

Objective 4: to test A&S concept of theories in action in both contracting and client organisations within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands

Objective 5 – to critically analyse the gap between policies and practice in the collaborative commercial risk management of U.K. construction and civil engineering

projects, including the validation of new insights into the interpersonal motivations and organisational drivers of this gap, with a particular focus on the Scottish Highlands and Islands

Construction is an industry of low profit margins, high operational risks, negative cash flow profiles and – consequently – high numbers of company failures. Chapman (2018) as well as a Parliamentary Committee enquiry have both suggested that, in the case of the collapse of Carillion, a gap existed between the company's and clients' optimistic commercial risk management rhetoric and their practices.

This gap between rhetoric/policy ('espoused theory') and practice ('theories-in-use) is common to all professions and was established in the academic writings of Argyris and Schön.

How then do these pressures and tensions manifest themselves in the 'real world'?

Firstly, do early career Quantity Surveyors receive training from an epistemologically broad spectrum of applied subject disciplines? And is there a tensions between technical and human-social-interpersonal subject disciplines in their training and socialisation? Is the industry, in fact, producing construction professionals who lack the human-social-interpersonal skills necessary for collaboration, risk sharing and the development of long-term working relationships?

Secondly, is there a gap between public-sector clients' well-intentioned policies of collaboration and risk sharing and their actual practice at project level? And how does the industry's positivistic culture impact on this?

The following section describes the methodologies of two empirical studies. The first, Study 1, explored the training of an early career quantity surveyor employed by a contractor in the north of Scotland. It used semi-structured interviews, documentary analysis and social network analysis to examine whether there was an absence of the human-social-interpersonal aspects in

training for commercial risk management. It then assessed whether there was a gap between the company's risk management rhetoric and its practises. The second study, Study 2, used documentary analysis, semi-structured interviews and non-participatory observations to examine the work of six Quantity Surveyors within the commercial department of a large utility company in Scotland. It aimed both to assess the gap between the organisation's risk management policies and practices and analyse the motivations, feelings and drivers of this gap.

Chapter 4

Methodology

4.1 Introduction

This work aims to be a holistic study of commercial risk management within construction and civil engineering projects in the Scottish Highlands and Islands. As such, the empirical stage of the study was two-handed, with an exploration of the policies and practices within both a contracting (Study 1) and then a client (Study 2) organisation.

Study 1 explored the training of an early career quantity surveyor employed by a medium-sized contractor working in the north of Scotland. It used semi-structured interviews, documentary analysis and social network analyses to critically analyse whether there was an absence of the human-social-interpersonal aspects of training for commercial risk management. It then re-analysed the data to assess whether there was a gap between the company's risk management rhetoric and its actual practices.

Study 2 used documentary analysis, semi-structured interviews and non-participatory observations to examine the work of six Quantity Surveyors within the commercial department of a large utility company in Scotland. Its aim was to critically assess whether there was a gap between the organisation's risk management policies and practices. A further aim was to then analyse the organisational drivers and staff motivations responsible for the creation of this gap.

In respect of methodologies, both studies utilised a case study approach, which is common in the Professional Doctorate in the Built Environment. However, there was a philosophical progression from Study 1 to Study 2, a move towards a more fully interpretivistic approach and from a mono-method choice of methodologies (case study with an ethnographic slant) towards more mixed methods (fully ethnographic case study). In particular, semi-structured interviewing - the principal data collection technique for Study 1 - was largely superseded in

Study 2 by non-participatory observations. The principal driver for this was theoretical, observation being the prescribed methodology in the work of Argyris and Schön as well as the methodology responsible for the creation for High Reliability Theory (HRT).

These difference between the methodologies of Studies 1 and 2 and the philosophical progression they represent are summarised in Table 11 below which utilises Saunders et al. (2007)'s Research Onion approach to methodology choice:

Table 11: Methodological differences between Study 1 and Study 2, based on Saunders et al., 2007)'s Research Onion

Stage from Saunders et al. (2007)'s Research Onion	**Study 1**	**Study 2**
PHILOSOPHIES	Interpretivism	Interpretivism
APPROACHES	Deductive	Inductive and deductive
STRATEGIES	Case study (with an ethnographic slant)	Fully ethnographic case study
CHOICES	Mono-method (case study)	Mixed method (case study and ethnography)
TIME HORIZONS	Cross-sectional	Cross-sectional
TECHNIQUES AND PROCEDURES	• Semi-structured interviewing • Documentary analysis • Social network analysis	• Non-participatory observations • Documentary analysis • Semi-structured interviewing

4.2 The Research Philosophy

There are two main philosophical paradigms within research, positivism and interpretivism. Choosing a research paradigm influences the research methodologies to be used as well as the approaches to dada analysis and interpretation.

Positivism is often described as a universal reality; reality does not change with the historical or cultural context, it does not differ over time and it is the same for every person. Bryman (2012) defines four key characteristics of positivism: phenomenalism (only knowledge confirmed by science is truly knowledge); deductivism (the purpose of theory is to generate hypotheses that can be tested and proved or disproved by experiment); objectivism; and inductivism (knowledge is gained by the gathering of facts).

Within Interpretivism truth and knowledge are subjective and culturally and historically situated. Reality is only knowable through socially constructed meanings, there is no single, shared reality (Ritchie and Lewis, 2003). A crucial difference with positivism in that in interpretivism, the researcher's values and beliefs inform data collection, interpretation and analysis (Bryman, 2012).

There are also two types of reasoning used in research, inductive and deductive. Inductive reasoning involves the use of observations, measurements and experimentation in aiming to find patterns in the subsequent data which can be used to develop theories. Repeated measurements and observations are made until the researcher is sure that the findings describe a wider situation (Bryman, 2012).

Deductive reasoning begins instead with a theory which is used to make predictions or hypotheses. Observations, measurements and experiments are then used to prove or disprove the hypotheses (Bryman, 2012).

Both Study 1 and Study 2 started from an interpretivistic viewpoint. The culture and practices of Quantity Surveyors are social constructs developed almost exclusively within in the U.K. within the last three hundred years. Indeed, the profession only exists in its current form in some English-speaking parts of the world, for instance, the U.K., Australia, New Zealand and South Africa. Many other parts of the world arrange their commercial risk management needs in quite different ways with different professions and practices. The Literature Review section of this study has described the historical development of both the profession and its commercial risk management practices. It has also attempted to describe and document the development of the positivistic culture into which most trainee Quantity Surveyors are socialised. This positivistic culture has inevitably influenced research techniques in the field of Quantity Surveying which, for the most part, are positivistic and quantitative (Dainty, 2008).

However, emerging criticism of the construction industry's adherence to single and predominantly quantitative research methods (e.g. Dainty, 2008) has led to a growth in the use of mixed methodologies in construction research. Viewed from the Biglanian perspective of Figure 6 above, an '*appropriate enquiry strategy'* (Cresswell, 2009, p11) for this study might indeed appear to be one which used both quantitative and qualitative techniques concurrently. Several writers claim that a mix of methodologies brings out the strengths of its constituent methods (e.g. Dainty, 2008, Amaratunga et al., 2002). Essentially, these writers argue that by using a mixed methodology the total output of a study can be greater than the sum of its parts.

Whilst a mixed methodology might seem appropriate in the light of the inter-disciplinary nature of the skills required for commercial risk management, this study's aims do not focus on *how many,* but on *what?* and *how?* (for example, *'What* collaborative commercial risk management policies and tools are being used or ignored?' / *'What* gap exists between practice and rhetoric?' / '*How* are existing policies, procedures and tools being used in practice?' / '*How* are these policies, procedures and tools adapted or even ignored in practice?') As a result, it demands

the use of more qualitative techniques in a holistic, naturalistic exploration of the complexity, detail and meaning of this situation for its protagonists (Payne & Payne, 2004). The overarching aim of the research is:

> *"To seek to interpret the world, particularly the social world, (and where) knowledge … comprises constructions arising from the minds and bodies of knowing, conscious and feeling beings … generated through a search for meaning, beliefs and values and through looking for wholes and relationships with other wholes."* (Higgs, 2001, quoted in Paterson & Higgs, 2005, p 341).

Given however that Quantity Surveying is a positivistic profession in a positivistic industry (Dainty, 2008), it would be naïve to imagine that some element of quantitative methods was not utilised. For instance, within the data analysis of both Study 1 and Study 2, greater weight was given to concepts, complaints and criticisms which appeared repeatedly. To this extent, it might be said that the interpretation of the qualitative data was still approached from a somewhat quantitative perspective.

4.3 Deductive and Inductive approaches

In terms of approach, Study 1 used deductive methods, that is that hypotheses were developed from existing literature and then tested in the field. Literature from the related academic fields of accident learning in engineering and behavioural economics and finance was used to produce a table of essential skills required for commercial risk management. The typology was then tested in a medium-sized contracting company and partially validated. An amended hypothesis was then proffered.

Also in Study 1, Aygyris' and Schön's concept of espoused theories and theories-in-use was tested in the same medium-sized contracting company and again partially validated, a further example of a deductive approach.

In Study 2 both deductive and inductive approaches were used. The work of Argyris and Schön on espoused theories and theories-in-use was tested using non-participatory observations, an example of a deductive approach. However, the drivers and motivations for this gap were developed through an inductive process of observation, description, analysis and theory development and validation.

4.4 The use of theory in Study 1 and Study 2

For research in very new areas a descriptive rather than explanatory emphasis is acceptable (Punch, 2006). However, as Cresswell states, '*all researchers bring theories, frameworks and hunches to their inquiries*' (Cresswell, 2011, p208). Whilst commercial risk management of construction projects is a largely unexplored area of study, many writers have considered risk management within the fields of accident learning and behavioural economics and finance. A developing epistemological tension in these fields between the 'human-social-interpersonal' and 'technical' with a move towards a greater consideration of the influence of human factors in risk management is clear and has been described above in the Literature Review. Although the synthesised framework of accident learning and behavioural economics and finance (Table 10 above) was developed in an earlier stage of the research, its adaptation to incorporate the inter-disciplinary, principally applied, nature of commercial construction risk management occurred during the data collection stage of Study 1. Therefore, it was not used as '*orienting*' or '*transforming*' lens to shape the direction of Study 1 (Martens, 2003, cited in Cresswell, 2011, p208) but, instead, only in the data analysis and interpretation phases.

In a similar way, the relevance of Argyris and Schön's work on espoused theories and theories-in-use did not emerge until towards the end of Study 1. Once its relevance became clear, the data was re-analysed in a tentative test of Argyris' and Schön's theory. Their concept was then used as an *'orienting'* lens (Martens, 2003, cited in Cresswell, 2011, p208) for Study 2. This

was in addition to the influence of Argyris and Schön on the methodology for Study 2. Their advice that a person's theory-in-use could not be ascertained by simply asking them, but that observation was required instead, heavily influenced the change from semi-structured interviewing to non-participatory observations as the principal data collection technique of Study 2.

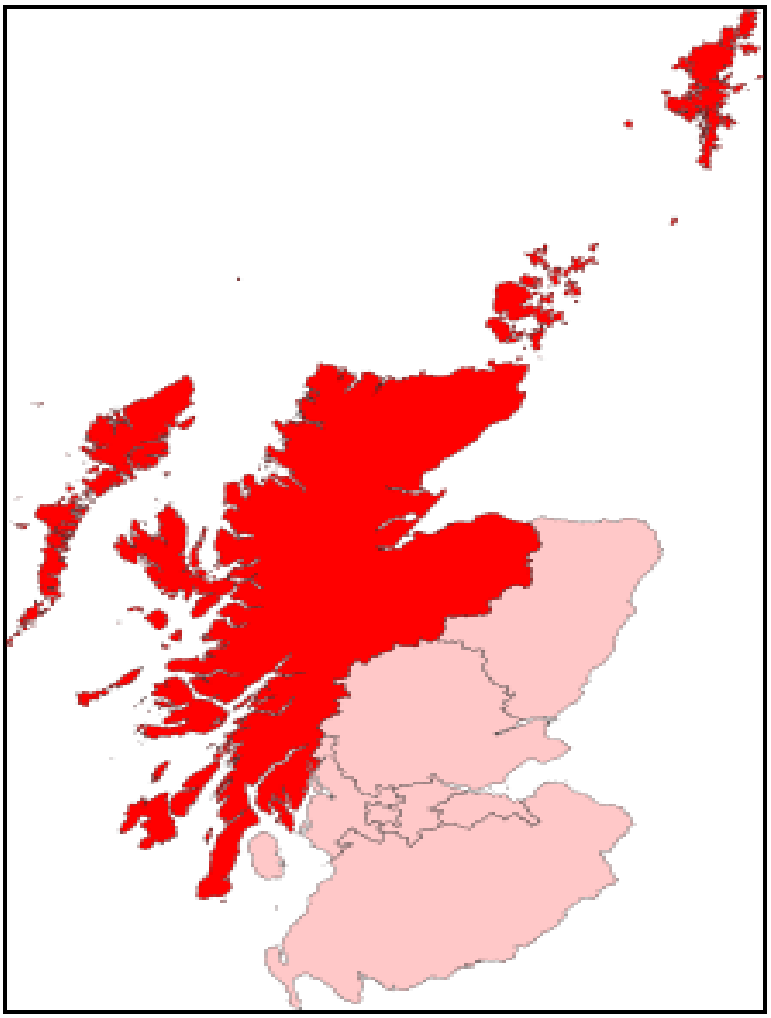
In these senses, then, both studies tended very much towards the unfolding end of a pre-structured versus unfolding spectrum (Punch, 2006).

4.5 The Research Context

4.5.1 The Highlands and Islands of Scotland

The Highlands and Islands cover an area the size of Belgium and constitute almost 15% of the U.K. landmass (as shown in Figure 11 below).

Figure 11: Area of the Highlands and Islands (Scottish Government, 2013)



The population of the region has increased by 12.3% since 2001 (Press and Journal, 2017), partially reversing the decline of many decades. Better employment opportunities, particularly in hospitality, culture and engineering, the development of a Higher Education campus and investment in new technology (Scotlandsuperfast, 2019) make the region an increasingly attractive place in which to live and work.

However, the area remains the remotest part of the country, with the lowest population density in the U.K. (Office for National Statistics, 2013). The region encompasses 93 inhabited islands (Scottish Government, 2013), some of which are crucial to the economic prosperity of the region, yet it lacks any motorways with many roads and train lines still single-track. Ferry and

air travel, although subsidised, remain expensive and subject to the vagaries of inclement weather.

In recent years, private and public expenditure on infrastructure, including social infrastructure (schools, hospitals, clinics etc.) has grown. Current major works include the £2 billion project to dual the A9, the principal road link between the Highlands and the Central Belt (BBC, 2015); annual expenditure of £500M on upgrading water and waste water treatment works and a decade-long £10B investment programme in renewables electricity generation throughout the region (University of the Highlands and Islands, 2012).

In spite of the oil price crash of 2014/15, oil and gas extraction remain important to the construction and engineering sectors as well as the wider economies of the Northern Isles (Orkney and Sealtann) and the Cromarty Firth (Ward and Thomas, 2017; Pfeifer, 2018).

Crucially, the recent performance of many remotely-based projects, both within the U.K. and across the world, remains poor. The Deep Water Horizon spill in the Gulf of Mexico illustrated the difficulties of repairing remotely located equipment (Syvles and Comfort, 2012); the Liquid Natural Gas plant at Melkøya in northern Norway closed four times for major repairs since its opening in 2007 (Anon, 2012); and, in the Highlands, the largest hydro-electric scheme for fifty years at Glendoe closed in 2009 after less than eight months in operation. Massive rockfalls blocked the inlet tunnels, remedial works are estimated to have cost around £100M (Hansford, 2013) and the failure of the project led to the largest claim in Scottish legal history (Drummond, 2016).

In common with the rest of the U.K. the region is experiencing skills shortages, leading to the Scottish Government's call for the immigration to be devolved post Brexit (MacNab, 2018). Training is problematic, with construction profession training only available up to ordinary degree level in the region. And, despite Scottish devolution, the country remains highly

centralised; most of the construction companies and large clients operating in the Highlands and Islands have their head offices in the Central Belt or even in England.

The region also suffers from an impression of it as ‘backward’. This is not altogether unjustified, since the area’s workplaces have much greater gender segregation then in the rest of Scotland and gender pay gaps of up to 23% persist (Highlands and Islands Enterprise, 2017).

The huge investment in infrastructure, commercial and residential construction now taking place in the Highlands and Islands, combined with skills shortages, a paucity of specialist training, remoteness from the centres of commerce and government, mean that projects here form a rich source of data for the construction researcher. The problems of construction in the Highlands and Islands are similar to those of the U.K. construction industry but writ larger. It is interesting to note that Kier, Interserve and Carillion were all active in the north of Scotland, with Carillion’s Board describing the Aberdeen by-pass of one of the principal causes of the company’s demise.

4.6 The operational aspects of Study 1

4.6.1 Title

Is too little attention paid to human-social-interpersonal factors in training for effective commercial risk management? A case study of a medium-sized contracting company employing an early-career Quantity Surveyor.

4.6.2 The Research Aims

1. To critically assess whether an early-career Quantity Surveyor received commercial risk management training from an epistemologically broad spectrum of mainly applied subject disciplines or whether there was a tension between technical and human-social-interpersonal subject disciplines in her training.

2. To assess whether there was a gap in the company between its commercial risk management policies and its practices.

4.6.3 The Research Objectives

1. To use ethnographic techniques to assess whether an early stage Quantity Surveyor received commercial risk management training from an epistemologically broad spectrum of mainly applied subject disciplines. Further, to assess whether there was a tension between technical and the human-social-interpersonal subject disciplines in her training.

2. To test a conceptual framework for effective commercial risk management which synthesises lessons from the fields of Accident Learning in Engineering and Behavioural Economics and Finance and has been adapted to reflect the epistemologically broad, mainly applied, nature of subject discipline knowledge required for effective commercial risk management in the construction industry.

3. To use ethnographic techniques to critically assess the company's espoused theory and the theories-in-use of its senior staff.

4.6.4 The Research Procedures

The procedures adopted for this empirical Study 1 were a short-term case study of a contracting organisation employing an early-career Quantity Surveyor. The specific tasks undertaken were: 2 x semi-structured interviews with the inexperienced Quantity Surveyor and the Commercial Director of the firm; 1 x social network analysis of the early-career Quantity Surveyor's relationships of trust within and outwith their employing organisation and documentary analysis. The appropriateness of the use of a case study for this research is justified below.

4.6.5 Justification for the Use of a Case Study for Study 1

As mentioned above this stage of the research explored not *how many*, but *what* and *how?* 'W*hat'* implies a descriptive answer exploring the characteristics and possible patterns of social phenomena where there has been limited previous research (Blaikie, 2007, p5). '*How*' implies practical outcomes and operational linkages (Blaikie, 2007, p5; Yin, 2003). Table 12 below compares case study with experiment and survey and confirms that a case study was appropriate for this research problem.

Table 12: Comparison of Case Study with Experimental and Survey Approaches (Gomm et al., 2004, p4)

	Experiment	**Survey**	**Case Study**
Number of cases	Small number	Large number	Small number, sometimes just one
Information gathered and analysed	Low number of features in each case	Small number of features in each case	Large number of features in each case
Control of variables	Controlled as a primary concern	Naturally occurring, but selected to represent a larger population	Naturally occurring
Quantification of data	A priority	A priority	Not a priority
Research aim	To test / develop theory or evaluate intervention	An empirical generalisation from a sample	To understand the case itself. The wider relevance of findings is conceptualised as a basis for 'naturalistic generalisation'

A single case study was chosen to give the opportunity for greater depth of study and to avoid the chances of an inexperienced researcher 'getting lost' in too much data. However, the use

of single case studies is still seen as problematic by many researchers and, as a result, the following section provides a justification for the use of a single case study in Study 1.

4.6.6 Justification for a Single Case Study in Study 1

Whilst concerns in the literature regarding the use of single case studies are common (e.g. Yin, 2003), it also possible to find the use of findings from single case studies as a basis for generalisation defended (e.g. Flyvberg, 2006; Kennedy, 1979; Evers and Wu, 2006); in other words the reliability and validity of the use of single case studies is not settled.

Even Yin (2003) - generally considered to unsupportive of this approach - discusses five rationales which may be used to support a single case study. Table 13 lists these and notes their relevance to Study 1, showing that it can be defended as 'typical', i.e. it will '*capture the circumstances and conditions of an everyday or commonplace situation'* and the lessons learned will be revelatory for the sector and be *'informative about the experiences of the average…institution'* (Yin, 2003, p41).

Table 13: Five Potential Rationales for a Single Case Study (Yin, 2003, p45)

Rationale	Summary	Relevance for this study
Critical case	Testing a well-formulated theory to confirm, challenge or extend it.	Not relevant
Extreme / unique case	Unique or unusual, so worth documenting and analysing.	Not relevant
Longitudinal case	Studying the same case at multiple points in time.	Not relevant
Revelatory / exploratory case	Opportunity to observe a previously unavailable phenomenon.	May be relevant as little academic literature in this area exists.
Typical case	Capturing circumstances and conditions of a commonplace phenomenon	Relevant

4.6.7 Generalisability of Research Findings from a Single Case Study

Generalisability is usually considered to be the responsibility of the second researcher (Marshall and Rossman, 1999; Stake, 1995).

In terms of how far results from this single case study could be generalised no expansive claims have been made. Instead, in accordance with Denscombe's advice, an attempt was made to provide readers with sufficient information in the form of full transcripts to judge for themselves the generalisability of the study's findings (Denscombe, 2003).

Denscombe (2003) also writes that the results arising from a typical case (which this is) can be extended to other instances by summarising the elements of comparison. Table 14 summarises the features of this study and show how these compare with other medium-sized contractors working in this context.

Table 14: Single Case Study Justification – This Study as a Typical Case (Denscombe, 2003, p33)

Element of comparison	Example	This study	Medium sized local contractors
Historical	Development, change	Continuing low profit margins and the increasing complexity of procurement methods (discussed in the literature review and subsequently noted by the study Participants) leading to an increased importance of commercial risk management skills for contracting staff	All contractors in the U.K. face these changes
Institutional	Type and size of organisation, policies and procedures	Contractor is a medium-sized, regional contractor combining contracting and house building	A common model for medium-sized contractors in the U.K.
Physical	Geographical area, town, building	Contractor is based in the Highlands and Islands	Results are only generalisable to local contractors of this size and type in the Highlands and Islands
Social	Participants	Early Career Quantity Surveyor; Commercial Director	Results are only generalisable to other early-career Quantity Surveyors.

4.6.8 Triangulation Strategy

A triangulation strategy using semi-structured interviews, social network analysis and documentary analysis was chosen with a deliberately ethnographic tone, the researcher adopting the position of '*learner among the more knowledgeable'* (Payne & Payne, 2004, p73).

Semi-structured interviews offered the opportunity for high response rates (in contrast to, for example, Participants' diaries), privacy, consistency and flexibility (Payne & Payne, 2004). Interviews were digitally recorded, but handwritten notes were also kept in case of equipment failure. '*Rich, thick descriptions'* (Cresswell, 2009, p191) of interview settings were attempted.

The limited use of reflective practice as a learning tool for inexperienced professionals has been noted by Canning (2011). For professionals in the early stages of their career more direct forms of learning such as mentoring may be more helpful. Early career Quantity Surveyors may seek advice from other staff within and outwith their organisations and social network analysis was used to illuminate these relationships as well as show where mentoring was not occurring or where professional relationships had broken down (Scott, 1991).

Documentary analysis of naturally occurring data was considered important in the triangulation of any findings. An early start on documentary analysis was made possible with the use of publicly available documentation on the company's website. The aim was to use documentary data as a topic and not merely a resource (Prior & Prior, 2004). The interpretation proceeded from the standpoint of the documents as '*social facts'* rather than '*transparent representations of organisational routines'* (Coffey and Atkinson, 2004, p58).

An action learning strategy was considered inappropriate here because this study sought to explore an existing situation rather than implement or evaluate a change.

Focus groups and group discussions, although offering a time-efficient method of data collection, were not used since the privacy offered by individual interviews was considered vital.

4.6.9 The Pre-structured and Unfolding Stages of Study 1

Whilst this Study 1 cannot be described as '*grounded theory'* it had a deliberately loose design with open-ended, wide-ranging interview questions; the researcher avoided the temptation to ask direct questions about the applicability of the conceptual framework at the data collection stage. Writers such as Silverman are clear that Grounded Theory can be used differently by researchers with different ontological and epistemological perspectives (Silverman, 2006).

For the same reason, pre-structured interview data codes were deliberately not used; instead, open coding was used to attempt to truly *'hear the voices'* (Payne and Payne, 2004, p101) of the Participants. The organising of the initial transcript into collective headings and concepts (axial coding) was then used in a process of data reduction (Payne and Payne, 2004) to give structure, detail and direction (Punch, 2006) to the later interviews and validation.

4.6.10 The Research Ethics

Using Robson's definition of ethics, '*the general principles of what one ought to do'* (Robson, 2011, p198), the issues for this study appeared to be: will the early career Quantity Surveyor who was a Participant in this study and who was also a student at the University of the Highlands and Islands, where the researcher was also - at the time of the data collection - a lecturer, feel she had a genuine right to refuse to take part? Would she feel there would be penalties for non-participation? Would all Participants' consent be fully informed? Could confidentiality be assured? And how would a situation in which a Participant refused confidentiality be dealt with? (Robson, 2011; Bryman, 2012; Dirner and Crondall, 1978).

4.6.11 Informed Consent

The study adopted an overarching principle of universalism (e.g. Erikson, 1967; Dingwall, 1980; Bulner, 1982; all cited in Bryman, 2012), that is, that subterfuge was not permissible in any circumstances. Additionally, a key ethical aim was the development of mutual trust between researcher and Participants (Kelman, 1967).

Since the construction industry in the Highlands and Islands is a small and tightly-knit one the researcher needed to be transparent about the study in all areas of her life (e.g. as a lecturer, practitioner and resident). In respect of the researcher's role as a lecturer there was a risk of becoming too close to the study Participant who was also a student. To counter this examination scripts in classes where the Participant was a student were marked by other members of University of the Highlands and Islands (UHI) staff. In this way the Participant, who was also a student at UHI, could be reassured that she would not be penalised if she chose to withdraw from the study.

Walker, Hogart and Hamilton (2008) suggest Participants absorb limited information prior to giving their consent and consent forms should therefore be short, coherent and straightforward. This study adapted the informed consent form developed by Employee Rson (2011) and based on Crow, Wiles, Heath and Charles (2006).

Since the Commercial Director of the company was also a Participant, he was informed in advance of the time requirements and potential impacts the study might have for him and his organisation. As an act of both courtesy and to ensure the integrity of the data the researcher worked with the participating company to ensure there was as little disturbance as possible to the work setting (Cresswell, 2012).

4.6.12 Confidentiality and Gender bias

It was considered important to adopt a realistic and cautious approach to a commitment of confidentiality. The study used pseudonyms for all Participants, contracting organisations, projects and geographical locations. Interview tapes, transcripts and Participants' contact details were stored separately and securely, but no absolute guarantee of confidentiality was made (Bryman, 2012). As described previously, the construction industry in the Highlands and Islands is a small and tightly-knit community and, therefore, even with the extensive use of pseudonyms for Participants, the organisations, project names and locations, any such guarantee of confidentiality could have proved unwise.

If Participants declined confidentiality it was intended that the study would follow the advice of Giodarno, O'Reilly, Taylor & Dogra (2007, cited in Cresswell, 2012, p90); Participants would be informed of the possible risks to themselves of taking this course of action, for instance the inclusion of unexpected data analysis in the study findings, but the final decision to refuse confidentiality would remain theirs. In the event no Participant declined the offer of confidentiality.

One of the Participants (the early career Quantity Surveyor) of this research project was female. The study used Eichler's (1988) guide in interview-drafting to attempt to avoid sources of gender bias such as '*androcentricity*' (viewing the world from a male perspective) and '*sexual dichotomism'* (treating the sexes as two entirely distinct social groups rather than as groups with overlapping characteristics) (Robson, 2011, p229, based on Eichler, 1988).

The researcher attempted to adopt a reflexive stance towards her own bias as an older female in a male-dominated industry since it was clear that her perspective as an older woman in the industry might be outdated and not shared by the early career Quantity Surveyor.

4.6.13 Approach to Data Analysis and Interpretation

The interpretive approach to both Study 1 and Study 2 was guided by the principal conclusion of the Literature Review, that is that commercial risk management practices demand competency in an epistemologically wide range of disciplines, pure and applied, hard and soft. The study therefore relied on Paterson and Higgs' assertion that professional practice requires much more than the application of technical knowledge, it also needs what they describe as '*artistic judgement'* (Paterson & Higgs, 2005, p342). They define this as:

> *"The capacity of professional practitioners to make highly skilled, micro- and macro and meta-practice judgements that are optimal for the circumstances of the client and the context."* (Paterson & Higgs, 2005, p341)

Furthermore, they claim that skills such as reasoning, listening, negotiating, unravelling complex data and making moral and ethical choices are required for sound professional decisions (Paterson & Higgs, 2005).

In terms of the approach taken towards the data analysis and interpretation phases of the work both studies followed Paterson & Higgs (2005) in taking a hermeneutic approach and the use of the hermeneutic circle.

4.6.14 Hermeneutics and the Hermeneutic Circle

Hermeneutics is the study of the interpretation of texts. The discipline developed in the 17th Century when it came to be associated with the interpretation of religious and particularly biblical texts (Crotty, 1998). Since then hermeneutic philosophies and practices have been developed by many academic writers including Heidegger (1962), Gadamer (1975) and Ricoeur, (1976). Schleiermacher (1971) was largely responsible for developing hermeneutics as a secular discipline, with Dilthey (1998) extending its use into organisations and cultural systems (Paterson & Higgs, 2005).

Paterson and Higgs (2005, p343) describe three philosophical assumptions or constraints associated with a hermeneutic approach to data interpretation.

1. Dialogue is used to produce a shared understanding of the different interpretations of the phenomenon under study (in this case, professional practice judgement artistry);

2. Meaning emerges gradually through a dialogue between the reader, the texts and the inquirer:

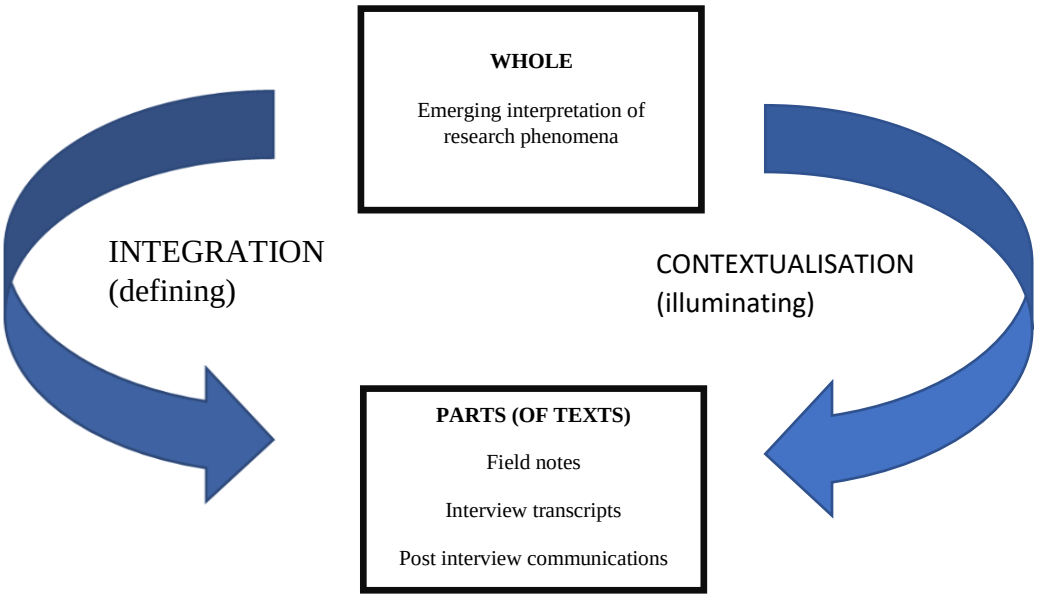
> *"A unique characteristic of hermeneutics is its openly dialogical nature: the returning to the object of inquiry again and again, each time with an increased understanding and a more complete interpretive account*" (Parker, 1985, p1091).

3. The researcher becomes part of the hermeneutic circle (see figure 12 below) moving many times between interpretations of parts of the text and interpretations of the whole text to develop and refine the emerging understanding of the phenomenon (Paterson & Higgs, 2005, p343).

It should be stressed that, for most academic writers on hermeneutics - even its critics - meaning and meaningfulness are always contextual (e.g. Dilthey, 1998). Relationships between the reader, the text and the context must always be established within its historical and cultural context. It is for this reason that this work included a historical review of both the profession of Quantity Surveying, allied professions such as construction management and architecture, and the practices of commercial risk management. It also attempted to describe the epistemological aspects of the culture of Quantity Surveying and the AEC industries in general.

The hermeneutic circle, adapted from Bontekoe (1996) and used in the data analysis and interpretation of Study 1 is now shown below in Figure 12 below:

Figure 12: Hermeneutic circle used in the analysis and interpretation of data from Study 1 (adapted from Bontekoe, 1996)



4.6.15 Ethics in Data Analysis and Interpretation

Ethical considerations flowed through to the data analysis and interpretation stages of the study. Anonymity involving the use of pseudonyms continued. Collected data has been secured safely and will be destroyed after a period of six years (Cresswell. 2012).

4.6.16 Reliability and Validity

In accordance with best practice interview questions were drafted and approved by the researcher's supervisor prior to their use (Yin, 2003), all interviews were digitally recorded (Flick, 2002) and code definitions were developed and cross-checked by an experienced qualitative researcher (Gibbs, 2007, cited in Cresswell, 2009, p190). Interview transcripts were checked for errors three times.

All transcripts were sent to Participants who were asked to check them and confirm any queries back to the researcher. Both interview Participants confirmed the transcripts as accurate representations of their interviews. All transcripts are appended to this study to increase the

provision of sufficient raw data to allow readers to separate data and interpretations (Dingwall, 1992).

Validation questions which emerged after transcribing and coding were asked of both the Commercial Director and the Managing Director. These are illustrated together with their responses.

Further validation took the form of exploration of divergent views (Hammersley and Atkinson, 1983) within the interpretation, in particular of the assertion in the conceptual framework that the socio / interpretivist is ignored in Participant A's training. This was not found to be valid in its entirety.

Finally, it should be noted that whilst validation of the findings was not possible by the use of comparison (e.g. comparison of different inexperienced Quantity Surveyors or comparison of this inexperienced Quantity Surveyor over time) this form of validation was used in Study 2.

4.7 The Operational Aspects of Study 2

4.7.1 The Research Title

Analysing the gap between policies and practices in the collaborative commercial risk management of construction and civil engineering projects: an ethnographic case study of Quantity Surveyors within a client organisation in the Scottish Highlands and Islands.

4.7.2 The Research Aim

To use an ethnographic case study of six Quantity Surveyors within the commercial department of a large client organisation to critically analyse the gap between policies and practices in the collaborative commercial risk management of U.K. construction and civil engineering projects, with a particular focus on the Scottish Highlands and Islands.

4.7.3 The Research Objectives

Two research objectives were defined for this study and these are listed below:

1. To test Argyris and Schön's concept of theories-in-action within a client organisation within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands;

2. To critically analyse the gap between policies and practice in the collaborative commercial risk management of U.K. construction and civil engineering projects, including the validation of new insights into the interpersonal motivations and organisational drivers of this gap, with a particular focus on the Scottish Highlands and Islands.

4.7.4 The Research Procedures

The procedures adopted for this empirical Study 2 were a case study of the commercial department of a client organisation employing six Quantity Surveyors. The specific tasks undertaken were: 2 x semi-structured interviews with two of the Quantity Surveyors; 12 x non-participatory observations of the six Quantity Surveyors and documentary analysis.

4.7.5 The Background and Context for Study 2

Public sector organisations have been at the forefront of adopting change in the construction industry over the last thirty years. Following governmental reviews such as Latham (1994), Egan (1998) and the Lean Client Group (2012), the public sector has led the way in the adoption of tools such as the NEC and construction frameworks, in an attempt to build more collaborative, longer-term working relationships with contractors. More recent reports such as the Farmer review into the U.K. construction labour market (Farmer, 2016) and the

Construction Sector Deal (2019) also lay an emphasis on the adoption of more collaborative working practices.

However, as evidenced by the experiences of companies such as Kier, Interserve and Carillion and the generally poorer outlook for contracting as a whole, such attempts have to date met with limited success. Why have the public sector failed to collaborate with the construction industry? Is there a gap between clients' stated desire to collaborate and their actual practices at project level? Can the gap be partially explained by the focus on construction occupations such as quantity surveying as technical professions and not human-socio-interpersonal ones? And, if so, what might be required to close the gap?

4.7.6 The Methodological Changes from Study 1 to Study 2

In considering the approach Study 2 should take in exploring the gap between rhetoric and practice semi-structured interviewing was clearly problematic. Within Alba Water it seemed likely that, when asked whether they used the organisation's risk management policies (their espoused theories), Participants were likely to merely confirm that they did. Argyris and Schön themselves clearly state that *'We cannot learn what someone's theory-in-use is simply by asking him. We must construct his theory-in-use from observations of his behaviour.'* (Argyris & Schön, 1974, p7). Although, in testing of their own work, Argyris and Schön did not use observations; they presented Participants with case studies and then led discussions on how Participants would react, it seemed perverse to ignore their advice in a context where non-participatory observations were possible. As well as the '*orienting*' lens (Martens, 2003, cited in Cresswell, 2011, p208) provided by Argyris and Schön's work, High Reliability Theory which contributed heavily to the conceptual model tested in Study 1, was drawn from non-participatory observations. It can be argued that High Reliability Theory is merely a typology of actions in organisations with good safety records but, importantly, these actions evidence

organisations where espoused theories and theories-in-use were presumably congruent. Both Argyris and Schön and High Reliability Theory pointed towards the use of non-participatory observation as the primary data collection method for Study 2.

4.7.7 The use of observation in construction research

A consistent criticism of interviewing as a research technique is that '*what people say to researchers may prove a very unreliable guide to what they actually do*' (Harrison, unknown date, quoted in Hall, 2015, p50). With an increasingly higher profile in construction research, non-participatory observation was therefore chosen as a more appropriate tool, one which might tease out the actual gap between the commercial risk management rhetoric of organisations and the way these tools are used in practice; a gap between espoused theory and theories-in-use.

This research explored not '*how many?'*, but '*what?' a*nd *'how?' What?* implies a descriptive answer examining the characteristics and possible patterns of social phenomena where there has been limited previous research (Blaikie, 2007, p5). '*How*' implies practical outcomes and operational linkages (Blaikie, 2007, p5; Yin, 2003). As such, a case study approach exploring these keys questions seems applicable and this is now discussed below.

4.7.8 Justification for the use of a Case Study for Study 2

Table 15 below compares case study with experiment and survey and confirms that a case study was appropriate for this research problem.

Table 15: Comparison of Case Study with Experimental and Survey Approaches (Gomm et al., 2004, p4)

	Experiment	**Survey**	**Case Study**
Number of cases	Small number	Large number	Small number, sometimes just one
Information gathered and analysed	Low number of features in each case	Small number of features in each case	Large number of features in each case
Control of variables	Controlled as a primary concern	Naturally occurring, but selected to represent a larger population	Naturally occurring
Quantification of data	A priority	A priority	Not a priority
Research aim	To test / develop theory or evaluate intervention	An empirical generalisation from a sample	To understand the case itself. The wider relevance of findings is conceptualised as a basis for 'naturalistic generalisation'

A small sample of six Quantity Surveyors (five Quantity Surveyors and one Cost Engineer) working in multi-disciplinary project teams managing construction and engineering projects for a single utility company (Alba Water) with an annual spend of over £600m on construction

work was chosen. To provide the opportunity for greater depth of study whilst avoiding the obvious risk of an inexperienced researcher 'getting lost' in too much data, the study focused on the work of a single department, Managed Delivery North. The six Quantity Surveyors constituted the whole commercial team for the department managing all the construction and engineering projects for Alba Water in the north of the country.

4.7.9 Justification for the Use of a Small Case Study Sample

The use of very small or single case study samples is still seen as problematic by many researchers (e.g. Yin, 2003); yet it also possible to find the use of findings from single case studies as a basis for generalisation defended (e.g. Flyvberg, 2006; Kennedy, 1979; Evers and Wu, 2006); in other words, the reliability and validity of the use of single or very small sample size case studies is not settled.

Even Yin (2003) - generally considered to unsupportive of this approach - discusses five rationales which may be used to support a single case study. Table 16 lists these and notes their relevance to this study, showing that it can be defended as 'typical', i.e. it will "*capture the circumstances and conditions of an everyday or commonplace situation"* and the lessons learned will be revelatory for the sector and be *"informative about the experiences of the average…institution"* (Yin, 2003, p41).

Table 16: Five Potential Rationales for a Single Case Study (Yin, 2003, p45)

Rationale	Summary	Relevance for this study
Critical case	Testing a well-formulated theory to confirm, challenge or extend it.	Relevant – the testing of Argyris and Schön's work on theories of action in the field of construction and engineering
Extreme / unique case	Unique or unusual, so worth documenting and analysing.	Not relevant
Longitudinal case	Studying the same case at multiple points in time.	Not relevant
Revelatory / exploratory case	Opportunity to observe a previously unavailable phenomenon.	Relevant. Very little academic literature in this area.
Typical case	Capturing circumstances and conditions of a commonplace phenomenon	Relevant. Multi-disciplinary project teams are common in construction and engineering. Utility companies are responsible for high levels of expenditure within the construction and engineering industries within the U.K.

4.7.10 Generalisability of Research Findings from Single Case Studies

In terms of how far results from single or small-sample case studies can be generalised no expansive claims will be made. Instead, in accordance with Denscombe's advice, an attempt was made to provide readers with sufficient information in the form of detailed extracts and full transcripts to judge for themselves the generalisability of the study's findings (Denscombe, 2003).

Denscombe (2003) also writes that the results arising from a typical case can be extended to other instances by summarising the elements of comparison. Table 17 summarises the features of this Study 2 and shows how these compare with other utility companies working in this context.

Table 17: Single Case Study Justification – This Study as a Typical Case (Denscombe, 2003, p33)

Element of comparison	Example	This study	Construction and Civil Engineering Projects in the U.K.
Historical	Development, change	Continuing low profit margins and the increasing complexity of procurement methods leading to an increased importance of commercial risk management skills for construction professionals	All U.K. construction and civil-engineering projects face these challenges
Institutional	Type and size of organisation, policies and procedures	The client is a pan-Scotland utility company	A common model for the utility companies across the U.K. (although Alba Water is publicly owned and the water companies in England are in private ownership, whilst Wales has a non-for-profit model).
Physical	Geographical area, town, building	Company operates pan-Scotland and is also active in the Middle East and Australia	Results are only generalisable to medium-sized civil engineering projects of this type in the Scottish Highlands and Islands, but some aspects may be of relevance to works in the rest of the U.K., Middle East and Australia
Social	Participants	Quantity Surveyors responsible for the implementation and maintenance of	Results are only generalisable to other Alba Water staff in the Highlands and

		commercial risk management policies	Islands, but some aspects may be of relevance to Alba Water staff working in the rest of Scotland, the rest of the U.K., the Middle East and Australia as well as staff working in other utility companies in the U.K.

4.7.11 Justification for the Greater Use of Ethnographic Techniques in Study 2

In contrast to Study 1, Study 2 moved towards fully ethnographic techniques in an exploration of the policies, practices, culture and meaning of commercial risk management for construction professional staff working in one regional department of Alba Water. The appropriateness of ethnography for this study is considered below.

4.7.12 Ethnography

Ethnography is *'iterative-inductive research (that evolves in design through the study), drawing on a family of methods, involving direct and sustained contact with human agents, within the context of their daily lives (and cultures), watching what happens, listening to what is said, asking questions, and producing a richly written account that respects the irreducibility of human experience, that acknowledges the role of theory as well as the researcher's own role and that views humans as part object / part subject.'* (O'Reilly, 2005, p3).

Although construction research in the past has often remained ignorant of developments in social and behavioural sciences (Dainty et al., 2007), with only very limited use of ethnographical methodologies made (exceptions are Sykes 1969; Strati, 2003; Gherardi and Nicolini, 2002; Marchand, 2007), there has been, in recent years, an increasing recognition of the value of such techniques for construction (e.g. Pink et al., 2010 & 2012; Shipton, 2012;

Shipton & Hughes, 2013; Tutt et al., 2011 & 2013). Ethnography has been used to explore issues such as health and safety within groups of non-English speaking construction workers (Tutt et al., 2011) and gender inequality (Loosemore et al., 2015), problems to which there does not appear to be a wholly technical or legal solution. In addition, the last decade has seen a more general trend in built environment research towards the use and acceptance of '*non-traditional*' methods of construction research (Ahmed et al., 2016, p231).

In fact, in the study of groups in the U.K. under-represented in academic writing, ethnography has a long heritage. Ethnographic techniques were used in the initial Mass Observation (M.O.) studies of northern industrial communities in the 1930s (Hall, 2015). Researchers attempted to distinguish between the rhetoric of the national media and 'establishment' institutions and the private opinions of working-class people in relation to issues such as the abdication crisis. Since this research will also explore the difference between an organisation's rhetoric in respect of commercial risk management and the way in which this rhetoric is used, rejected or adapted during the course of several construction projects, it seems appropriate for the study to follow this long, distinguished and well-trodden anthropological path.

It is important to emphasise that Study 2 had a deliberately loose design. As Pink et al. (2010) comment, *'Ethnography is a serendipitous craft: ethnographers often learn precisely when they are least expecting to'* (p658). This study, therefore, sat very much towards the unfolding end of the pre-structured versus unfolding spectrum of qualitative research (Punch, 2006).

4.7.13 Defence of a Fully Ethnographic Case Study Approach

Specific theories for the commercial risk management of construction projects in the Highlands and Islands do not exist. However, there are concepts in the related fields of Accident Learning in Engineering and Economics and Finance which have been explored in the literature review section. The use of these theories is discussed in more detail in the Data Analysis section, but

here it is sufficient to note that the inclusion of theories from allied subject disciplines meant that this could not be considered a Grounded Theory study.

With the work seeking to explore an existing situation, rather than implement or evaluate a change, an Action Learning Strategy was also rejected as a possible methodology.

Finally, time pressures meant that this could not be considered to be a fully ethnographical or anthropological study which would have required the full immersion of the researcher within the culture at Alba Water over a long period of time. Instead, a case study approach using ethnographic techniques, was considered a more appropriate strategy.

It is clear from the literature of allied subject disciplines (e.g. Behavioural Economics and Finance and Accident Prevention in Engineering) that social networks perform an important role in risk management systems. From an anthropological perspective Tett (2009 and 2013), drawing strongly on Bourdieu's work, discusses the development of elites in finance and how social structures and social networks enable these elites to maintain their dominance. Tett claims these elites possess a cognitive tunnel vision and have not been trained to dispute the optimistic rhetoric surrounding financial innovation (Tett, 2013). As Paul Krugman has said, '*I think there's a pretty good case to be made that the stuff that I stressed in the models is a less important story that the things I left out because I couldn't model them, like spill-overs of information and social networks.'* (MacFarquher, 2010).

4.7.14 Triangulation Strategy

An ethnographic triangulation strategy using documentary analysis, semi-structured interviews and non-participatory observations was chosen with the researcher adopting the position of '*learner among the more knowledgeable'* (Payne & Payne, 2004, p73).

Documentary analysis was used to unlock the company's commercial risk management policies and was considered important for context (Prior, 2004). In this case, however, as well

as context documentary analysis was also used to examine the company's existing policies and procedures for commercial risk management. An early start was possible with the use of publicly available documentation on Alba Water's website, as well as internal policies and procedures from the company's Intranet. The interpretation proceeded from the standpoint of the documents as '*social facts'* rather than '*transparent representations of organisational routines'* (Coffey and Atkinson, 2004, p58) and sought to explore '*what (the documents) are used to accomplish'* (Coffey & Atkinson, 2004, p58).

Non-participatory observation explored the ways in which the policies were used, ignored, adapted and 'lived out' in the projects.

Finally, semi-structured interviews offered the opportunity for high response rates (in contrast to, for example, Participants' diaries), privacy, consistency and flexibility (Payne & Payne, 2004, p133). Interviews were digitally recorded, but handwritten notes were also kept in case of equipment failure. '*Rich, thick descriptions'* (Cresswell, 2009, p191) of interview settings were attempted.

4.7.15 The Choice of Observation over Semi-Structured Interviewing

With an overreliance on interviewing in construction research (Dainty, 2008), observation can be an alternative method of capturing Participants' thoughts, views and actions. Whilst semi-structured interviews offer the opportunity for high response rates, only by direct observation of behaviours can one hope to understand how a culture operates in practice (Harrison, quoted in Hall, 2015, p26).

Early ethnography focused much more on observation (perhaps because the early researchers did not speak the same language as their subjects). Unfortunately, there were often clear ethical issues in the interpretations of what observers witnessed. Mainly carried out by upper or middle-class white males rooted in a strict class system and living in a country which still

regarded itself as head of an empire, the observations were often carried out without Participants' informed consent and interpretations were subject to the observers' own prejudices (for example, the M.O. Observers' tendency to regard most women in pubs as prostitutes). Perhaps, for this reason, interviews are now seen as a more egalitarian and less hierarchical alterative to direct observation.

However, the issue of what people say (the 'rhetoric') differing from they actually do ('the reality') is pertinent to this study. A key conclusion of Study 1, which used semi-structured interviews as the principal data collection method, was that, in the pause between question and response, Participants often seemed to be searching for the 'right' answer. Again, the experience of the original M.O. researchers is instructive. In an attempt to draw opinions from as wide an industrial base as possible, observers from the M.O. Worktown project were stationed in a mine in Wigan to ascertain the miners' views on politics and, in particular, the rise of fascism in continental Europe. The observers reported that the miners' discussions revolved principally around their work with their most common comments being phrases such as "Where's the f**king spanner?" (Wickam, 1980 quoted in Hall, 2015, pp135-136). Had the miners been interviewed rather than observed, the researchers might have come to very different conclusions about the priority and meaning right-wing politics held in the miners' lives. Interviews may not only lead to incorrect conclusions, but it is also conceivable that people actually report the opposite of what they believe:

> *'What people will say to a stranger on their doorstep about how many baths they take a week, how much beer they drink, how many cigarettes they smoke, whom they plan to vote for, how often they go to church, or if they ever engage in extra-marital sex, may prove to be a very poor guide to what those questioned actually do.'* (Harrison, unknown date, quoted in Hall, 2015, p50).

Since Objective 3 sought to test Argyris and Schön's seminal work on the difference between espoused theories and theories-in-use, it was thought critical to abide by their insistence on the use of non-participatory observation in the testing itself:

> *'We cannot learn what someone's theory-in-use is simply by asking him. We must construct his theory-in-use from observations of his behavior.'* (Argyris and Schön, 1974, p7).

In addition, High Reliability Theory (Rochlin, La Porte & Roberts, 1987) – which sought to define effective risk management practices within high-risk socio-technical systems – also used non-participatory observation to explore similarities in approach within complex systems such as aircraft carriers, air-traffic control, commercial air traffic and nuclear power operations.

4.7.16 Observational Strategies within Construction Ethnography

As previously stated, there has been very little use of ethnography within construction research historically. This has changed recently as construction researchers have chosen ethnographic methods to explore construction practices (e.g. Pink et al. (2010), Pink et al. (2012), Shipton (2012), Shipton and Hughes (2013), Tutt et al. (2011), Tutt et al. (2013) and Loosemore et al. (2015). Pink et al. (2010) suggest two possible ethnographic approaches for construction studies: the researcher observing work in practice and asking questions later or the researcher becoming an apprentice to the worker's craft and developing local knowledge akin to theirs. However, they are also clear that the over-arching requirement in such studies 'involves being there, to explore how tasks are performed *in practice* (authors' italics) and how people *know* (authors' italics) what to do *in practice'* (Pink et al., 2010, p10). Although recent construction writers such as Loosemore et al. (2015) have developed a 'rapid ethnography' technique to allow for data collection to take place quickly, this strategy was rejected since Study2 did allow

for an extended observations periods within the setting. Instead, the study turned to the seminal work of Wolcott (1994) to guide the observations.

4.7.17 The Observational Strategy

Study 2 used Wolcott's seminal work (Wolcott, 1994) as a guide for the observational strategy:

> *'When observations are linked to a particular discipline or professional interest (psychologist-observer, economist-observer, medical-observer), one immediately gains a sense of direction and purpose. Thus, part of the answer to the question, 'What do you look at?' is embedded in a counterquestion, 'What do your professional colleagues look at?' Each occupational or professional group has both customary ways of looking and customary foci of concern.'* (Wolcott, 1994, p160).

In respect of Quantity Surveyors their customary foci of concern would appear to be obtaining maximum value for money for their client, in this case Alba Water. Inevitably, this leads to a focus on managing the commercial risks of the client's many projects. With regard to 'customary ways of looking' both the literature review and Study 1 have indicated a preference for the technical over the human-social-interpersonal aspects of commercial risk management.

Wolcott goes on to recommend four strategies for ethnographic observers and these are outlined below, together with a commentary on how each strategy was used within study 2 and the emergent advantages and disadvantages of each.

4.7.17.1 Strategy One – Observe and Record Everything.

Whilst Wolcott maintains that *'one can conduct ethnographic enquiry anywhere'* (1994, p161), he appears to recommend this strategy for the initial observatory work only, perhaps during a settling-in period as one becomes better acquainted with the context:

> *'Beginning with a broad sweep, you can proceed in a rather unstructured manner until you become better acquainted with the new setting, meanwhile establishing some precedents for your own role: how you intend to take notes, how you intend to take photographs, how and how much you intend to participate, whether you 'write all the time' and so forth.*' (Wolcott, 1994, p161)

An early start was therefore made on 'practice observations' and these practice observations continued for some three to four months. During this time, the observational strategy developed in a number of ways. Firstly, a shorthand was developed for note-taking during observations. This enabled observations to be recorded almost simultaneously and without the need for recording equipment which may have interfered to a greater extent with the naturalistic settings. Secondly, it became clear that the observer was focused on what was *being said* and that there was an absence of other descriptive material (for instance, descriptions of settings, body language, physical movements of Participants etc). Given the major decision to move from semi-structured interviewing to observations, this seemed somewhat ironic. However, it is important to remember that the observations (even after this change to include more setting descriptions, tone etc) were of naturalistic settings (project meetings, informal discussions outwth the office environment) and perhaps it is this emphasis on naturalistic settings (as opposed to the rather artificial environment of an interview) that were the principal reason for the change. Whether in interviews, discussions or meetings, the primary focus is still likely to be on what it said. A decision not to take photographs was again made in an attempt to keep the settings as low-key as possible. Also, it was clear from initial discussions with the Participants that several would not allow photographs to be taken during the observations and so any taken would have illustrated only a few of the Participants and not the majority. Finally, the initial practice observations remained handwritten in shorthand and were not transcribed for some time. This was seen in retrospect to be a mistake. The actual observations were

transcribed much more quickly after the observations and an immediate reflection was added within twenty-four hours of the observation occurring. This was considered important to add context to an observation. Rapid transcription was necessary so that the transcription occurred whilst the event was still fresh in the observer's mind and so that any ambiguities or concerns could be checked quickly with Participants.

4.7.17.2 Strategy Two - 'Observe and Look for Nothing' – that is Nothing in Particular' (1994, p161-162).

Wolcott recommend this strategy be adopted in very familiar settings, for instance an educational observer in a classroom, as well as very unfamiliar settings, for example, as in a religious ceremony.

> *'What one actually looks for under this strategy are those elements that stand out from an otherwise flat landscape. In short, one watches for 'bumps'.'* (Wolcott, 1994, p161-162).

As a Quantity Surveyor observing other Quantity Surveyors this strategy was adopted. It meant that the substantive observations focused on disagreements, complaints and discussions where the correct course of action was ambiguous. The clear problem with this strategy was that it created the impression that Alba Water staff spent a great deal of time complaining about Alba Water procedures, contractors, senior management and each other. It created an unbalanced picture which although illuminating the stresses of the staff, did little to illustrate how many hours the staff spent on routine work (creating contracts, processing payments, maintaining Compensation Event registers, discussing non-controversial projects) and, crucially, agreeing and collaborating with each other. In fact, most of the Participants considered that the workload alone required of Alba Water Quantity Surveyors was such that, without the assistance of other Quantity Surveyors, keeping up would have been impossible. When new processes and

procedures were introduced (which happened frequently and without specific training) individual Quantity Surveyors became dependent on more experienced QSs for assistance and in some cases to take over the task completely.

4.7.17.3 Strategy Three - Look for Paradoxes.

Wolcott suggests focusing observations on the paradoxes facing the group, for example the paradox of teachers complaining of prescriptive curriculums whilst seeming unwilling to their managers to consider change. Wolcott offers no advice on what the analysis of such paradoxes might illuminate but offers it simply as a way to focus the observer's efforts.

In reality, a focus on paradoxes arose naturally from Strategy Two. Much of the discussion and complaints of the QSs focused on two paradoxes; firstly, their desire for comprehensive Commercial Procedures at the same time as they continued to ignore any Commercial Procedures they personally disagreed with. Secondly, the paradox of collaborating with contractors they viewed as adversarial. Strategy Three then, leads naturally to Wolcott's Strategy Four.

4.7.17.4 Strategy Four – Identify the Key Problem Facing the Group

Wolcott's fourth strategy was initially suggested by sociologist, Howard Becker (Becker et al., 1968, quoted in Wolcott 1994, p164) when Becker suggested looking for *the* problem (or problems) facing the group being studied.

> *'How they deal with that problem provides an effective way to observe them at work by focusing on something rather than everything.'* (Wolcott, 1994, p164)

In the case of the project teams at Alba Water and in particular the Quantity Surveyors, this appeared to be how to manage the commercial risks of a project where the contractor was perceived to be adversarial and not collaborative.

The use of Wolcott's four strategies is summarised in the table 18 below:

Table 18: Wolcott's (1994) Four Observational Strategies

Strategy	Use in Study 2	Comments
1: Observe and Record Everything	Used for Practice Observations only	Used for developing and practicing shorthand, to decide not to use photographs and to focus more attention on setting descriptions, non-verbal communication etc.
2: Observe and Look for Nothing – That is, Nothing in Particular	Used to focus observations on problems, disputes, discussions, anomalies etc.	Drawback is it creates an impression of a disputatious environment in which very little routine work was carried out.
3: Look for Paradoxes	Not used as a deliberate strategy.	Paradoxes emerged naturally from the observations
4: Identify the Key Problem Confronting a Group	The key problems emerged from a focus on discussions and disagreements	

4.7.18 Sampling

A decision to use naturalistic sampling (purposive sampling or theoretical sampling are other terms) was taken early on in the projects. The aim of naturalistic sampling is to maximise information, rather than aid the production of generalisations (Lincoln and Guba, 1985).

Decisions are not made before the study begins but adapted as the study develops. Sampling ends when no further useful information can be obtained, so called '*informational redundancy'* (Lincoln and Guba, 1985, p202).

By choosing purposive sampling rather than random or representative sampling, this study aimed to increase the range of data in the hope of generating a 'full array of multiple realities' (Lincoln and Guba, 1985, p40. By contrast, random or representative sampling is likely to supress more deviant cases which is not desired here (Lincoln and Guba, 1985, p40).

According to Lincoln and Guba, purposive sampling has particular characteristics which are outlines in table 19 below:

Table 19: The Particular Characteristics of Purposive Sampling (from Lincoln & Guba, 1985, pp 201 – 202)

Characteristic	Description	Relevance to Study 2
Emergent Sampling Design	Sample cannot be drawn in advance	The initial sample of two QSs (the gatekeepers) emerged from the practice observations
Serial Selection of Sample Units	Selection of the sample only after the previous sample has been tapped and analysed	The focus gradually extended from two to all six of the QSs in the department
Continuous Adjustment or Focusing of the Sample	As the researcher develops insights into the situation, the sample may be refined to focus on those units which seem most relevant	As the dominant themes emerged a focus on three out of the six QSs in the department developed
Selection to the point of Redundancy	Sampling is terminated when no new information is forthcoming	The point at which no further useful insights into the practice of commercial risk management in the department heralded the end of the sampling

As Lincoln and Guba state:

'The object of the game is not to focus on the similarities that can be developed into generalizations, but to detail the many specifics that give the context its unique flavor.' (Lincoln & Guba, 1985, p 201).

4.7.19 The Research Ethics in the Study

Study 2 adopted an overarching principle of universalism (e.g. Erikson, 1967; Dingwall, 1980; Bulner, 1982; all cited in Bryman, 2012, p133), that is, that subterfuge is not permissible in any circumstances. A key ethical aim, in the data collection, analysis and interpretation stages of the study, was the development of mutual trust between the researcher and Participants (Kelman, 1967).

PhD level ethical approval, in accordance with the university's academic regulations, was sought and obtained for Study 2.

4.7.20 Informed Consent

Walker et al. (2008) suggest Participants absorb limited information prior to giving their consent and consent forms were therefore based on that developed by Robson (2011, p205; based on Crow et al., 2006). Line managers were informed in advance of the time requirements and potential impacts the study might have had for employees. As an act of both courtesy and to ensure the integrity of the data, the researcher worked with the participating teams to ensure there was as little disturbance as possible to the work setting (Cresswell, 2009).

4.7.21 Confidentiality

In light of the researcher's experience in Study 1, it was considered important to adopt a realistic and cautious approach to a commitment of confidentiality. The study used pseudonyms for all Participants (SQS1, SQS2 etc), contracting organisations, projects and geographical

locations. Some internet references - where pseudonyms would have been insufficient to protect Participants' identities - were removed on the advice of the study's supervisor and stored securely in password-protected documents.

Transcripts and Participants' contact details were stored separately and securely, but no absolute guarantee of confidentiality was made (Bryman, 2012). All collected data was password protected and will be destroyed after a period of six years (Cresswell. 2009).

4.7.22 Gender bias

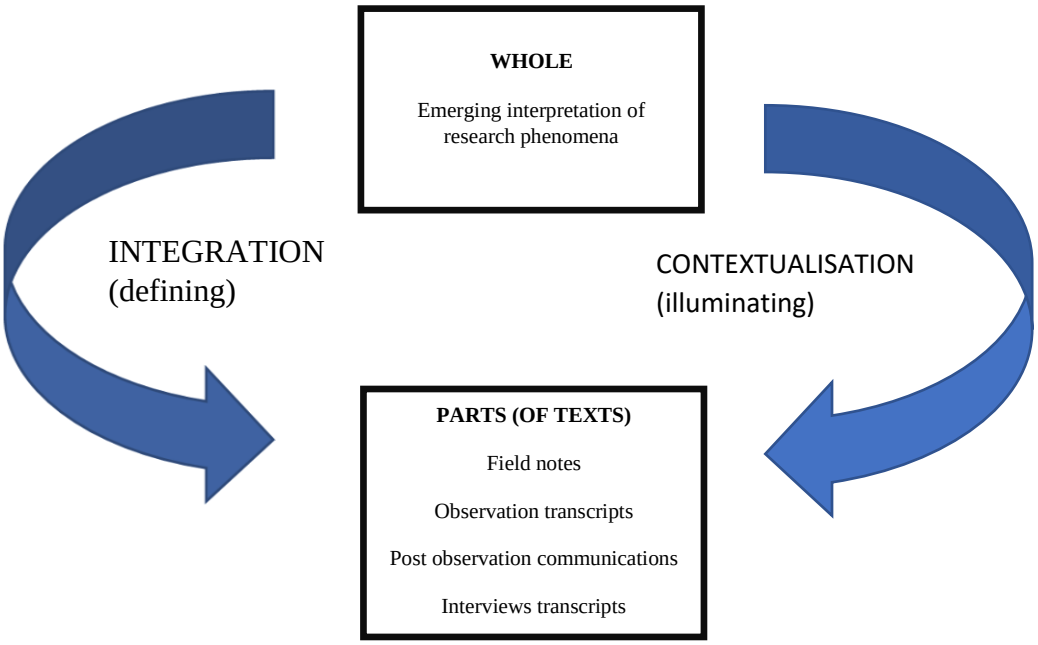
A further change from Study 1 was the adoption of non-gender specific pseudonyms for the Participants and the use of the non-gender specific pronoun 'they'. All Participants were labelled by their title (SQS1, SQS2 etc), which could not hint at either their gender or ethnic origin. Although there were clearly much to be learned from the experiences of female Quantity Surveyors in an industry that is so male dominated and from BAME Participants in an industry that is so predominantly white, it felt important to protect Participants' identities as much as possible. All the Participants were generous with their time and were very open in their discussions and the protection of their identities was felt to be of utmost importance.

4.7.23 Approach to Data Analysis and Interpretation

Early and on-going analysis was used throughout the study in an attempt to keep control of the expanding data. Software, such as Excel was used to assist effective data management and analysis.

In line with Study 1 (described above) a hermeneutic approach was used for the data analysis and interpretation sections. This process – and the use of the hermeneutic circle adapted from Bontekoe, 1996, is shown below in Figure 13:

Figure 13: Hermeneutic circle used in the analysis and interpretation of data of Study 2 (adapted from Bontekoe, 1996)



4.7.24 Ethics in Data Analysis and Interpretation

Ethical considerations flowed through to the data analysis and interpretation stages of the study. Anonymity involving the use of pseudonyms continued. Collected data has been secured safely and will be destroyed after a period of six years (Cresswell. 2012).

4.7.25 Reliability and Validity – establishing trustworthiness

Any initial conclusions reached during the data analysis and subsequent validation questions were discussed on a regular and on-going basis with the researcher's supervisor (Yin, 2003). Code definitions were developed and cross-checked by an experienced qualitative researcher (Gibbs, 2007, cited in Cresswell, 2009, p190). All transcripts and other observation data were given to Participants who were asked to check them and return any queries to the researcher. Several did return queries or concerns and two observations were withdrawn from the data

analysis after concerns from Participants about the level of criticism of Alba Water and / or other staff members.

Lincoln and Guba (1985, p300) claim the four terms ‘credibility’, ‘transferability’, ‘dependability’ and ‘confirmability’ as the naturalists’ equivalents of the conventional terms ‘internal validity’, ‘external validity’, ‘reliability’ and ‘objectivity’.

Table 20 below illustrates how the strategies recommended by Wolcott (1994) and Lincoln and Guba (1985) to establish trustworthiness were used in Study 2. The application of several of these methods to the study - negative case analysis, Member Checking and the use of a Reflective Diary - are then discussed in detail below.

Table 20: The Trustworthiness Strategies used in Study 2

Author	Method	Relevance in this study
Wolcott (1994, p348)	Talk little, listen a lot	Over thirty hours of observations were made. The Observer's comments amounted to less than 2% of the dialogue recorded.
Wolcott (1994, p349)	Record accurately	Observations were recorded using shorthand. Verification of 20% of the transcriptions were made by a fellow student.
Wolcott (1994, p349)	Begin writing early	Writing commenced once the thematic analysis had been made.
Wolcott (1994, pp350-351)	Let readers 'see' for themselves	Data analysis section used a high percentage of direct quotes and transcriptions are appended to report
Wolcott (1994, pp351)	Report fully	No attempt to restrict findings to any theme or to provide evidence for particular theories was made.
Wolcott (1994, pp351-352)	Be candid	No attempt was made to 'sanitise' the findings of the observations.
Wolcott (1994, p353)	Seek feedback	Feedback was sought from the Supervisor, fellow students, Participants and non-Participant Alba Water employees.
Wolcott (1994, p354)	Try to achieve balance	A Reflective diary and Supervisory feedback were used to attempt to achieve balance and not overstate the findings.

Wolcott (1994, p354-356)	Write accurately	Two Participants and the study's supervisor read through the data analysis chapter and initial findings and provided comment which was incorporated into the final report.
Lincoln & Guba (1985, pp301-304)	Prolonged engagement	The study was based on over twelve months of engagement and three months of non-participatory observations.
Lincoln & Guba (1985, pp304-305)	Persistent observation	The three-month period of non-participatory observations was an attempt to record a high percentage of the interactions between team members. However, whether this constitutes 'persistent observation' is not clear.
Lincoln & Guba (1985, pp305-307)	Triangulation	The decision to extend the Participant group from two to six QSs reflected a desire to triangulate findings between different QSs.
Lincoln & Guba (1985, pp 308-309)	Peer debriefing	Debriefing with the supervisor, one of the Participants and the Commercial Manager took place during the observation phase.
Lincoln & Guba (1985, pp309-313)	Negative case analysis	Negative case analysis was used in case of MacCallum Construction.
Lincoln & Guba (1985, pp313-314)	Referential adequacy	There were insufficient resources available to allow for the use of referential adequacy.

Lincoln & Guba (1985, pp314-316)	Member checking	Two Participants provided member checking and provided feedback on the initial and revised findings.

4.7.26 Limitations of the Study

The principal limitations of this work flowed directly from the lack of theory in commercial construction risk management and the study's consequent reliance on other academic specialisms which are themselves developing areas of knowledge. Difficulties also arose from the potential within the study for a Hawthorn Effect as well as confusion over the axiological stance of the researcher as both a non-Participant observer and practicing quantity surveyor. Continuing attempts to address these limitations through reading, training, discussions with and feedback from Supervisors and, crucially, reflexivity were considered vital for the success of Study 2.

Chapter 5

Data Analysis

5.1 Study 1

5.2 Introduction

The study's Literature Review arrived at a number of conclusions. Firstly, contractors in the UK compete against a background of low profit margins, high operational risks, often negative cash-flow profiles and low levels of inward investment. Secondly, the ability to identify, assess and manage commercial risks is a highly valued, tacit skill; within a largely positivistic industry, the preferred domain for the acquisition of these skills is industry rather than academia. An epistemological analysis of the skills required for effective commercial risk management has shown that a wide range of skills – soft as well as hard – is required. Finally, literature from allied fields such as accident learning in engineering, behavioural economics and finance, as well as the work of Argryis and Schön on action theories indicate that there may be a bias in training for effective risk management towards the technical and away from the human-social-interpersonal aspects.

Study 1, the first empirical study aimed to understand how these factors manifest themselves in practice. It attempted to answer the following research questions. Did an early-career Quantity Surveyor receive commercial risk management training from an epistemologically broad range of mainly-applied subject disciplines? Or was there a neglect of the human-social-interpersonal in their training (Objective 1)? Could a conceptual framework developed from allied academic fields be validated here in practice (Objective 2)? And, was there a gap within the company between its commercial risk management rhetoric and the practices of its staff (Objective 3)?

Table 21 below illustrates the types of data collected for each objective and the analysis techniques undertaken.

Table 21: Objectives, Types of Data Collected and Analysis Techniques for Study 1

Objectives	**Data collected**	**Analysis Techniques**
Objectives 1 and 2	Company documents	Narrative Analysis
	2 x semi-structured interviews	Initial thematic analysis (NVivo) Secondary thematic analysis (Excel)
Objective 3	2 x semi-structured interviews	Thematic analysis (Excel)

The data analysis for Objectives 1 and 2 is now shown below. Data analysis for Objective 3 follows and the chapter ends with the conclusions for Objectives 1, 2 and 3.

5.3 Narrative Analysis for Objectives 1 and 2

The following documentary extract was taken from Company X's website and appears on every page next to the Facebook link and the company's contact details. The extract was chosen after extensive research because it appeared to illustrate the company's stated attitude (or espoused theory) towards commercial risks.

Qualitative data such as interviews, documents, conversations and even technical reports, often takes a narrative form (Silverman, 2006, p166) and the extract was analysed using narrative analysis questions suggested by Cortazzi (2001) and Riessman (1983).

'Company X started out in the 2001 with a team who had previously worked together and knew a variety of clients in the Highlands of Scotland. We hit the ground running! The company has grown, surviving the difficult years of the recession when the Highlands lost so many indigenous companies. We have experience in a wide variety of sectors and are known for a personal approach within our local team.' (Document 3)

A narrative analysis of the extract is shown below in table 22.

Table 22: Narrative Analysis of Extract from Company X's Website (from Cortazzi, 2001; Riessman, 1983)

Question	**Narrative analysis**
What is the content of the story you are examining?	The history of the company from its inception in 2001 to the present day.
Who are the principal agents?	The 'local team' who built and continue to sustain the company
How is the story told (structure and sequence)?	The narrative moves straight from the company's inception in 2001 to the recession of 2008 to 2013.
What purposes does the story serve?	The company is experienced and can be trusted; the management team is local, they're a very tight group of experienced professional who have worked together before the inception of the company; clients encouraged them to set up on their own by giving them projects rights from the beginning (?); the company has grown (before and after the recession, but not during); the company was Employee Rust and skilled enough to survive the recession when many local firms were lost.
In what place or setting is the story told (context)?	On every page of the company's website
Does the story have a clear culmination with a moral, as in a fairytale, or does it follow a different pattern?	A clear moral – 'Being local, experienced and skilled helped us survive the recession; you can trust us with your projects.'

Narrative analysis of a further extract from the 'About Us' section of the company's website attempted to quantify the subjects or agents mentioned, something considered essential for narrative analysis by many qualitative researchers (e.g. Silverman, 2006, p161):

> *'About Company X Ltd.'*
>
> *'Working in partnership with external design teams in both the public and private sectors, we have experience in various methods of contract procurement including Design and Build.*
>
> *Our expertise in securing sites and negotiating planning consents, our skilled and motivated workforce, our close relationships with design teams and specialised sub-contractors and our client-orientated attitude have become a package to provide accommodation solutions for both businesses and the residential market. Our ability to influence design development early in the process can help to deliver projects within budget.*
>
> *On a smaller scale Company X can also provide a full client service for domestic renovations and extensions'* (Document 3)

Table 23 below uses Silverman's typology (2006, p161) to identify the quantifying agents or subjects of the extract from Company X's website:

Table 23: Quantifying agents or subjects (from Silverman, 2006, p161)

Agents or Subjects	Number of times mentioned	Details
Procurers of construction works	5	3 mentions of design teams (public and private sector), 1 mention of 'business' and 1 mention of the 'residential market'
Employees	1	
Specialised subcontractors	1	
Clients	0	Clients are only referred to obliquely as in 'full-client service' and 'client-orientated attitudes'

In this case the appeal of this section of the website would seem to be clearly towards procurers and, more specifically, public and private sector design teams. This wide appeal could be part of a deliberate commercial risk management strategy.

The company's statement that its 'ability to influence design developments early in the process can help to deliver projects within budget' is clearly an appeal to both procurers and design teams for early contractor involvement and design and build. Clearly, the company feels that the earlier it is involved in the design and planning process, the more effective its commercial risk management can be.

As Coffey and Atkinson state, the rigorous researcher will approach documents not as transparent representation of facts but seek to explore '*what they are used to accomplish'* (Coffey & Atkinson, 2004, p58). Although a subsequent interview with the Managing Director of the company was sought with the intentions of exploring what these documents were intended to achieve the time constraints of the research did not make this possible. Instead, the analyses above were used to frame the subsequent interviews with the early career Quantity Surveyor and Commercial Director.

5.4 Semi-Structured Interviews for Objectives 1 and 2

5.4.1 Introduction

Semi-structured interviews were conducted with the early career Quantity Surveyor (Participant A) and the Commercial Director (Participant B), each at a single session which took place in the boardroom of the company's head office. The interviews were recorded on a handheld digital device and transcription of the interviews and setting descriptions took place within a week of each interview with further refinements taking several weeks. Over 15,000 words of text were generated and the total transcription time was 23 hours.

The transcriptions were checked by another Professional Doctorate student and spot-checked for errors by a part-time PhD student. The Participants were each sent a transcription of their interviews and asked to check them for errors; neither asked for any changes to be made.

The unit of analysis was deemed to be Participant A, the early-career Quantity Surveyor.

Two separate sets of data analysis were undertaken. Firstly, the software programme, NVivo, was used to identify sections of the text where aspects of commercial risk management, and particularly, training for commercial risk management, were discussed. The Nodes were pre-agreed with the study's supervisor and are illustrated below in Table 24a.

Table 24a: Pre-agreed NVivo Nodes for the Analysis of the Semi-Structured Interviews with Participant A and Participant B from 'Company X'

Node	Description
A	Commercial risk management within Company X
A1	The frustrations of being an inexperienced Quantity Surveyor amongst older, more experienced staff
B1	Specialisation through growth
B2	The changing construction industry since the 1980s
B3	Creating a feedback loop (between site and office)
B4	Influence of own experience in the training of inexperienced staff
B5	The nature and role of Quantity Surveyors
B6	The nature and role of Estimators The value of mixed experience (contracting and consultancy)
B7	The nature and role of Commercial Managers
B8	The provenance of Quantity Surveying
B9	The value of mixed experience (contracting and
C1	The importance / value of construction management and technical knowledge for commercial risk management
C2	The necessity of reminding people of the commercial nature of the company
C3	Participant A's role in the commercial risk management of the company
C4	The tensions in trying to find sufficient time for training in a commercial organisation
C5	Getting a good match between trainee and line manager
C6	Learning to manage commercial risks

Following the initial analysis of the transcripts using NVivo, a further analysis was undertaken. This secondary analysis used Excel in the identification of those sections of the transcripts which related to the themes within the conceptual framework developed in the Literature Review and shown in Table 10 above. The nodes used for this secondary analysis are now shown below in Table 24b:

Table 24b: Nodes utilised for the Secondary Analysis of the Semi-Structured Interviews with Participant A and Participant B from 'Company X'

Excel Node	Description
D1	A critical understanding of the tendency towards over-reliance on technology and technical warning systems in the risk management of socio-technical systems together with a need for a broad, mainly applied epistemological spectrum training of early career Quantity Surveyors.
D2	A critical understanding of the roles elites play in the risk management of socio-technical systems.
D3	A critical understanding of the role social networks play in the risk management of socio-technical systems
D4	A critical understanding of the importance of filling information gaps and linking seemingly unrelated events in the risk management of socio-technical systems
D5	The role of simulation in training for commercial risk management

The results from this secondary analysis are now discussed below.

5.4.2 Node D1: A critical understanding of the tendency towards over-reliance on technology and technical warning systems in the risk management of socio-technical

systems together with a need for a broad, mainly applied epistemological spectrum training of early career Quantity Surveyors.

From a Biglanian analysis of the skills required for effective management of commercial risks in the construction industry (figure 4 above), it might be assumed that the human / interpretivistic subject disciplines (law, management, accounting and psychology) would take a leading role in Participant A's training. In fact, the hard-applied subject of technology seems to take precedence. In answer to the question '*What would you have expected a graduate to do that Participant A can't?*" Participant B replies:

> *'Er, erm possibly just possibly more, possibly more understanding in construction. I mean that she says herself she doesn't because she's just been doing wind farms there isn't lot of understanding in construction…'* (lines 517 to 520)

This emphasis on the importance of understanding the technology is repeated several times by Participant B:

> *'…which again from a PQS point of view you probably don't need to. Estimator you possibly do to work out productivity or whatever, but certainly you know from a contractor's point of view I think you need to have that understanding.'* (lines 588 to 591)

and

> **'***There isn't that process in her head yet.'* (line 522)

In an effort to assist the development of this knowledge Participant B discusses arranging to send Participant A to work on a large construction site where she will:

> *'…just see the physical process of how a housing development comes together and everything that's in it…watching the guys pouring the founds, putting the*

reinforcement in, levelling, the brickies etc. to try and get an understanding' (lines 519 to 584)

Mentioning previous trainees he had worked with Participant B comments on the importance for trainee Quantity Surveyors of learning how to relate paperwork to the technology on site:

'So they, they were landed up on Location L on a housing site for a week basically sitting there getting an understanding and watching the guys pouring the founds, putting the reinforcement in, levelling, the brickies etc. so to try and get an understanding. So, sitting there with a bill of quantities watching what the guys were doing and trying to relate, you know, something on a bit of paper to something the physicality of how it actually happens on site cos they just didn't, there was nothing in their heads that related the two.' (lines 577 to 586)

Participant A herself mentions her unease with building technology (possibly based on her own insecurity having worked previously in civil engineering):

'...started doing take-offs with the help of Employee J, the m2 they're fine, but it's the other ones I'm struggling with at the moment. Erm just interpreting the drawings and stuff.' (lines 34-36)

In terms of academic training Participant A mentions returning to college to study for an HNC in Construction Management (line 230) and later mentions using Google for research if she feels it's something (she) '*should know'* (line 270); this seems more likely to refer to technical, rather than human – social - interpersonal knowledge.

Whilst both Participant B and Participant A are quite explicit about the importance of technical knowledge (and particularly construction technology), references to the importance of the human – social - interpersonal aspects of risk management are rather more implied. For

instance, when Participant B is talking about the actual '*nuts and bolts'* processes of commercial risk managing a project once a tender bid has been accepted he says:

> *'... reappraising it, deciding which subcontractors you're gonna go with, renegotiating the subcontractors to try and introduce more margin, looking at the material requisitioning with the buyer and the surveyors to see that you're making a margin on it, erm, and then liaising with the production side, with the project managers etc. and trying to ensure that they're running the job efficiently, erm, and again the commercial management every month obviously you're doing your valuations, CVRs etc. and reporting back up on whether you're making anything or not (laughs)...'* (lines 42 to 52)

Here, Participant B is clearly referring to tasks which involve much human interaction. When talking about Participant A's training, Participant B again makes references to implicit skills development such as collaboration:

> *'...so, I mean we'd be expecting her to sit with the agent and assist in take-off of materials, drainage materials, blockwork, whatever, so, you know, I mean there would be added value, she wouldn't just be sitting there doing nothing.'* (lines 629 to 632)

It is interesting to note that in the narrative analysis of the company's website the importance of this collaborative work is clear:

> *'(We) are known for a personal approach within our local team.'*
>
> (Company X, 2013)

In fact, there is a real tension, a gap, between the company's rhetoric about its values and skills and its actual practice; rhetoric which emphasises the importance of the human – social - interpersonal and practice which primacies technique and the technological.

This gap between the explicit need to develop further technically and the implied requirement to develop the more human aspects of effective commercial risk management causes Participant A some personal tension:

> '*What I really should have done is I should have spoken to Freelance Worker D and when Freelance Worker D said No, that's not right I should have, I should have pushed it, but because of all yesterday's ( ), you just keep it quiet, I just, sort of, didn't say anything which I possibly should have, should have mentioned it to him again but when you start irritating them, because you correct them there's not really…and you can't then go above it that would just cause problems, so it's a bit of an awkward situation.'* (lines 186 to 193)

It is clear that the human – social – interpersonal aspect of Participant A's training for commercial risk management is not being ignored but rather that it is less explicitly referred to and is more implied. In addition, the absence of advice for handling difficult situations such as that described above, cause her anxiety and stress, which perhaps might have been eased had a greater weight been given to the importance of their development.

5.4.3 Nodes D2: a critical understanding of the roles elites play in the management of socio-technical systems.

The role of elites in the management (or mismanagement) of risk is a recurrent theme in accident learning and behavioural finance and economics. As Tett says of the elites in the financial industry:

'*…most important of all they assumed the only people who would understand how modern finance worked were the bankers themselves' (Tett, 2013)*

Commercial risk management skills in the construction industry are likely to be mainly tacit and this tacit knowledge is highly valued. There is then the possibility of a tension between the power such tacit knowledge confers on individuals and the commercial need to make this knowledge explicit and pass it onto the next generation.

Understandably, both Participant B and Participant A make only tenuous reference to elites but there are crucial clues to their importance in both interviews. Both Participant B and the interviewer continually stress the word '*management*', as in construction management, commercial management etc. Participant B insists that the commercial manager refers, not to a risk management role, but instead to the person who manages all the other Quantity Surveyors:

'I mean, going back to previous employer Combine, the senior QS was called the Commercial Manager because all the other QSs reported to him and he reported back to the Board.' (lines 109 to 111)

and

'…that's what a commercial a manager is, it's the top guy for us.' (line 155)

Participant A's experience of elites is, of course, rather different. Describing an incident in which she had pointed out to her line manager that the drawings were not to scale and he had ignored her (only later realising she was correct) she says:

'But you can't challenge them after they've said it to you twice, you see, so you go 'OK' and then he goes and checks it and he goes 'It's not to scale'. I'm like, 'I've said that to you, Freelance Worker D, it's not to scale'. Because, they think, obviously that

you're a trainee and obviously they know so much more than you, but sometimes it's just minor errors which is just common sense, but then they think no no, that is how you do it, which is a [bit like]…' (lines 127 to 135)

When the interviewer recalls making similar errors (realising a trainee is actually correct) Participant A laughs:

'But, you never say they're right though do you? I bet you never say they're right! You just go, Yeah, it's not, it's not to scale.' (lines 205 to 206).

When asked to talk about her social networks Participant A displays a reluctance to ask the elites for advice:

'Well, if it's something I feel I should know by myself I'll google it a lot of the time.' (laughs). (lines 270 and 271)

In spite of finding it somewhat difficult to work with some individuals in the company, Participant A also makes a point of emphasising that the company is a meritocracy and very different from her previous place of employment, BJs:

'…whereas Participant B, Participant B, Participant B's only got an HNC in Quantity Surveying but he's like worked his way up really well so you'll find that a lot of, one of the boys hasn't even got his HNC and he's now a Project Manager so here you grow with the company. And the office manager, when she retires in a couple of years, Employee C who's the same age as me they're just going to promote Employee C straight away than get someone else in which is good because a lot of companies would say 'Oh no she's not even short of her 40s or 30s yet we're not going to give her that responsibility.' But here they do which I think is a nice change from places like Company Z, where until someone dies you don't move up on the ladder' ((laughs)). (lines 245 to 257)

In other words, whilst there is a hierarchy and clearly an elite, it is one which Participant A feels she will be able to join in due course.

5.4.4 Node D3: a critical understanding of the roles social networks play in the management of socio-technical systems.

In terms of social networks, it is clear from the literature that they perform an important role in risk management systems. It is likely that, within the profession of Quantity Surveying, this has always been the case. An analysis of the background of some of the early members of the Institute of Surveyors (the forerunner of the RICS) is illustrated in Tables 25 and 26 below:

Table 25: Analysis of the Backgrounds of the 20 Founder Members of the Institute of Surveyors (based on Thompson, 1968, p131)

Type	**Numbers**	**Percentage of total**
Sons of surveyors	10	50%
Grandsons of surveyors	4	20%
Sons of master builders	1	5%
Articled to surveyors' office during training	20	100%
Aged in their 40s and 50s	20	100%

Table 26: Further Analysis of 29 Members of the Institute of Surveyors who joined the Institute between 23/3/1868 and 15/6/1868

Type	**Numbers**	**Percentage of total**
Sons of surveyors	15	52%
Grandsons of surveyors	2	7%
Son of architect	1	3.5%
University educated (as surveyor- architects)	2	7%
Articled to a surveyor	16	55%
Articled to an architect	4	14%
Articled to an engineer	1	3.5%
Articled to a builder	1	3.5%
No recorded professional training	3	10%
With London offices	17	59%
With provincial offices	12	41%

Whilst these tables might seem to illustrate merely the early date at which professional Quantity Surveying became a 'family profession' they might also indicate the development of important social networks within the nascent profession.

Returning to the Participants of this study it is conceivable that, as a minority (a female) in the construction industry, Participant A might find social networks harder to develop. As part of the interview process Participant A was asked to describe her own social network. Marsden's advice (Marsden, 2011) the question, '*In your work here, when you need help where do you get information from, who do you speak to*? was used as a name generator. Participant A

mentions Freelance Worker D, her line manager, Employee E, the buyer, but seems particularly reliant on the Commercial Director, Participant B, for help:

> '*Yeah, but see actually Participant B, Participant B knows everything. For everything, he's great, there's nothing he won't know. It's quite amazing that. It's, it's, he's really nice about it as well*.' (lines 304 to 306)

It's clear that it is not just Participant B's knowledge and experience which Participant A values, but also his tone. Perhaps Participant B's attitude is partly influenced by his own experiences: when asked to reflect on the poor parts of his own training as a young person he says:

> '*I mean the bad experience is when you go and ask for help and everyone's too busy to offer you it and you sort of feel isolated.'* (lines 766 to 768)

In terms of her own relationship with her line manager, Freelance Worker D, this is clearly more problematic. When asked to describe how that relationship works Participant A says:

> *'Well, erm, it's alright, I suppose, you know. Well, erm, it varies because sometimes hard working with someone more experienced because they'll give you something to do and you won't be sure of it and you'll ask for help, but it ends up being that first of all they explain it to you and then they end up actually doing it, you know, so because, because it's quicker, which sort of you know it's quicker but it's hard…'* (lines 73 to 80)

Clearly, Participant A's relationship with her line manager's line manager (Participant B) is stronger than that with her line manager (Freelance Worker D).

Outwith the company Participant A mentions staff at her previous employer and lecturers and fellow students at college as well as her own boyfriend (a stonemason) as important sources of advice and help.

Participant A clearly has an understanding of the importance of developing these networks of advice within the industry as well as a willingness to ask for help.

In terms of the company there is a real emphasis on the importance of social networks in the website extracts analysed above:

> *'Working in partnership with external design teams…our close relationships with design teams…'*

In spite of this, Participant B makes no explicit reference to the need for Participant A to develop effective social networks. He is, however, at pains to encourage their development, for example by introducing her to the Project Manager at Location T and encouraging her to work on site with the site agent on the Y Housing project.

He also makes reference, when talking about his own career development, to the importance of social networks:

> *…came back up to Location I and started working with a house builder, had 10 years with them, erm, and then moved on, worked wi' Employee G for 4 years, went off back to house building, erm, back to World Construction - as they were at the time - and then they decided they were getting out of house building with the downturn and concentrating on utilities and civils and ended up back with Employee G…'* (lines 8 to 15)

It is suggested that a more explicit reference to the role of elites and the value of social networks in commercial risk management might be of real value to Participant A in her training.

5.4.5 Node D4: a critical understanding of the importance of filling information gaps and linking seemingly unrelated events in the risk management of socio-technical systems

Understandably perhaps, with Participant A at an early stage in her career, there is little direct reference in her interview to the importance of 'joining the dots' in the commercial risk management of socio-technical systems; the emphasis is on Participant A learning as much as she can *about* the dots before she can appreciate how to link them together. There are, however, references to making connections in both Participant A and Participant B's interviews. In fact, in the quotation from Participant B's interview already referred to above, the importance of linking events and processes for effective risk management is clear:

> *'… reappraising it, deciding which subcontractors you're gonna go with, renegotiating the subcontractors to try and introduce more margin, looking at the material requisitioning with the buyer and the surveyors to see that you're making a margin on it, erm, and then liaising with the production side, with the project managers etc. and trying to ensure that they're running the job efficiently, erm, and again the commercial management every month obviously you're doing your valuations, CVRs etc. and reporting back up on whether you're making anything or not (laughs)…'* (lines 42 to 52)

Again, when Participant B is describing the need for Participant A to spend a significant time on site he clearly illustrates the importance of making connections and managing interfaces:

> '*Erm I mean part of what we've talked about is she's going to probably go and spend two or three days a week on site ( ) so possibly the (Y Housing Project). I mean she can come in and out of the office, at least it's Location I, and go and sit with the site manager and watch the take-off process, how you manage, when you have to have materials ordered, look at the costing of the materials, do a, do a reconciliation of*

the tender against what we're buying materials at, provide advice or liaise with the buyer, and just see the physical process of how a housing development comes together and everything that's in it.' (lines 533 to 543)

Participant A, herself, is not a mere bystander in this process. When prompted by the interviewer to reflect on how time pressures can affect the quality of explanations given by senior staff to trainees Participant A's reaction proves her developing understanding of linkages between events:

'*What you're doing, that's always like 'just add this up' and you're like 'why?' you know!'* (lines 101 to 102)

In an important passage Participant B makes clear reference to the importance of information gaps in risk management:

'...and highlighting things against it. I mean, ugh, the things that come up quite often are an example of something that comes up is you'll get a price from a roofer put it into your tender, they come back, the architect hasn't drawn on (the detail), the soil vent pipes and what the verge detail is or whatever, so the roofer comes back to you and says Oh you've not allowed any soil vent pipe collars or tile vents or he never described that he wanted for that fancy verge detail or whatever and especially once you're on design and build which the council especially try to push you against to pass all the risk of it onto the contractor you're then stuck having to try and find the money for that, so I mean and again that's only probably with experience but it is probably something that could be taught someone could sit and say right from the experience I've had here's the risks going with a roofer, you know, put a value against them or a risk value.' (lines 676 to 692)

This is a clear acknowledgement by Participant B of the importance of filling in information gaps, of making connections and of the possibility of being able to teach this to inexperienced staff.

Before moving onto the subject of simulation, it is important to note that the connections Participant B makes in his interviews are very often linear. With the emphasis in the interview on the training of early career Quantity Surveyors he perhaps felt it necessary to restrict his comments to these simpler, linear connections. However, given Participant A's obvious abilities, it does seem feasible that she might be introduced to theoretical concepts of risk management and ideas such as the dangers of tight couplings and that she might find them useful.

5.4.6 Node D5: the role of simulation in training for commercial risk management

Simulation is playing an important role in Participant A's training, although often this results from the lack of time available for her to participate in 'real' processes:

> '*So a lot of the time it's hard is getting shown how to do it, so it ends up being Freelance Worker D kind of shows me, sometimes Freelance Worker D ends up doing it, and then I then do it as a training exercise and then show Freelance Worker D what I've done and then we compare them…'* (lines 83 to 86)

and

> *Participant Bs always giving me little hints giving me little training exercises which is good.'* (lines 225 to 226)

One of the limitations of simulation referred to by Participant A is that her line manager does not always have sufficient free time available to give her detailed feedback:

> *Interviewer* *'Does he go through it with you?'*

Participant A *'Yeah, that's what usually happens, OK, (he always leaves at 4 because of the traffic), then he'll go over it and come back and say you should have done this or that.'* (lines 117 to 120)

Participant A also hints at one of the ways in which the lessons taken from simulation may be less useful than those drawn from real life experiences:

'…it is, it is handy as long as I don't forget and (do it again…)' (lines 120 to 121)

Whilst appreciating the value of simulation, Participant A also understand the worth of 'real' experience:

'Erm, I think it is, Employee G does it is, put you in the deep end and see how much you can swim ((laughs)). Which, sometimes it's actually very good but other times, I do, because with Company Z the problem was I wasn't getting enough experience, I wasn't doing anything and because I hadn't done it before they wouldn't let me do it. But you need to do it so they can see. But, pretty much what happens here is Freelance Worker D just puts a bill in from of me and it's all the stuff I've heard Employee R ((estimator at Company Z)) do but I just never got to do it. And it is a good way to do it because they give you the work, if you're stuck you can ask for help. You know, it's better than never getting the work because they're not sure if you can do it or not. And I think, I think it's a really good way to teach you.' (lines 208 to 221)

Participant B himself mentions the value of real experience when discussing how he himself learnt to manage commercial risks:

'Erm, probably by bitter experience most of it. You make a mistake see something goes wrong and you try and learn and not let it happening again. And it is, I don't know, cos it's not it's not something you're taught really. And I think, I think it probably is, it is probably just experience and having felt the pain learning from that

and trying not to let it happen again, like, and yeah I mean it still happens, stuff still happens…' (lines 664 to 671)

Clearly then, there is an understanding in both Participant B and Participant A of the value of simulation for training but also of its limitations.

5.5 Validation

For Objectives 1 and 2, validation questions were developed in conjunction with the course tutors at a Professional Doctorate workshop held at Salford University. For purposes of efficiency, validation took the form of closed questions which were submitted by email to Participants B and G (the Commercial Director and Managing Director respectively). The validation questions and responses are now shown below in Table 27.

Table 27: Validation Questions and Answers

Participant	Validation Question	Response (and method)
Participant B – Commercial Director	'Is it true you feel better knowledge of construction technology and construction processes is crucial to Participant A's understanding of commercial risks?	Confirmed by email
	'Is it your opinion that the term 'Commercial Manager' refers to the Senior Quantity Surveyor who manages the other QSs and not to a specific role?'	Confirmed by email
Employee G – Managing Director	'Is the message you're trying to get across on the website '*Being local, experienced and skilled helped us survive the recession; you can trust us with your projects.*'?'	Confirmed by email
	Is the appeal of your website to procurers (such as Design Teams) rather than just to potential clients? Is this a deliberate risk management strategy?	Confirmed by email

5.6 Objective 3

5.6.1 Introduction

A third and final analysis of the semi-structured interviews then took place. The aim here was to extract from the transcriptions of the semi-structured interviews Company X's espoused theories (its rhetoric of commercial risk management), as well as the participants' actual theories-in-use (their commercial risk management practices). An Excel spreadsheet was used to attempt to identify the company's espoused theories from the publicly available documents used in the narrative analysis, as well as the participants' theories-in-use. The results are now discussed below.

5.6.2 Company X's Espoused Theory and the Theories-in-Use of its Employees

Using the narrative analysis above the company's espoused theory may seem to be *'being a tightly-knit group of local, experienced and skilled construction professionals has helped us survive the recession; you can trust us with your projects.'* A further sub-theory, derived from the narrative analysis, could be '*the earlier you involve us in your projects the more effective our commercial risk management and cost control can be.'* Both theories relate to the company's role as a provider of construction services for public and private-sector clients; the principal espoused theory is intended to widen its appeal to potential clients as well as other construction professionals such as architects and engineers.

Review of the semi-structured interviews showed that, by contrast, the Commercial Director's principal theory-in-use was *'the importance of understanding the commercial model of the business'* which Participant B makes repeated references to in his interview. Examples are given below:

> *'I mean we're basically you know the business is set up to make <u>money</u> from the projects we do.'* (lines 37-38)

'I mean the one thing we sort of struggled integrating Freelance Worker D in is that the PQS has less commercial awareness because all their cost planning their bills of quantities they're not really concerned with profit margins or overheads or over-runs or whatever and I mean OK they deal with claims from contractors for extensions of time and variations fine but it's not their money.' (lines 206-210).

'…and it was trying it took a wee bit of time for Freelance Worker D to appreciate that.' (lines 219-220).

'…there's been a couple a couple another trainee surveyor who's no longer with us who should have known better but was passing on net costs from subcontractors to clients with no margin on it and and just couldn't grasp why we would be trying to add money and stuff (laughs). I mean he didn't last long' (lines 225-230).

'*…so, no there is an understanding either there or developing that it's you know it's cost plus to try and get a margin out of it and stuff.'* (lines 260-262).

In fact, Participant B makes no less than ten references to the necessity (and repeated failure) of employees to understand the commercial business model of the company.

At first sight, it does seem that there is a disconnect between the company's espoused theory *('being a tightly-knit group of local, experienced and skilled construction professionals has helped use survive the recession; you can trust us with your projects'*) and the Commercial Director's dominant theory-in-use *('We have to make money'*). The espoused theory could be seen as little more than rhetoric designed to drive sales (in this case, projects or invitations to tender) towards the company, whilst the fundamental driving force is the Commercial Director's theory-in-use.

However, the status of these theories is not proven and they are only offered tentatively here. Firstly, no observations were carried out in the company and Argyris and Schön are clear that

'*we cannot learn what someone's theory in use is by asking him. We must construct his theory in use from observations of his behaviour'* (Argyris & Schön, 1974, p7). Time pressures and the sheer volume of the semi-structured interviews to be transcribed and analysed left little time for other data collection methods.

Secondly, it must be asked whether the espoused theory and theory-in-use proffered conform to Argyris and Schön's own definition of a theory, namely that it must have generality, relevance, consistency, completeness, testability, centrality and simplicity.

The Commercial Director's theory-in-use (*'we must make money'*) appears at first sight to be the more Employee Rust of the company's theories of action. It has generality (it appears to apply across the board and to all projects and areas of the business); it is relevant (the company may fail to survive without such a theory); it is consistent (from the semi-structured interviews with the Commercial Director, it appears to be applied across the company and throughout all levels and areas of the company's business); it is testable (by reference to the company's annual accounts); central (this message is reiterated more than any other throughout the Commercial Director's interviews with no less than ten references to the importance of the employees understanding the commercial business model of Employee G MacKay's); and it is simple, being only four short words long.

But the company's espoused theory *('being a tightly-knit group of local, experienced and skilled construction professionals has helped use survive the recession; you can trust us with your projects'*) can also be seen to be Employee Rust. It too has generality (the theory apples to all potential clients); relevance (technical and commercial competence are of supreme importance to clients); consistency (the team's experience and knowledge is reiterated throughout the website and in the interviews); completeness (the theory apparently describes a one-stop-shop for clients); testability (the theory's claims can be tested in real experiments

by the clients or in simulations or case studies); centrality (without new projects the company will fail) and simplicity, describing the company as a 'one-stop-shop'.

The extent to which the company's theories are espoused or theories-in-use is more moot. In particular, is the theory '*We must make money'* really a theory-in-use? Clearly, from Participant B's comments, the theory is not quite as well established within the firm as he would like:

> *'I mean the one thing we sort of struggled integrating Freelance Worker D in is that the PQS has less commercial awareness because all their cost planning their bills of quantities they're not really concerned with profit margins or overheads or over-runs or whatever and I mean OK they deal with claims from contractors for extensions of time and variations fine but it's not their money.'* (lines 206-210)

Alternatively, is '*We must make money'* an *internal* espoused theory? Although Participant B may aspire to make this an espoused theory which is entirely congruent with his own theory-in-use, the fact that several of the current and past commercial staff failed to espouse it means that it is far more likely to be merely a theory-in-use of the Commercial Director, a means for him to ensure his own success and survival within the company .

People who fail to grasp Participant B's attempts to make his own theory-in-use an espoused theory are unable to remain at Company X. This is evidenced by the fact of the young Quantity Surveyor who was passing on sub-contractor costs directly to the client without adding a contractor's margin:

> *'I mean he didn't last long*.' (line 230).

In fact, whilst there is an apparent contradiction between the company's espoused theory *('being a tightly-knit group of local, experienced and skilled construction professionals has helped use survive the recession; you can trust us with your projects'* and the Commercial Director's theory-in-use *('we have to make money')* there are also clear links. Without

attracting new clients to the business by emphasising the company's experienced staff the company will be unable to make money and will fail.

The conclusions of Objectives 1, 2 and 3 of Study 1 are now shown below. Short sections describing the Principal Limitations, the Hawthorne Effect, Axiology, the Production of Obsolete Data and a Reflexive Statement then follow.

A chance to focus Study 2 on more experienced construction professionals arose within a Scottish utility company. This was clearly an opportunity to move the research from a contractor to a client organisation and to view commercial risk management practices from a new perspective. This offered the prospect of triangulating the study's findings for the construction industry as a whole. Data analysis and interpretation for Study 2 are now described.

5.7 Study 2

5.8 Introduction

The Literature Review and the first empirical study, conducted within a contracting company, arrived at a number of crucial conclusions for Study 2. Firstly, literature - particularly the seminal work of Argyris and Schön - indicated that a gap between a company's rhetoric on collaborative commercial risk management and the beliefs and practices of its staff may develop. Because of a long-standing and continuing perception of the industry as failing, all construction organisations – contracting and client-side - now operate against a backdrop of governmental and institutional pressure for greater collaboration and commercial risk-sharing. These concepts clearly require the adoption and implementation of 'soft' skills such as team-working, negotiation and compromise: indeed, the Literature Review has shown that commercial risk management itself requires an epistemologically broad range of skills, hard as well as soft. However, Study 1 clearly showed that greater emphasis was given to the development of technical skills within training for commercial risk management. How are Quantity Surveyors – socialised into a largely positivistic profession in which less emphasis is given to the human-social-interpersonal aspects of their training – adapting to the new reality of collaboration and risk-sharing? And, if there is a gap between the rhetoric of collaborative commercial risk management and the reality, what factors are driving it and how might the gap be closed?

This work has always aimed for a holistic view of the issue and, for that reason, Study 2 shifted the focus of analysis from contracting to client, with a case study of a large utility company operating throughout Scotland. It attempted to answer the following research questions: can Argyris' and Schön's concept of theories-in-action be validated within a client organisation operating throughout Scotland but with an emphasis on the Highlands and Islands (Objective

4)? And can a critical analysis of the gap between policies and practice in the organisation's commercial risk management of its projects lead to validation of new insights into the interpersonal motivations and organisational drivers of this gap (Objective 5)?

Several months of data collection within Alba Water – one of the largest construction clients by value in Scotland - were undertaken. Almost thirty hours of non-participatory observations of the project teams, each comprising a project manager, quantity surveyor and cost engineer, were gathered. Semi-structured interviews were used explore the participants' backgrounds and stated approach to commercial management, commercial risks and the company's policies. However, an early decision was taken to rely largely on observational data alone and, except for one minor examples, the semi-structured interviews were not used in the final report.

Documentary data collection was extensive and covered the company's policies, training literature, guidance notes and toolkits including worked examples. All documents used in the documentary analysis were publicly available.

Citing data privacy concerns, Alba Water's senior management refused to permit the use of work emails in the final report.

In line with purposive sampling, the study began by observing two Quantity Surveyors within Managed Delivery North. These two Quantity Surveyors – one male and one female - acted as gatekeepers to the department. As the study continued data collection was extended, with the permission of the Participants and their line managers, to include all six Quantity Surveyors within the commercial section of Managed Delivery North.

5.9 The company

Alba Water is the fourth largest water and waste-water service provider in the U.K. serving 2.52 million households and 153,000 businesses (Document 2, 2018). The organisation is a public sector body, classified as a public corporation of a trading nature, and answerable to the Scottish Parliament through Scottish Ministers. Ministers also set out the organisation's broad strategic framework (Document 2, 2018).

Alba Water's Board of Directors is directly accountable to the Scottish Parliament and has no shareholders. (Document 2, 2018). It is regulated by a number of organisations, including the Water Industry Commission for Scotland (WICS) and the Drinking Water Quality Regulator (DWQR) (Document 2, 2018).

5.10 Background to Alba Water

Water and waste services in Scotland were originally the responsibility of local authorities. In 1975 nine new regional councils and islands councils were established to control public water supplies, sewerage and sewage disposal. In 1996 three new water authorities were created, Alba Water West, Alba Water East and Alba Water North. These took over water and waste-water services from the regional councils. Alba Water was formed in 2002 to replace the three water authorities (Document 1, 2018). As such, Alba Water, is a relatively young organisation, a fact reiterated many times by participants in the study.

Alba Water is currently the only publicly-owned water company operating in the U.K. However, Welsh Water is a not-for-profit company limited by guarantee and serving 1.4 million homes and businesses (Dwrcymru, 2018). All the English Water companies were privatised in 1989 (Ford & Plimmer, 2018).

Large increases in consumers' water bills, tax avoidance measures by the companies and poor performance in areas such as water leakage (Blackman, 2018) have led to some public

dissatisfaction with the performance of the privatised water companies in England. The average household charge for water and sewerage in Scotland is £42 per year lower than in England and Wales (Document 2, 2018). Reflecting these apparent discrepancies in service delivery and costs, a recent opinion poll found 83% of respondents favouring re-nationalisation of private water companies in England (Ford & Plimmer, 2018).

The return of the English water companies to public ownership was Labour Party policy in the last two general elections (Blackman, 2018) and an energy price cap was levied on the privatised energy companies by the Conservative government in early 2019 (Peachey, 2019). Such initiatives mean that a change in the status of all the privatised U.K. utility companies is now possible. As a result, there may now be renewed interest in the performance of public-sector utility companies such as Alba Water and Welsh Water.

5.11 The structure of Alba Water

Alba Water is one of the country's largest construction clients by value (Document 2, 2018). Its investment programme for the five years from 2015 to 2021 is £3.9 billion and, in 2017-2018, it spent £647 million on 2,600 individual projects to repair and replace its assets (Document 2, 2018).

The organisation employs 3,400 employees with a head office in Dunfermline and regional offices - based on the three regional water companies from which it evolved - in Aberdeen, Dundee, Edinburgh, Stepps and Inverness (Document 2, 2018). The company expends over £53 million per month with 200 suppliers.

5.12 Alba Water's approach to its delivery partners

Alba Water describes its strategic approach as collaborative:

> *'with Scottish Government, our supply chains, academia and the wider industry, including regulators and centres of expertise and universities in the U.K. and Europe are crucial to our success…'* (Document 2, 2018, p83)

The company maintains a supply chain of thirteen Tier 1 contractors who operate across Scotland, augmented by fifty-seven local contractors who work regionally. It has supply frameworks covering design. process equipment, civils materials, hire and infrastructure producers (Document 2, 2018).

Alba Water's frameworks further sub-divide its Tier 1 contractors into Civils and Mechanical and Electrical contractors and all Tier 1s are known within the company as 'MDPs' (Main Delivery Partners). The local or Tier 2 contractors are known as 'RDPs' (Rural Delivery Partners) and its design consultants as 'CDPs' (Consultant Delivery Partners).

Alba Water also delivers major works, such as the £100 million Shieldhall tunnel project, via strategic alliances, but these are outwith the scope of this study.

5.13 Alba Water Managed Delivery

The bulk of Alba Water's repairs and replacement projects are delivered by the Managed Delivery department which has a base in the North (covering the Highlands and Islands), the East (covering the eastern central belt, Dundee and Aberdeen) and the West (covering the borders and western central belt).

Within each area, Managed Delivery is internally managed by a Delivery Manager (DM) overseeing the work of several Senior Project Managers (SPMs) who, in turn, manage a number of Project Managers (PMs).

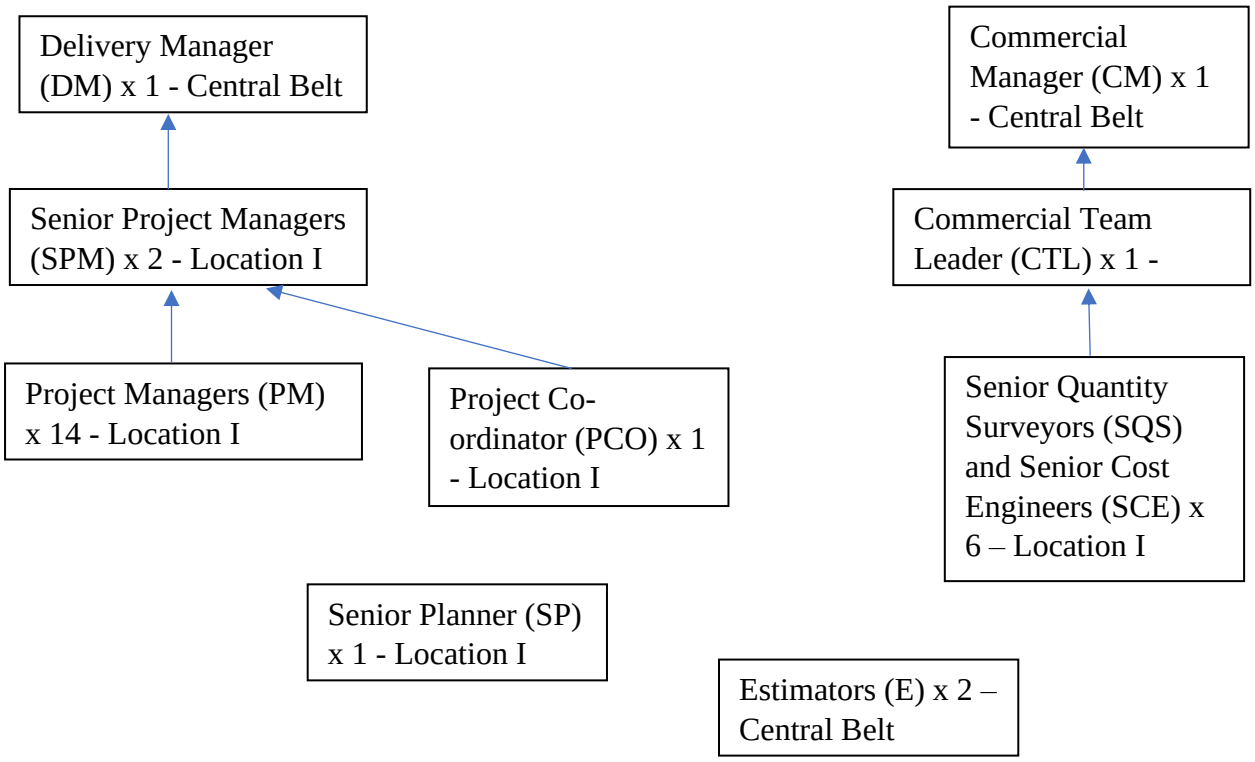
Managed Delivery are assisted by a commercial team (usually a Commercial Team Leader who manages a number of Senior Quantity Surveyors (SQS), Quantity Surveyors (QS), Senior Cost

Engineers (SCE) and Cost Engineers (CE)). A centralised Estimating function provides cost checks on quotations and estimates.

Limited administration support is provided by a Project Co-Ordinator (PCO) who is managed by the Senior Project Managers. A centralised Planning department also provides support to Managed Delivery. The organisational structure of Managed Delivery North, the subject of the empirical research in Study 2, is illustrated in Figure 14 below:

Figure 14: Managed Delivery North Organogram

Note: blue arrows indicate line management reporting



5.14 The Managed Delivery North team

Study 2 explored the work of project teams within Managed Delivery North based in Location I. Managed Delivery North carries out routine, cyclical, responsive and emergency works in the Highlands and Islands, from Campbeltown in the south to Shetland in the north, a distance

of over 500 miles. The team also manages a number of pan-Scotland programmes of work such as membrane replacement (value £11 million in 2018/2019) and Service Reservoir repairs (value £16 million in 2018/2019).

At the time of the observations, the Managed Delivery North team consisted of two Senior Project Managers, fourteen Project Managers, one Senior Planning Co-ordinator and one Project-Co-ordinator. Support from the commercial team comprised one Commercial Team Leader, five Senior Quantity Surveyors and one Senior Cost Engineer.

Each Senior Quantity Surveyor worked with two or three Project Managers. The Senior Cost Engineer was only employed on projects exceeding £1 million in value. Each project team was responsible for managing 100 to 150 individual projects in a year.

Projects below £250,000 in value at inception were known as 'Small Value Capital Delivery' (SVCD) projects and were subject to separate policies and procedures although, as will be seen, these were rarely followed.

5.15 Responsive Team

One team, consisting of one Project Manager and one Senior Quantity Surveyor, also delivered projects known as Responsive Repairs. Responsive projects sat between 'urgent' and 'routine' repairs, where assets or elements of assets were predicted to fail within the next six months. Other criteria for Responsive projects included the fact that they should not require design input, should have no third party issues - such as the common situation where Alba Water did not own the land its asset sat on - and the issue must be able to be fully resolved within three months.

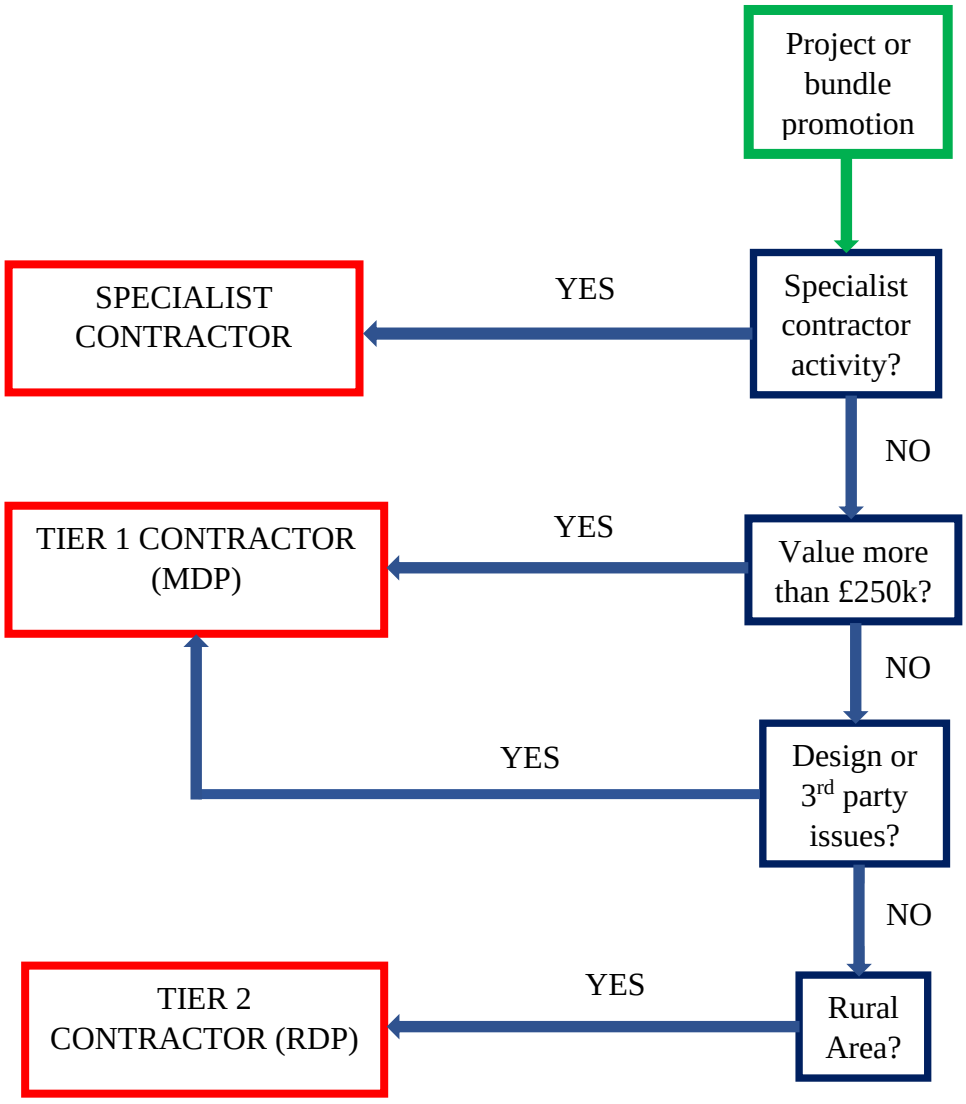
5.16 Project initiation within Managed Delivery North

A project was initiated and delivered to Managed Delivery North by one of the Asset Planners. Asset Planners were responsible for a number of assets within a particular geographical location. An individual Asset Planner might have 100 – 200 individual assets, such as reservoirs, water treatment works, pipelines or service water tanks, within their portfolio. Projects were handed over to Managed Delivery North at a stage where their funding and timescales had been approved and an initial risk assessment had been carried out. The project would then require tendering, contracting and supervising to completion. It was these tasks – the procurement, the contracting and the supervision – that the project teams in Managed Delivery North were responsible for.

5.17 Framework contractor choice for a Managed Delivery North project

A decision tree was developed internally by Alba Water to determine whether a Tier 1 or Tier 2 contractor could be approached to deliver a project. This decision tree, as described by SQS1 and SQS5, is illustrated below in Figure 15:

Figure 15: The Alba Water decision tree for contractor selection



From the Decision Tree the following can be seen:

- If a project included specialist activity (e.g. the like-for-like replacement of a pump), it had to be carried out by a specialist contractor;
- if a project value was likely to exceed £250,000 the work had to be carried out by a Tier 1 contractor, an MDP;
- if a project value was likely to be less than £250,000, but there were third party issues (e.g. the asset sits on land which Alba Water does not own, a very common occurrence)

or the project required design input then, again, the work had to be carried out by a Tier 1 contractor, an MDP;

- Only if the work was not likely to exceed £250,000 in value and there were no third-party issues AND no design input was required could the work be carried out by a local Tier 2 contractor, an RDP. This was because the local, RDP contractors, were not deemed to have the necessary capacity to provide design services or deal with the complex land ownership or access issues common to Alba Water assets.

5.18 Invitation to tender or Direct Awarding of Managed Delivery North contracts

As is common in the industry, a contractor's inclusion in an Alba Water framework was no guarantee of work and competitive tendering of all works was the default procedure. In spite of this, projects were often direct awarded to contractors, with one Quantity Surveyor claiming that 95% of their contracts were procured in this way.

5.19 Choice of contract

The default contract choice for all Managed Delivery projects was the New Engineering Contract 3 (NEC3). Within this there were several options available to project teams and these are illustrated below in Table 28:

Table 28: NEC3 contract options available to project teams

NEC3 CONTRACT AVAILABLITY FOR MANAGED DELIVERY NORTH PROJECT TEAMS

Contract Name	ECC Option A	ECC Option B	ECC Option C	ECC Option D	ECC Option E	ECC Option F	ECSC Short form
Contract Type	**Priced Contract with Activity Schedule**	**Priced Contract with Bill of Quantities**	**Target Contract with Activity Schedule**	**Target Contract with Bill of Quantities**	**Cost Reimbursable Contract**	**Management Contract**	**Short form**
FRAMEWORK							
Tier 1 Civils	Yes	No	Default	No	Yes	No	Yes
Tier 1 M&E	Yes	No	Default	No	Yes	No	Yes
Tier 2 Civils	Yes	No	No	No	Yes	No	Yes
Tier 2 M&E	Yes	No	No	No	Yes	No	Yes
Tier 2 Specialists	Yes	No	No	No	Yes	No	Yes
CDPs	Yes	No	Yes	No	Yes	No	No

It can be seen from Table 26 above that only four of the six options were available to Managed Delivery North project teams; Option A (Priced Contract with Activity Schedule), Option C (Target Cost Contract with Activity Schedule), Option E (Cost Reimbursable Contract) and the Short Form contract. Options B (Priced Contract with Activity Schedule) and Option D (Target Cost Contract with Bill of Quantities) therefore, were not available, in spite of the fact that both offered Alba Water an opportunity to use a contract type with a different, lower commercial risk profile. This is further complicated by the fact that Option C was not available for use with Tier 2 contractors, the RDPs. Similarly, the Short Form contract was not available for design consultants, the CDPs.

Alba Water's commercial procedures provided guidance on the contract choice and staff were encouraged to seek advice from the guidance notes produced by NEC, copies of which were held in the office.

In practise, the Option C contract was described by team members as the 'default' contract for Tier 1 contractors and, for this reason, is described as such in Table 22.

5.20 Risk

In its annual report and accounts for 2017/2018 Alba Water described its principal risks as water quality, cyber security, critical assets, strategic water mains, climate change, Data Protection, Private Finance Initiative (PFI), Business Stream and Health and Safety. In spite of the fact that 100% of its investment programme is delivered by external contractors, suppliers and consultants, no mention was made of effectively managing the risks of its delivery partners. This seems to be something of a disconnect with its three strategic ambitions, the third of which is:

> *'3. Increasing the reliability, resilience and sustainability of all our services'* (Document 2, 2018, p9)

5.21 Alba Water's Commercial Risk Management Policies and Procedures

Alba Water's risk management policies and procedures were described in several internal documents and procedures and guidance notes relating specifically to commercial risks totalled more than 300 pages of text alone. In spite of the volume of literature available, it is important to note that none of the observed project teams had undergone commercial risk management training or even awareness raising (which was more common at Alba Water). Risk management learning instead took place 'on the job' and, often resulted from advice or independent learning following a non-compliance notification.

The sheer volume of risk management documentation meant that, even project team members motivated enough to access it, often described it as unhelpful.

A basic tenant of the open and collaborative nature of NEC3, the keeping of the Risk Register intended to encourage sharing of information and risk between client and contractor, was compromised in the case of Alba Water as the risk register was kept internally and not shared with the contractor.

5.22 The Alba Water Risk Management Toolkit

The principal tool for managing risk was the Risk Management Toolkit which was kept for all projects over £250,000. This spreadsheet was maintained throughout the lifetime of the project but was not shared with the contractor. If not updated on a monthly basis, an audit alert was generated which was emailed to the project's Project Manager. An anonymised sample of a risk management toolkit is shown below in Table 29:

Table 29: Sample Risk Management Toolkit

Risk / Issue ID	Threat Or Opportunity	Current Status	Date Raised	Life Cycle Phase	Risk Expiry Date	Cause	Event	Effect
R001.0	Threat	Open	07/06/2016	Implementation	31/03/2017	As a result of water quality during commissioning during changeover to chloramination	May result in risk to water quality	Increased cost and delays, reputational issues
R002.0	Threat	Open	07/06/2016	Implementation	30/04/2017	As a result of Network /SR Condition or Cleanliness	May result in risk to water quality	Additional tank cleaning or network flushing required to avoid taste & odour issues following change to chloramination
R003.0	Threat	Open	07/06/2016	Implementation	30/04/2017	As a result of external cracking witnessed on site of existing 4 year old Chlorine Contact Tank.	May result in tank being taken out of service for investigation and repair	Bypass of chlorine contact tank, delay to construction and commissioning of chloramination project
R004.0	Threat	Open	07/06/2016	Implementation	31/03/2017	As a result of condition / locations of existing assets not being as per As Builts	May result in issues with implementing design.	Could require late design changes or additional scope to overcome
R005.0	Threat	Open	07/06/2016	Implementation	31/08/2016	As a result of change in design from IDP process	Change in scope	Additional scope including impact on other processes rather than simple dosing skid. Increased cost.
R006.0	Threat	Open	07/06/2016	Implementation	31/03/2017	As a result of the high reputational importance of this project	Require to undertake additional scope or events to address community concerns	Acceleration or additional scope
R007.0	Threat	Open	01/07/2016	Implementation	31/10/2016	Contractor Design & Build	Instrumentation scope increase	Additional Cost
R008.0	Threat	Open	01/07/2016	Implementation	31/10/2016	Contractor Design & Build	Control System scope increase	Additional Cost
R009.0	Threat	Open	01/07/2016	Implementation	31/10/2016	Contractor Design & Build	Dosing Skid scope increase	Additional Cost
R010.0	Threat	Open	01/07/2016	Implementation	31/10/2016	Contractor Design & Build	pH found to not be stable enough for chloramination	Additional scope and cost

Ironically, the risk toolkit was actually simpler and more comprehensible than the various guides to it might have implied. It was simply a spreadsheet with a list of likely threats and opportunities, an indication of the chances of them occurring or not and the likely financial implications to Alba Water if they did arise.

5.23 Conclusion

Like many large organisations, Alba Water struggled to communicate policies and procedures to its staff, particularly those who were remotely located like the Managed Delivery North team. Formal face-to-face training was rare. Instead, awareness raising was carried out using online Powerpoint presentations. Guidance notes were often poorly written and some information was contradictory.

The nature of Alba Water as a 'young company' was often commented on by staff and this may have been responsible for much of the confusion subsequently expressed by project teams members with regard to policy. Certainly, the onus on locating the most important information, agreeing it locally and attempting to implement it fairly and consistently lay with staff. It is this aspect – the confusing nature of much of the policies and procedures and the radical departures from them by many staff - which became the focus of the observational work which is discussed next.

5.24 Study 2 Data Analysis

5.25 Introduction

Approximately thirty hours of non-participatory observations were undertaken, including seven hours of practise observations. Each observation was manually transcribed from handwritten shorthand notes taken during the observations. All observations also had a reflective passage attached which was written immediately (usually within 3 hours) of the observation occurring and included the background to the observation, contextual notes and reflections on the possible significance of the observation.

The observations and reflective notes were initially transcribed into Microsoft WORD documents before being line numbered and subjected to a thematic analysis using a spreadsheet. The thematic analysis was then reviewed by the study's supervisor and amended several times as a result.

As noted earlier in the research plan, Wolcott (1994) recommends four strategies for ethnographic studies. A summary of each strategy and the ways in which each was used in Study 2 is outlined below in table 30:

Table 30: Wolcott's (1994, pp160-164) Strategies for Ethnographic Studies and their Use in Study 2

Strategy	Use in Study 2	Comments
1: Observe and Record Everything	Used in the initial phase for practice observations only	Strategy 1 was used to develop and rehearse a suitable shorthand for the main observations; to develop and abandon the taking of photographs of settings during the observations; and to learn to focus more attention on setting descriptions and non-verbal communication rather than to merely record speech.
2: Observe and Look for Nothing – That is, Nothing in Particular	Used in the initial stages of the main observations phase to highlight problems, disputes, discussions and anomalies.	Although useful in enabling problem areas to come to the fore one serious drawback of this strategy was that it created the impression that this was a disputatious environment in which very little routine work was carried out. The importance of redressing this imbalance in the final report was made clear during the validation phase when the Participants failed to recognise this conflicted environment.
3: Look for Paradoxes	Not used as a deliberate strategy.	Paradoxes emerged naturally from the observations
4: Identify the Key Problem Confronting a Group	Used increasingly as observations developed. The key problems confronting the group emerged from the focus via Strategy 2 on problems, disputes, discussions and anomalies.	The key problems facing the group emerged early on in the practise and main observation phases.

As illustrated in table 30 above all of Wolcott's strategies were used, but at different points in the observations phase and to differing extents. It is not clear whether Wolcott intended his recommended strategies to be applied temporally, that is at different points in a study.

However, from the adoption of Strategy 1 (Observe and record everything) at the outset, the use of Strategies 2 and 3 emerged organically, leading naturalistically to the dominance of Strategy 4 (Identify the Key Problems Confronting a Group).

A negative outcome of the dominance of Strategy 4 (Identify the Key Problems Confronting a Group) was that the observations, taken alone, suggested a level of conflict within the group not immediately apparent to the Observer. Focusing on the key problems of the group and Participants' feelings, thoughts and disagreements surrounding it, obscured much of the collaborative routine work which actually filled most of the Participants' days. An attempt to test and scrutinise this impression of the workplace as adversarial and, to some extent, 'heated' was made in the validation phase. Here it became clear that the Participants themselves did not view their workplace in this way. As the written feedback from one of the Participants in the validation phase states:

> *'Your summarisation on these specialised teams, that it can cause conflict, I have to say, I personally haven't seen any such signs amongst the QS's.'*
>
> (Member Checker A feedback, lines 89-90)

Although there was substantial disagreement amongst the Quantity Surveyors about their role within Alba Water, the department was for the most part a very collegiate environment. This is perhaps one of the greatest paradoxes of Study 2. At this stage therefore, it is useful to observe two things: firstly, that the workload of each Quantity Surveyor was huge. Most surveyors had between 100 and 150 individual projects to manage, with a total value often exceeding £50m. This fact, combined with the often unwieldy and constantly changing IT systems, meant that it was not possible for the Quantity Surveyors, as a team, to reach their monthly targets *without* substantial collaboration. Frequently, a Quantity Surveyor particularly adept at using one IT system would take on this task for other QSs, a favour that would be

returned with a different system on another occasion. It was this collaboration and 'pulling together' that enabled the team to keep up with their workloads.

Secondly, much of the Quantity Surveyors' ire was focused not on each other but on senior managers or contractors. In this way - in modern parlance - they could be seen to be 'othering' their disputes.

A further interesting phenomena to emerge from the observations – one which will be explored in greater depth later - was the extent to which Participants talked of understanding that they were part of a collaborative engagement with the contractors at the same time as discussing the many ways in which these same contractors refused to collaborate. This strongly dominant theme appears to reflect Becker's (1982) advice; *'Sociology does not discover what no one has ever known before, in this differing from the natural sciences. Rather, good social science produces a deeper understanding of things that people are pretty much aware of'* (Becker, 1982, p 36). Participants were aware of this paradox, yet rarely discussed how it might be addressed.

The nature of the observations themselves is now discussed below.

5.26 The nature of the observations

With the exception of the validation phase, Alba Water management refused to allow the use of email communications in this study because of a fear of a breach of data privacy. They did, however, allow the use of contracts, specifications, letters, drawings and meeting minutes.

It was hoped that non-participatory observations could be used to elucidate the Participants' theories-in-use. The observations, therefore, focused on more informal settings such as project reviews, team meetings, as well as discussions during breaks. These observation environments are described in table 31 below:

Table 31: Observation Environments

Obs no.	Title of Observation	Present	Formal or Informal	Private or Public area
1	Risk discussion in Tiso café	3	Informal	Public area (café)
2	Conversations amongst QSs in kitchen	5	Informal	Public area (kitchen)
3	Project Reviews discussion on risk	6	Formal	Private (meeting room)
4	Project Reviews discussion on using ECI	6	Formal	Private (meeting room)
5	Project Review discussion on using RDP	7	Formal	Private (meeting room)
6	Discussion on escalation	6	Formal / informal	Public area (open plan office and kitchen)
7	MDP discussion on adjudication	10	Formal	Private (meeting room)
8	Commercial Procedures discussion	4	Formal	Public area (open plan office)
9	Discussion on use of RDP + CDP	4	Formal	Public area (open plan office)
10	Telephone call regarding MDP payment	3	Formal / informal	Public areas (open plan office and kitchen)
11	Discussion of collaborative MDP	4	Informal	Public area (open plan office)
12	QS meeting	7	Formal	Private (meeting room)

The description of team meetings and project reviews as ‘informal’ may, at first sight, seem surprising. However, this reflects the relative freedom Participants felt in voicing their true feelings about contentious issues within team meetings and project reviews. It is, perhaps, also

a reflection of the autonomy individual Project Managers and Quantity Surveyors had and of the relatively flat management structures within Managed Delivery North. Within the Location I office there were only two grades, Project Managers who were line managed by Senior Project Managers, and Senior Quantity Surveyors who were line managed by a Commercial Team Leader. There were no senior managers within the Location I Office; instead, Delivery Managers (who managed Senior Project Managers) and Commercial Managers (who managed Commercial Team Leaders) were based in the Central Belt, almost two hundred miles from Location I. Visits to Location I by senior managers were infrequent. The categorisation of team meetings and project reviews as 'informal' may, therefore, have been unique to the Location I office, isolated as it was from the main offices in Glasgow and Edinburgh.

Meetings such as project reviews were attended only by the Quantity Surveyors and their immediate line manager (a situation replicated for the Project Managers), as well as a number of other front-line workers such as the Senior Planner, the Project Co-ordinator and the Senior Cost Engineer. Surrounded only by their colleagues and immediate line managers, Quantity Surveyors, Project Managers and their line managers appeared to feel relatively free to speak their minds. There was little difference between the informal language employed in the project reviews from that used in a more conventionally informal settings such as the office kitchen or a local café.

5.27 Analysis of the Data

The analysis of data for Study 2 aimed to follow Wolcott in his seminal work on the transformation of qualitative data (Wolcott, 1994):

> *'Descriptive accounts must by definition be well grounded in observational data. The researcher's presence already assumed (if not made explicit) in the organization and presentation of data. Analysis, in the restricted sense in which I use the term here, must*

> *also be tethered to its data base; it can float above but must not drift far away. Links to the data must be apparent and strong.* (Wolcott, 1994, pp263-264)

Whilst the initial aim was to focus on two Quantity Surveyors and the project teams of which they were part, this proved difficult in practice. Although each Quantity Surveyor was a member of two or three different project teams their principal interactions (and therefore their main discussions) were with other Quantity Surveyors. An early decision was therefore taken to seek permission to include all six of the Managed Delivery North Quantity Surveyors.

Not all the observational data was transcribed. Several observations began with what appeared to be discussions about work but actually led to non-work discussions (for instance, about road traffic, tourism, night clubs and several about the weather). One observation was not transcribed because a Participant within it made allegations about another member of staff. And four were disregarded because the recording of them was incomplete (the Observer having been interrupted mid-way through the observation).

The nodes were developed manually in conjunction with the study's supervisor and the transcripts were coded using an Excel spreadsheet. The coding was checked once by a fellow student.

The nodes and emergent themes of the analysis of the remaining observations are illustrated in table 32 below:

Table 32: Thematic Analysis of Observational Data in Study 2

THEMATIC ANALYSIS OF OBSERVATIONS			
NODE	**THEME**	**OBSERVATIONS**	**LINES**
1	**COMMERCIAL RISK MANAGEMENT SYSTEMS WITHIN ALBA WATER MANAGED DELIVERY NORTH**		
1.1	Projects under £250k outwith AW risk management systems	1	All
		3	1-8
1.2	Some projects under £250k having risk registers	1	All
1.3	Poor management of opportunity risks	3	11-22
1.4	Poor management of AW risk management systems	3	26-36
2	**THE ROLE OF QUANTITY SURVEYORS WITHIN ALBA WATER MANAGED DELIVERY NORTH**		
2.1	QSs autonomy to do what they think best	2	3, 53-59
		5	28-30
		8	59-66
		10	13-17, 29-32
2.2	Confusion over QS role	2	78, 80-81, 119-120, 122-125
2.3	Tension between PMs and QSs	8	72-79, 85-87, 132-137, 138-143, 147-148, 161-165, 200-203, 207-209, 210-220
3	**COMMERCIAL PROCEDURES WITHIN ALBA WATER MANAGED DELIVERY NORTH**		
3.1	Commercial Procedures not consistent	8	5-7
3.2	Commercial Procedures not being used	8	116-124, 182-193
		10	29-32
3.3	Tendering not being used	8	29-34, 101-107

4	**ALBA WATER SENIOR MANAGEMENT INFLUENCE ON COMMERCIAL RISK MANAGEMENT WITHIN MANAGED DELIVERY NORTH**		
4.1	Delivery time as senior management priority	2	31a-34, 40
		5	4-5
		8	46-55
		9	22-24
4.2	AW attitude to contractors	2	26
4.3	Poor management of change within AW	3	23-25
4.4	Focus on IT systems	8	23 (QS ignores question), 12-20, 93-97
4.5	AW attitude towards adjudication	7	35-37
5	**MDPs (TIER 1 CONTRACTORS) WITHIN MANAGED DELIVERY NORTH**		
5.1	Adversarial and untrustworthy nature of MDPs	2	84-104, 157-158
		4	12-17, 23-24, 26-28, 39-40
		5	32-57
		9	6-9
		10	7
		12	6, 8-9, 12-16, 12-19, 39-40, 41-44, 48-49, 61-62
		11	All
5.2	Inappropriateness of Option Cs & Es for MDPs	2	15-20
		12	1-4, 8-9, 12-19, 20, 21-26, 28-36, 39-40, 45-47
5.3	Using ECI to deal with MDPs	4	4-8, 19-22, 25-28, 46-48
5.4	Decision Tree manipulation	4	2-3, 4, 29-33, 36-38
		9	14-16
5.5	Overturning framework	5	88-91
5.6	Collaborative MDP as anomaly	11	All
6	**RDPs (TIER 2 CONTRACTORS) WITHIN MANAGED DELIVERY NORTH**		

6.1	Competence of RDPs	5	58-59, 111-112
		6	94-96
6.2	Weaknesses of RDPs	5	60-61, 81-83
		7	15-18
6.3	Decision Tree manipulation	4	2-3, 4, 29-33, 36-38
		9	14-16
6.4	Overturning framework	5	88-91
7	**COMMERCIAL DISPUTE MANAGEMENT WITHIN MANAGED DELIVERY NORTH**		
7.1	Unhappiness with Escalation Procedure	2	102-110
		6	13-15, 28-31, 34-35, 80-81
		10	27-28
		12	35-36
7.2	MDP's attitude towards adjudication	7	31-34,38
7.3	AW attitude towards adjudication	7	35-37

5.28 Thematic Analysis

The observations subject to analysis all recorded discussions concerning different aspects of commercial risk management protocols and practices within Managed Delivery North. The emergent themes were recorded in table 32 above. The relationship of each theme to commercial risk management in Alba Water's Managed Delivery North Department is recorded below in table 33:

Table 33: Main Emergent Themes from the Observations with their Relationship to Commercial Risk Management Within Alba Water's Managed Delivery North Department

Main Themes from Observations		Relationship to Commercial Risk Management within Managed Delivery North
1	Commercial Risk Management Systems within Alba Water Managed Delivery North	This theme centred on descriptions of the ways in which commercial risks were actually managed within Managed Delivery North.
2	The Role of Quantity Surveyors within Alba Water Managed Delivery North	This theme explored the confusing role of QSs within Managed Delivery North and the question 'Are the Quantity Surveyors responsible for managing commercial risks or not?'
3	Commercial Procedures within Alba Water Managed Delivery North	This theme explored the ways in which the Commercial Procedures (especially those concerning the management of commercial risks) were often ignored or amended by staff
4	Alba Water Senior Management's Influence on Commercial Risk Management within Managed Delivery North	This theme centred on staff beliefs that Senior Management had little focus on commercial risk management within the business and instead were 'obsessed' with delivery times.
5	MDPs (Tier 1 contractors) within Managed Delivery North	This theme explored how MDPs were seen by staff as adversarial and untrustworthy and how staff developed informal commercial risk management plans to deal with this.
6	RDPs (Tier 2 contractors) within Managed Delivery North	This theme explored how staff preferred to use RDPs rather than MDPs because it was felt this strategy reduced commercial risks for the business.
7	Commercial Dispute Management within Manage Delivery North	This theme explored the ways in which staff believed that the main dispute resolution method (the Escalation Process) hindered efforts by them to manage commercial risks properly.

Each main theme and its constituent sub-themes are now discussed in detail.

5.29 Theme 1: Commercial Risk Management Systems within Alba Water Managed Delivery North

With the exception of the mandatory completion of the Risk Management Toolkit (discussed below) Managed Delivery North staff were not required to consider the commercial risks of projects in a formal sense; there was no requirement to develop commercial risk management *plans*. Given the repeated assertion by staff that Alba Water was a 'young' business, this may have been an interim position; more formal commercial risk management planning may emerge as the organisation matures. Instead, actions to manage commercial risks were, for the most part, informal and ad-hoc in nature.

At the time of the observations a Risk Management Toolkit and Risk Management Database had been developed by the newly formed Risk Management Department based in the Central Belt. This department was staffed by risk management specialists and others from outside the construction and engineering professions. The Risk Management Toolkit and Risk Management Database aimed to assist staff to better identify common commercial risks and manage them more effectively.

The Risk Management Database was simply a list of commonly occurring risks obtained from previous projects across Scotland. The Risk Management Toolkit comprised a partially pre-populated spreadsheet which Project Managers were to complete to help them to identify, cost and manage commercial risks throughout the duration of all projects over £250,000 in value. Monthly completion of the Risk Management Toolkit by Project Managers was mandatory. At the time of the observations no training on the use of either the Database or Toolkit had been provided to Managed Delivery North staff. Completed Toolkits for each project were kept in a

central file where they could be accessed by senior staff as well as members of the Risk Management Team.

As previously stated, outwith the requirement to maintain the Toolkit for projects exceeding £250,000 in value, informal commercial risk management planning did occur. The structure of these commercial risk management 'plans' for Managed Delivery North projects differed slightly, depending on whether the project vale exceeded £250,000 or not. These structures are illustrated in table 34 below:

Table 34: Formal and Informal Commercial Risk Management Planning for Managed Delivery North Projects

Types of Commercial Risk Management Planning	Managed Delivery North Projects under £250k	Managed Delivery North Projects over £250k
Regular formal	None	Monthly completion of the Risk Management Toolkit
Ad-hoc formal	Discussions within the monthly Project Reviews	Discussions within the monthly Project Reviews
Ad-hoc informal	• Non-minuted discussions between the PM and the contractor; • Non-minuted discussions between the PM and the QS; • Non-minuted discussions between the PM and the SPM; • Non-minuted discussions between the QS and the CTL • Other discussions within and outwith project teams	• Non-minuted discussions between the PM and the contractor; • Non-minuted discussions between the PM and the QS; • Non-minuted discussions between the PM and the SPM; • Non-minuted discussions between the QS and the CTL • Other discussions within and outwith project teams

The subsequent commercial risk management 'plans' were not recorded and remained as un-minuted and informal verbal agreements between members of staff and, often, their line managers. Elements of these plans - for instance a change of contractor or type of contract - might be recorded within the notes taken by the Senior Project Managers at the monthly Project Reviews.

During the course of the observations a number of commercial risk management sub-themes emerged. These are listed below:

1. Projects under £250k being outwith Alba Water's risk management systems;
2. Some projects under £250k having risk registers;
3. The poor management of opportunity risks; and
4. The poor management of Alba Water's risk management systems

Discussions during the observations focused on the regular, formal aspects of commercial risk management planning (i.e. the completion of the Risk Management Toolkit), rather than on the other formal ad-hoc or informal ad-hoc measures undertaken. Following Argyris and Schön, this may reflect a pre-occupation with discussing and critiquing the company's espoused theories, e.g. the mandatory use of the Risk Management Toolkit, rather than a focus on the team members' theories-in-use, i.e. their formal and informal discussions with colleagues and line managers. Perhaps this was a way in which grievances could be safely aired and disputes between team members about the appropriate courses of action minimised.

Each of the sub-themes is now discussed below.

5.30 Sub Theme 1.1: Projects under £250,000 being outwith Alba Water Risk Management Systems

Senior managers had chosen to restrict the use of the Risk Management Toolkit to projects over £250,000 in value. This decision presumably allowed resources to be focused on larger projects where un-identified or poorly managed risks might have a greater impact. However, many of the projects held by Managed Delivery North were under £250,000 in value. Although individually small in value, the sum of all the sub-£250k projects was substantial. Staff members felt that the sum of these small projects still represented a serious risk to the business. As SQS1 said in Observation 1:

'SQS1 But we all know that projects under £250k have risks (0.3),

but there's just nowhere to put them.'

(SQS1 in Observation 1, lines 1 – 2)

Clear in their belief that projects under £250,000 do have risks this Quantity Surveyor had tried to use the Risk Management Toolkit (or 'risk register' as it was usually known) to manage them, but found that this raised an alert:

'SQS1 *... 'If you <u>try</u> to do a risk*

register it throws up an audit and you've got to (swears)

take it out.'

(SQS1 in Observation 1, lines 2 – 4)

In one of the monthly Project Reviews, the Senior Planner also commented on the desirability of using the Toolkit for projects under £250,000:

'SP *It's <u>obvious</u> that risks in small projects need to be managed the same way as in <u>large</u> projects. (pauses to take drink). We shouldn't just be waiting 'til they blow.'*

(Senior Planner in Observation 3, lines 1 – 3)

Unable to use the Risk Management Toolkit for smaller projects meant that a practice of 'hiding' risk monies within different codes in the monthly reporting system had developed:

'Observer So, are you saying you can hide risk money in a project that's

under £250k in a different code?

SQS1 You can put it under 299 'cos that's a risk code anyway,

but it'll still get picked up on an audit.'

(Observer and SQS1 in Observation 1, lines 22 – 25)

As noted above, this practice would have been picked up in the monthly audit carried out by the Risk Management Team and its presence would have raised an alert. This alert would have been emailed to the Senior Quantity Surveyor, Project Manager and Senior Project Manager responsible for the project. The team member would then have been required to remove the monies from the risk code. In this way, allocating monies to the risk code could only ever be considered a temporary (month to month) method of managing commercial risks in small projects.

Interestingly, some projects under £250k in value were actually given Risk Management Toolkits. This inconsistency in the system also caused practical problems for team members, as shown below.

5.31 Subtheme 1.2: Some Projects Under £250k having Risk Registers

Some projects under £250,000 in value were inadvertently allocated Risk Management Toolkits (or 'risk registers' as they were known) by the Risk Management Team:

'SQS5 And (pause), as well as that, you can actually have a project

that's a project under £250k that has a risk

register and no one knows how to get it removed. (0.5)

It's just mad.'

(SQS5 in Observation 1, lines 5 – 8)

This anomaly may have occurred in the initiation stage of the project, which predated the handover to Managed Delivery North; at that point the project value may have been estimated

at over £250,000. However, the fact that the project proceeded to Managed Delivery North with a Risk Management Toolkit attached which then needed to be removed *('and no one knows how to get it removed'*) added a further level of frustration for the team members.

Another irritation concerned the management of opportunity risks - the chance that a saving may be made - which is now discussed below:

5.32 Subtheme 1.3: The Poor Management of Opportunity Risks

The management of opportunity risks (potential savings) was also an issue for Quantity Surveyors and others, including the Senior Planner quoted below:

> 'SP *Basically no notice is taken of opportunistic risks, like when the PM or the QS see some way of saving money. (drinks). There's one PM who used to use opportunistic risk, but then he realised that the risk figure is just deducted from the contract sum (pause) 'cos the system automatically assumes that the risk will occur and will save the company money, so there's no point. You just lose the (swears) money out of your project.'*
>
> (Senior Planner in Observation 3, lines 11 – 17)

Unfortunately, in the case of opportunistic risks the Risk Management Toolkit assumed that the savings would always be made and automatically deducted the sum from the project. There was no way to incorporate *potential* savings into the Toolkit, the Toolkit always actualised opportunity risks. For project teams this meant there was little organisational incentive to look for potential savings, although many continued to do so as a matter of professional pride.

As a result of this the practice of incorporating potential savings into the Risk Management Toolkit register had – as far as the Senior Planner was aware - now been abandoned:

'SP *No one's gonna do that...*

CTL *Yeah. Are there any PMs using opportunistic risk now, (SP)?*

SP *Not as far as I know, no. (0.3). Don't know about other areas though (0.2). Don't think so.'*

(Commercial Team Leader and Senior Planner in Observation 3, lines 18 and 20 – 22)

The final sub-theme concerned the organisational management of Alba Water's risk management systems and the heavily centralised approach taken. Team members felt this often took little account of the regions' expertise in managing the risks associated with particular locations, types of projects, third parties or specific contractors.

5.33 Subtheme 1.4: The Poor Management of Alba Water's Risk Management Systems

The relative remoteness of Managed Delivery North from the Risk Management Team and senior management in the Central Belt, as well as Alba Water's practice of using external consultants to develop new policies and policies, was heavily criticised during the observations:

'SPM2 *The trouble with the business is, they <u>never</u> take advice off the people who are gonna be affected by the change before they introduce it. They just shout at people later.'*

(Senior Project Manager in Observation 3, lines 23 – 25)

However, as well as criticisms, project team members also made suggestions for improving the workings of the Risk Management Team. An example of this is given below:

'SP *…You could have one risk manager attached to each Delivery Manager and they could monitor the risks in all the projects attached to that DM. Instead of what you've got now, which in my opinion is (swears) useless – a risk department overseeing every single project in the company.*

SPM2 *Yeah (0.2,) like I mean there's just no way anyone in the risk department knows about all the projects. It's impossible.'*

(Senior Planner and Senior Project Manager in Observation 3, lines 3 – 10)

Although there was one Delivery Manager per region, all the Delivery Managers were based in the Central Belt. The suggestion that a Risk Manager might be attached to each Delivery Manager was presumably intended to help the Risk Managers to learn from regional staff about the particular risks associated with locations, project types, third parties (e.g. large landowners that are exclusively Highlands-based) and contractors.

The study now proceeds to discuss the second theme to emerge from the observations, that of the role of Quantity Surveyors within Alba Water's Managed Delivery North Department.

5.34 Theme 2: The Role of Quantity Surveyors within Alba Water Managed Delivery North

The Commercial Department was relatively new to Alba Water, having been introduced less than five years before the observations took place. Prior to this, commercial activities had either

been dealt with internally by the Finance Department or externally by consultants. It is not clear what prompted the development of an internal commercial department and enquiries have not revealed any conclusive answers.

One of the consequences of the relative youth of the Commercial Department – at least when compared to their departments such as Finance - was that there was little opportunity for Quantity Surveyors to be developed internally within Alba Water. Of the five Quantity Surveyors and one Cost Engineer studied in the observations, only one had matured internally, joining Alba Water on a graduate programme. The remaining Quantity Surveyors had either developed externally to Alba Water, within contracting, private practice or other public sector organisations, or internally within a different department, e.g. the Finance department. The backgrounds of the five Quantity Surveyors and one Cost Engineer are illustrated below in table 35:

Table 35: The Backgrounds of the Quantity Surveying Participants

QS number	Time in Alba Water	Summary of background
SQS1	22 years	As a Finance Officer within AW until moved into Commercial Department 5 years ago to train as a QS
SQS2	18 months	Over 10 years as a QS in contracting before joining AW
SQS3	1 year	Over 10 years as a QS in contracting and private practice before joining AW
SQS4	5 years	Graduate QS in AW after leaving university
SQS5	1 year as a contractor	Over 25 years as a private practice QS before joining AW as an agency worker
SQS6 / Cost Engineer	8 years as a contractor	Over 20 years in the military before joining AW as an agency worker

This paucity of 'home grown' commercial expertise within Alba Water had two important consequences. Firstly, external private practices based in the Central Belt, had been used to develop most of Alba Water's commercial policies and procedures. A prime example of this were the Commercial Procedures, the organisation's standing orders for commercial issues. These were developed in 2016 by a Central Belt private practice and were under review by the same private practice during the period of the observations. Secondly, Quantity Surveyors - often with many years' experience outwith the organisation in contracting, private practice and other public sector organisations both in Scotland, the rest of the U.K. and abroad - were encouraged to bring their own expertise to bear on their work within Alba Water. In spite of

the development of standing orders such as the Commercial Procedures, Quantity Surveyors often departed from official processes and policies and did not appear to be subject to sanction for doing so.

Three sub-themes developed during the course of observational comments relating to the role of Quantity Surveyors within Alba Water. These were:

2.1: Quantity Surveyors' autonomy to do what they thought best;

2.2: Confusion over the Quantity Surveyors' roles;

2.3: Tension between Quantity Surveyors and Project Managers over the role of the Quantity Surveyors.

Each sub-theme is now discussed below.

5.35 Subtheme 2.1: Quantity Surveyors' Autonomy to Do What They Thought Best

Quantity Surveyors appeared to be given a great deal of autonomy within Managed Delivery North. They were encouraged to use their own professional judgement to best judge how to act within the commercial management of their own projects. An example of this is shown below in an extract from observation 2:

> *'SQS2 But I mean (0.2), this place, people <u>just do</u> what they want.'*
>
> (SQS2 in Observation 2, line 2)

It is not clear where and why this level of autonomy had been granted or if it had just developed over time. It had, however, profound consequences for the functioning of the Commercial department within Managed Delivery North because Quantity Surveyors often had very divergent views on how to behave in any given situation. Given the widely differing backgrounds of the Quantity Surveyors, perhaps this was not surprising.

As an example of these divergences, NEC Option A contracts were widely used within Managed Delivery North; in fact, they were the default contract for Rural Development Partners (RDPs). An Option A contract includes an activity schedule, which is completed and maintained by the contractor. The activity schedule is simply a list of all the activities to be undertaken by the contractor in the completion of the project. The layout and level of detail contained within the activity schedule is at the discretion of the contractor. One of the observations focused on differences of opinion within the team of Quantity Surveyors about whether a part payment – that is a payment for an activity of the schedule which had only been partially completed – could be made in the monthly payments:

'SQS4 *I do part payments.*

SQS1 *I don't.*

SQS4 *Yeah, especially with RDPs or Islands contractors. You can't have them waiting for months for their money.*

SQS2 *I <u>never</u> make part payments. They can (swears) as far as I'm concerned.'*

(SQSs 1, 2 and 4 in Observation 2, lines 53 – 58)

A resolution of this issue could have been made by reference back to the contract itself, but such was the level of divergence from the NEC within Managed Delivery North, that this did not happen during the course of the observations.

It is interesting to add here that, although an activity schedule was an essential part of an Option A contract (indeed an Option A contract is described as a 'Priced Contract with Activity Schedule'), contractors were not usually required to submit them. An analysis of Option A

contracts within Managed Delivery North showed that most (87%) did not contain activity schedules.

A further extension of the autonomy given to Quantity Surveyors within the business was their ability to opt out of new processes and protocols altogether. An example of this is shown below within a discussion between a Quantity Surveyor with a background in contracting and private practice and the Commercial Team Leader. It relates to the implementation of the SVCD process (Small Value Capital Delivery process), essentially a shortened version of the Commercial Procedures for small value works, developed in the Central Belt by a private practice:

'CTL *(chewing bottom lip whilst writing in notebook) I suppose the small value stuff will come into the SVCD process when that's finally [agreed]…*

SQS3 *[What's] happening about that?*

CTL *To be honest, I don't know. It's meant to be being used right now.*

SQS3 *It's not though, is it? Cos some people don't like it they're refusing to use it.'*

(SQS3 and Commercial Team Leader in Observation 8, lines 59 – 66)

It is possible to observe within the SQS3's response – *'It's not though, is it? 'Cos some people don't like it they're refusing to use it'*, a level of irritation at the lack of consistency as well as bewilderment at the inability of senior managers to impose new procedures on their staff.

However, whilst Quantity Surveyors were given discretion over processes and procedures, this was not the case with new IT systems; their use was mandatory. The impact of the imposition of new IT systems on the Quantity Surveyors can perhaps be judged by the following discussion between the Commercial Team Leader and SQS3 in Observation 8. Unifier was a new contract development and management IT system which had been introduced in the spring of 2018. It was intended to simplify the process of issuing, agreeing and storing construction contracts. Prior to its introduction contracts were developed by individual Quantity Surveyors using templates stored on the organisation's intranet. Once completed they were then printed out and issued to contractors as hard copies. The contractor could then accept, sign and return one copy to the project's Quantity Surveyor or engage in discussion on changes or derogations. Unifier replaced this with a system in which contracts were developed within Unifier and then issued electronically to most contractors, although some of the smaller RDPs still received paper copies.

'CM *Has Unifier changed anything?*

SQS3 *I was thinking as well that a lot of stuff talks about Solutions and AW Horizons and there's usually no mention of Managed Delivery…*

CTL *(writing in notepad) Yeah, yeah, that's a good point.*

(Commercial Team Leader and SQS3 in Observation 8, lines 23 – 27)

The fact that the Quantity Surveyor ignores the question – *'Has Unifer changed anything?'* - and continues to discuss what they see as issues within the Commercial Procedures, is potentially significant. Despite being the major IT change during the course of the observations, this is almost the only mention of it. The choice of the name of the new system – Unifier – in

a business in which such divergence in practice within the Commercial team was the accepted norm is perhaps also telling.

The failure of systems such as Unifier to make the processes and procedures within the Commercial department more consistent emerged later as a theme within the Participant feedback and will be discussed later.

Certainly, there appeared to be a deal of confusion over the role of the Quantity Surveyors within Managed Delivery North and this is now considered below.

5.36 Subtheme 2.2: Confusion Over the Quantity Surveyors' Role

The role of Quantity Surveyor is one which is generally poorly understood within wider society. It might therefore be expected that there would be a clear understanding of the role of Quantity Surveyors at Alba Water, a large utility company employing several thousand people. However, this did not seem to be the case.

There was a very broad understanding that the role of the Quantity Surveyor was to advise their Project Manager on commercial issues, but that the Project Manager – as the named party within the contract – had the final say.

> *'CTL … Commercial are just there to advise the [PMs]…'*
>
> (SQS3 and Commercial Team Leader in Observation 8, lines 212 – 213)

This role of advising, as opposed to instructing or acting, was a difficult concept for some Quantity Surveyors to handle and could be a source of conflict between them and the Project Managers:

'SQS2 *[Yeah, everybody's happy]. That (names PM), I just don't get on with them. Asks your advice and then you give it and they argue with you.*

SQS3 *I think it's just being new, you know.*

SQS2 *If you're not going to listen to my advice, don't waste my time asking for it, that's my (swears).'*

(SQS2 and SQS3 in Observation 2, lines 141 – 146)

Conversations between a Quantity Surveyor and their Project Manager sometimes became quite heated. In the observation below, the Project Manager and Quantity Surveyor disagree strongly on whether to pay the contractor or not:

'SQS3 *I'm not paying that. I don't (swears) what anyone else here does. I'm not paying it.*

PM3 *(Speaking to SQS on telephone. Not recorded)*

SQS2 *Listen (PM3), you can agree to pay it if you want, but my advice to you as your QS is that you don't.'*

(SQS2 and Project Manager 3 in Observation 10, lines 13 – 17)

Similarly, in the example below, the Observer and SQS2 discuss retention, the practice of deducting a small percentage of each payment until final completion of the project:

'Observer *Right. What's the rules here about retention?*

SQS2 *(shrugs and picks up drink) It's in the contract – 3%.*

But (nods towards other QS's desk) some people

just pay it. In fact, I think I'm the only one who doesn't.

Observer *But, if it's in the [contract]?*

SQS2 *[Exactly]. It's in the contract. Being in the*

contract makes (swears) all difference here…if you ask me.'

(Observer and SQS2 in Observation 10, lines 29 – 35)

This tension between the Quantity Surveyors and Project Managers is now discussed in more detail below.

5.37 Subtheme 2.3: Tension Between the Quantity Surveyors and the Project Managers over the Quantity Surveyors' Role

There was often little agreement between the Quantity Surveyors and Project Managers as to which had responsibility for making decisions in any particular situation. There was also confusion about when decisions should be taken jointly. The following extract shows a discussion between the Commercial Manager and SQS3 concerning New Subcontract Enquiries. The Commercial Procedures showed that his should be a task undertaken by the Quantity Surveyor jointly with the Project Manager, but – SQS3 claimed – this was not what happened in practice:

'SQS3 *Right (long pause) (looks at notebook) Well, one of the other*

things is New Subcontract Enquiries (pauses), the PMs often

do this themselves and they don't use the proper letters, they

just do it by email. Sometimes, I'm sending out enquiry letters

and I hear back from the contractor that they've already sent

quotes to the PM!

CTL *That shouldn't be happening (shakes head and writes in notebook.…*

'CTL *That's quite worrying really. They should know the Commercial Procedures or, at least, they should know when to ask a QS…*

SQS3 *Well, they definitely don't in my experience.'*

(SQS3 and Commercial Team Leader in Observation 8, partial extract from lines 72 – 87)

Again, in respect of tendering decisions, the Commercial Procedures stated that the Quantity Surveyor and Project Manager should both be involved but, claimed SQS3, this was not what happened in practice:

'SQS3 *See (reads) and there's things like the QS is 'part of the Qualitative Assessment Team' I don't think many PMs know that. Apart from (mentions PM), whenever I've done this (mentions a different PM) always just assumes that it's up to him to decide and he'll just email me his decision.*

CTL *No, no, that shouldn't be [happening]…'*

(Commercial Team Leader and SQS3 in Observation 8, lines 132 – 137)

The observations also contained the assertion that the Project Managers' commercial knowledge was, in some cases, incorrect. The extract below concerns the Generic Risk

Allowance, an allowance of, in most cases, 1% agreed at the Framework stage. The Generic Risk Allowance was added to all prices and covered the risk for such items as poor ground conditions. However, SQS3 claimed that, in spite of written guidance provided centrally by the Commercial Department, some of the Project Managers failed to understand what the Generic Risk Allowance was and how it should be used:

'SQS3 ... A lot of PMs think they understand it,

but what they really think is just nonsense.'

(SQS3 to Commercial Team Leader in Observation 8, lines 147 – 148)

The same Quantity Surveyor also alleged that Project Managers sometimes allowed items in prices and payment applications which should rightly have been excluded. They asserted that, by doing this, Project Managers set a precedent which made it hard for staff following them to argue that the items should be removed:

'SQS3 The MDPs'll always sneak stuff in and, like, then if it's an ongoing project (0.2), like (names a programme of similar projects), it's gets stuck in there and it's hard to argue to take it out. 'Cos the contractor's going, "Well so and so's allowed it up til now…"'

(SQS3 to Commercial Team Leader in Observation 8, lines 161 – 165)

It is important to note that the Project Managers' ignorance of the Commercial Procedures may have resulted from the fact that they were not allowed to access them, a decision which seems strange:

'SQS3 *No, no, that's it, I think. I think the main problem is the PMs not being able to access the Commercial Procedures files, so they can't check anything, so you can't blame them for not following something they're not allowed to read.'*

(SQS3 to Commercial Team Leader in Observation 8, lines 200 – 203)

Due to limited bandwidth, it was common for staff members to be denied access to numerous IT files. A further startling example of this is that the Project Managers also did not have access to their own project contracts even though they were a named party within them!

SQS3, who was relatively new to Alba Water, suggested more joint training for Project Managers and Quantity Surveyors within the department would help alleviate the obvious tension these issues were causing:

'SQS3 *[Then] there should be some sort of training for them and the QSs. I think this is what's leading to a lot of the confusion and bad feeling…*

CTL *You think there's bad feeling?*

SQS3 *Yeah, actually I do.'*

(SQS3 and Commercial Team Leader in Observation 8, lines 207 – 211)

Interestingly, the Commercial Team Leader disputed SQS3's claim that there was bad feeling between the Quantity Surveyors and Project Managers and then appeared to try and shut down their complaints:

'CTL *I wouldn't say bad feeling. Commercial are just there to advise the [PMs]…*

SQS3 *[But] they just think we make stuff up…we can take over or muscle in on their projects. Because they can't see that we're just doing what the CPs* tell us to.*

CTL *Hmm. Well, I think I've got everything. I'm going to try and synthesise these with the notes from (mentions other QSs) and before I send them off to (mentions QS in charge of updating Commercial Procedures) I'll let you all see them and comment.'*

* Commercial Procedures

(SQS3 and Commercial Team Leader in Observation 8, lines 212 – 220)

There did appear to be a general understanding amongst the Quantity Surveyors and Project Managers that the role of the Quantity Surveyor encompassed processes such as tendering, drafting and issuing contracts, making payments and maintaining compensation event registers. However, even within these tasks, there was divergence in practice. Presumably, before the advent of the Commercial department, Project Managers had had to carry out some commercial tasks themselves. According to several of the Quantity Surveyors in the observations, some Project Managers still undertook commercial functions themselves:

'SQS2 *I think (names PM) does most of the work.*

SQS3 *Mm. I can believe that.*

SQS1 *Yeah, I heard that. I heard that (names PM) does all the*

payments and keeps the CE [Registers]…

SQS2 *[Keeps the] CE Registers?!*

SQS1 *Yeah, (names AW staff member) told me.*

(SQS1, SQS2 and SQS3 in Observation 2, lines 78 – 83)

The astonishment of SQS2 upon hearing the rumour that one of the Project Managers and not their Quantity Surveyor *'keeps the CE Registers?!'* perhaps begins to explain some of the bewilderment felt by project team members at the Quantity Surveyors' role. Whilst the longer-serving Quantity Surveyors appeared to accept this as a normal part of working at Alba Water, the pain of one of the newer members of the commercial team can be felt in the exchange below:

'SQS3 *I don't know what I'm for half the time, what I'm meant to be.*

SQS2 *Haha. Welcome to Alba Water.*

SQS1 *Just do what <u>you feel</u> is the right thing to do.'*

(SQSs 1, 2 and 3 in Observation 2, lines 119 – 121)

Again, the advice from one of the more experienced Alba Water surveyors is to use their experience to do what they feel is best. Even where Quantity Surveyors attempted to confirm a course of action with colleagues they were often met with polarised responses:

'SQS3 *What do you think I should do with this CE? Part pay it or what?*

SQS2 *I'd part pay it.*

SQS1 *I wouldn't.'*

(SQS1, 2 and 3 in Observation 2, lines 122 - 125)

Perhaps, reference to the Commercial Procedures – Alba Water's standing orders for all commercial activities – could have helped team members to have a consistent approach. However, as shown in Theme 3 below, this was not what occurred.

5.38 Theme 3: Commercial Procedures Within Alba Water Managed Delivery North

The Commercial Procedures set out the tasks and responsibilities to be undertaken by the Quantity Surveyors, Project Managers and middle management for commercial construction activities within Alba Water. The range of issues covered by the Commercial Procedures is illustrated in table 36 below:

Table 36: Alba Water's Commercial Procedures (CPs)

CP no.	Description
1	Financial Sufficiency and DLAs
2	Bid Strategy and Management
3	Frameworks, Select Lists and Contractors
4	Contractor Selection and Allocation
5	Contract Award
6	Competitive Tendering
7	Risk Management
8	Contract Administration
9	Payment
10	Change Control
11	Project Control
12	Disputes, Terminations and Claims
13	Final Account
14	Cost and Commercial Assurance
15	Price Setting

There was no standard structure to the Commercial Procedures although each Commercial Procedure had folders titled Guidance Notes, Swimlane, Templates and Work Instructions within it.

Guidance Notes usually contained background and context documents, such as NEC contract extracts; the Swimlane was a flow-chart explaining the conduct of the Commercial Procedure;

Templates contained templates for letters, forms etc.; and Guidance Notes provided a narrative explanation of the swimlane.

However, the Commercial Procedures were not consistent. Some only contained one document, a swimlane or Guidance Notes. The level of detail contained in each Commercial Procedure differed and it was clear that the procedures had several authors so that the tone was inconsistent.

It is not clear how or when the Commercial Procedures arose. From what starting point did the consultancy who wrote them begin? Which departments, senior managers or standing orders influenced their construction?

This lack of consistency, in style and content, made the Commercial Procedures the subject of much criticism by the Quantity Surveyors. This had been recognised by senior management and a review of them was being undertaken at the time of the observations. However, the review was being undertaken by the same consultancy who drew them up in the first place and it was unclear whether this would involve 'root and branch' reform or was merely a 'tidying up' exercise.

Three subthemes emerged in relation to the Commercial Procedures:

3.1: Commercial Procedures not being consistent;

3.2: Commercial Procedures not being used;

3.3: Tendering not being used

These are now discussed in detail below.

5.39 Subtheme 3.1: Commercial Procedures not being consistent

The Commercial Procedures were viewed by the Quantity Surveyors as both positive and negative. This is illustrated in the extract below:

'CTL *What do you think of the Commercial Procedures then?*

SQS3 *(0.2). Er (0.5), actually, I er think there's quite a lot of good stuff in there. Some of them are really good, but I'm er definitely struggling with some of [them]…*

CTL *[I know] they're not what you might call [consistent].*

SQS3 *[Er, no, not] exactly.*

(Commercial Team Leader and SQS3 in Observation 8, lines 1 – 7)

The Quantity Surveyor then went on to give an example of the obliqueness of some of the procedures:

'SQS3 *But, there's just a lot of stuff in here that I don't understand myself (pauses and looks at notebook and then pauses again) like all this stuff about standstill periods. I can't understand when you use it and when you don't.*

CTL *I don't think standstill periods are very widely used here.*

SQS3 *No, I bet! But it says (reads) 'All mini competitions shall be conducted under the standstill and associated rules. A voluntary*

standstill will apply in all cases.' I don't really know what that means!

(Commercial Team Leader and SQS3 in Observation 8, lines 116 – 124)

As well as the issue of the inconsistency of the Commercial Procedures, much discussion in the observations focused on the fact that they were not always used and this is now discussed in the sub-theme below.

5.40 Subtheme 3.2: Commercial Procedures not being used

It is clear from the observations that many of the procedures mandated by the Commercial Procedures were not actually being used. The following extract concerns the Decision Matrix, a flow-chart to be used when deciding whether a figure for Delay Damages should be inserted into a contract:

'SQS3 *Well, the other thing is that the Decision Matrix definitely isn't being used.*

CTL *That's? (pauses) What is that?*

SQS3 *It's whether to apply delay damages or not. But it's pretty… what do you call it? Proscriptive? Like it says (reads from notebook) 'If despite these conditions not being met, there is a proposal to not include Delay Damages, this must be approved by the Head of Commercial'.*

CTL *Oh right! Can I see that? (leans over as SQS passes notebook*

over) (pauses to read) I'll look that up, I think (pauses) after

this meeting. I mean, I don't think that ever happens. I wonder if

that…on the Major Projects?

SQS3 *(shakes head) Dunno.*

(Commercial Team Leader and SQS3 in Observation 8, lines 182 – 193)

Here, the fact that the Commercial Team Leader was ignorant of the existence of the Decision Matrix and was not familiar with its terms could be seen as crucial evidence of the chaotic nature of much of the commercial operations at Managed Delivery North.

The Commercial Procedures then were widely seen by Quantity Surveyors and middle managers as part of a 'Pick'n'Mix' philosophy towards policies within the department. To repeat an example given earlier, this attitude seemed to apply to important commercial processes such as the application of retention to contracts:

Observer *Right. What's the rules here about retention?*

SQS2 *(shrugs and picks up drink) It's in the contract – 3%.*

But (nods towards other QS's desk) some people

just pay it. In fact, I think I'm the only one who doesn't.

(Observer and SQS2 in Observation 10, lines 29 – 32)

The ambiguous status of retention was also reflected in the attitude towards tendering, which is the subject of the third theme and is now discussed below.

5.41 Subtheme 3.3: Tendering not being used

Tendering was another confused and ambiguous issue. Although the Commercial Procedures and Framework contract made it clear that all projects should be tendered in mini-competitions,

tendering was not often used within Managed Delivery North. One of the Quantity Surveyors, SQS1, in a comment within a semi-structured interview, claimed that they only tendered 5% of their projects, the remaining 95% were direct awarded to a contractor.

Given that all the contractors - both MDPs and RDPs - had already submitted tenders to become framework contractors, the requirement to further tender each project, however small, could be viewed as excessive. This may partially explain why very few Quantity Surveyors used tendering. The following extract shows that it was often the Quantity Surveyors who had recently joined Managed Delivery North who utilised tendering. This was in contrast to the more established members of staff who tended to direct award more contracts:

CTL *I've got written down that you were looking at Bid Strategy, Competitive Tendering…*

SQS3 *[laughs]*

CTL *[Yes, well] I think you're probably the <u>best</u> person to comment on that one, you probably do more tendering than a <u>lot</u> of the QSs [here]...*

SQS3 *[Yeah], yeah, that'd be true.*

(Commercial Team Leader and SQS3 in Observation 8, lines 28 – 34)

Although there was an opportunity to use qualitative tendering within the Commercial Procedures, SQS3 claimed that it was rarely used. Indeed, qualitative tendering appeared to be another area of confusion between the Quantity Surveyors and their Project Manager colleagues:

'SQS3 *The <u>big thing</u> is there's a lot of emphasis in here on qualitative*

tendering and I think I'm the only person who's using it.

CTL *Really?*

SQS3 *Yeah. And it's not made me very popular with the PMs. I think some of them think you can just make a qualitative assessment through the normal tendering process, they don't seem to see qualitative and non-qualitative as different things.*

(Commercial Team Leader and SQS3 in Observation 8, lines 101 – 107)

The influence – or lack of it – of Alba Water's senior management on commercial risk management policies and procedures was also another subject of debate and is now discussed below.

5.42 Theme 4: Alba Water's Senior Management's Influence on Commercial Risk Management within Managed Delivery North

When Participants discussed Alba Water's senior management they appeared to be considering Directors and Heads of Department. At Director level Alba Water had a Chief Executive, Director for Corporate Affairs, Finance Director, Director of Strategic Operations and Customer Service Planning, Chief Operating Officer, Director of Digital, Director for People, and Director of Capital Investment (Alba Water, 2019). Below Directors sat Heads of Department, for example the Head of Commercial.

As might be expected in an organisation of 3,600 people (Document 2, 2018), the Directors and Heads of Departments were often viewed as remote figures out of touch with 'reality'. However, it may be important to distinguish between views of Alba Water as an employer -

which were largely favourable - with those of it as a construction and engineering client - which were less positive.

In 2016 Alba Water was awarded 'Best Workplace of the Year' at the Human Resources Network awards and 'Fair Work Employer of the Year' at the Scottish Business Awards (Alba Water, 2019). The organisation was also one of the Times' Top 50 Employers for Women in 2019 (Alba Water, 2019). As a result, it is not surprising that Participants focused their discontent on Alba Water as a client, not an employer.

Five subthemes emerged from the observations:

4.1: Delivery Times as a Senior Management Priority;

4.2: Alba Water's Attitudes Towards Contractors;

4.3: Poor Management of Change Within Alba Water;

4.4: Senior Management's focus on IT Systems

4.5: Alba Water's Attitudes towards Adjudication.

Each of the subthemes is now discussed below.

5.43 Subtheme 4.1: Delivery Time as a Senior Management Priority

Participants made frequent references to the senior management teams' perceived obsession with delivery time over value for money in projects. The extracts below give a vivid impression of how this was viewed at project level:

'SQS4 *It makes me sick. They don't care about money, all they care about is delivery time.*

SQS3 *Yeah. Er (names SPM) was saying that, that the business is delivery time-led, they don't care how much money it costs.'*

(SQS3 and SQS4 in Observation 2, lines 31 – 33)

'SQS4 They don't care about anything except time…'

(SQS4 in Observation 2, line 40)

There were, however, other opinions and one of these is quoted below:

'SQS4 They don't care about anything except time…

SQS2 Ah (0.2)., I don't think that's really fair. We do a good job.

SQS1 D'you think?

SQS2 Yeah, I do.'

(SQS1, SQS2 and SQS4 in Observation 2, lines 40 – 43)

It is important to consider what the Participant here may be alluding to. At first sight, it appears that SQS2 was disagreeing with SQS4 about the senior management teams' obsession with delivery time over cost *('I don't really think that's fair.'*) However, their next statement – *'I think we do a good job'* - may, in fact, be making a wider claim for Alba Water and perhaps Managed Delivery North. It certainly seems to suggest that there may have been a better balance between time, cost and quality than was believed by SQS4.

Projects were delivered to Managed Delivery North at implementation stage, having been developed from initiation in other parts of the business. They usually arrived at Managed Delivery North with preset timescales for delivery. These timescales had often been agreed with external bodies - the Regulator or other stakeholders – long before being delivered to Managed Delivery North. A high percentage of the Managed Delivery North projects (perhaps

60%) were ‘Water Quality issues’, meaning they resulted from a water quality failure at an asset. In the Regulator’s opinion they were already urgent. It was therefore important that the absolute minimum amount of time should pass before the project was completed and the water quality issue(s) was resolved. A further percentage of projects (perhaps 20%) arose as ‘Reputational issues’. An example of this was the Aviemore Chloramination project which took place during the period of the observations and is now briefly discussed below.

5.43.1 The Aviemore Chloramination Project

Aviemore is a small town of 5,000 people in the Highlands. Midway between Location I and Perth and with good road and rail links to both it had been a popular place for young families to move into. Aviemore’s water supply had originally been taken from a surface water source, a local loch. However, the increase in population put this source under strain and Alba Water sought to improve both the quantity and quality of drinking water available to the town by constructing new boreholes. The change from a soft to hard water supply was controversial; local people complained about a ‘metallic taste’ in the water. Over time the campaign grew and attracted national and international coverage as some in the local area began to accuse Alba Water of ‘poisoning’ the water supply. Repeated testing failed to find the source of the metallic taste in the borehole water and a decision was taken instead to build a chloramination plant at the Aviemore Water Treatment Works which would help to remove both the chlorine and any other undesirable tastes from the new water supply. The chloramination plant was projected to cost well over a million pounds and was considered urgent because of its status as Alba Water’s Number One Reputational Project.

5.43.2 Project Timescales

Project timescales were often agreed before any serious project planning had taken place and before any hurdles - which the project might need to overcome to get to the point of

implementation - had been uncovered. This meant that projects often arrived at Managed Delivery North with un-realistic timescales, as shown in the extract below:

'SPM2 *The timescales we've been given (0.2), there's no way it can be delivered.'*

(SPM in Project Review meeting, Observation 5, lines 4 – 5)

Where the pre-defined delivery timescales were impossible to achieve there was a 'recycling' process through which projects could be back-tracked a number of stages and a new delivery date agreed with stakeholders; however, it was rarely used. During the twelve months of this study only one project was recycled.

Just prior to the start of the observations an effort to mitigate the difficulties caused by unrealistic delivery times had been made by the Senior Project Managers. Each Alba Water asset had an Asset Manager (an asset might be a cold-water storage tank, a length of pipeline or a water treatment station) who was not part of Managed Delivery. The Senior Project Managers had suggested that, prior to delivering a project to Managed Delivery North, the Asset Planner should meet with the proposed Project Manager to ascertain whether the timescale was reasonable. However, as shown in the extract below, this practice had not being widely used. Instead, SQS3 suggests, it might be incorporated into the Commercial Procedures:

'SQS3 *In the Requirements section it doesn't mention about this new thing of the Asset Planner meeting with the PM before the project's handed over (pauses), you know, to make sure the project is do-able like…*

CTL *Hmm. I'm not sure er how er that's going to, I mean, I'm*

not sure whether it'll take off. Have you heard of any Asset Planners meeting PMs yet?

SQS3 *(shakes head) (laughs) No! To be honest. But if it's going to become standard practice then we should put it in.*

CTL *Well, let me have a think about that then. What else?*

(Commercial Team Leader and SQS3 in Observation 8, lines 46 – 55)

The Commercial Team Leader's response to the suggestion – *'Let me have a think about that then. What else?'* - suggests that it will probably not make its way into the revised Commercial Procedures.

The more usual way of dealing with a difficult delivery date was to put pressure on the contractors and / or the consultant (the CDP) to work to the original timescale. Only if they refused was it possible to consider changing the delivery date. The extract below shows that this was not easy to achieve and required the agreement of the Delivery Manager, a senior member of staff based in the Central Belt:

'SQS2 *Could we ask them* (the CDP) *to squeeze it in somewhere?*

PM2 *(0.2) Trouble is we've already asked them to do that on (names project) and (names project).*

SPM2 *I don't know whether (names Delivery Manager) would like that? Let me have a think (0.6). Er, no, let's ring (names CDP) and ask them how soon they can guarantee delivery of the design and then, I'll speak to (names Delivery*

Manager) about flexing the start date on site.

(SQS2, Project Manager and Senior Project Manager in Observation 9, lines 22 – 29)

As well as a focus on delivery times rather than value for money, there was also a perception amongst the Participants that the senior management team – as exemplified by the phrase 'Alba Water' or 'the business' - were weak in their attitude towards contractors. This subtheme is now discussed below.

5.44 Subtheme 4.2: Alba Water's Attitude Towards Contractors

Participants often expressed disappointment at the treatment of contractors by 'the business' (taken to mean the organisation as led by the senior management team) and this is illustrated in the extract below:

'SQS1 Alba Water just lets the contractors walk all over them.'

(SQS1 in Observation 2, line 26)

A further complaint about senior management was their poor management of change within the organisation and this is now considered below.

5.45 Sub theme 4.3: Poor Management of Change within Alba Water

'SPM2 The trouble with the business is, they <u>never</u> take advice off the people who are gonna be affected by the change before they introduce it. They just shout at people later.'

(Senior Project Manager in Observation 3, lines 23 – 25)

Finally, it was clear from the observations that staff believed senior managers focused on IT systems rather than other procedures and policies to deliver improvements and this is now discussed below.

5.46 Subtheme 4.4: Senior Management Focus on IT Systems

Although alterations were made to policies and procedures it was in the area of IT systems that profound change most often came. An example of this was the introduction of Unifier, a new IT system for producing, agreeing and storing contract documentation.

Prior to the introduction of Unifier (and perhaps surprising given Alba Water's size as the second largest construction client in Scotland), contracts were still produced using Microsoft WORD templates.

The basic contract production systems prior to the introduction of Unifier is summarised below:

1. Production of draft contract (Quantity Surveyor / Senior Quantity Surveyor) using Microsoft WORD templates;
2. Production of Procurement Justification (Quantity Surveyor / Senior Quantity Surveyor) using Microsoft EXCEL template;
3. Printing out of the draft contract and assembling by hand (Quantity Surveyor / Senior Quantity Surveyor);
4. Hole punching and binding of the contract by hand (Quantity Surveyor / Senior Quantity Surveyor);
5. Signing of the hand copies of Procurement Justification (Quantity Surveyor, Senior Quantity Surveyor, Commercial Team Leader, Project Manager and Senior Project Manager);
6. Photocopying of the Procurement Justification (2 copies) and binding into contracts (Quantity Surveyor / Senior Quantity Surveyor);

7. Scanning of the contract and Procurement Justification and emailing to central contracts department (Quantity Surveyor / Senior Quantity Surveyor);
8. Posting both copies of the contract to the contractor with covering letter for their consideration (Quantity Surveyor / Senior Quantity Surveyor);
9. Negotiation and possible amendments of the contract by contractor (with Quantity Surveyor / Senior Quantity Surveyor), followed by possible reprinting, re-scanning, re-photocopying, re-binding and re-postage of contracts (ditto);
10. Once both contracts have been signed by the contractor, the contractor returned both copies of the contract to the Quantity Surveyor / Senior Quantity Surveyor, who then forwarded them by post to the central contracts department in Edinburgh.

Under Unifer, the system was slightly different:

1. Production of the draft contract (Quantity Surveyor / Senior Quantity Surveyor) using Microsoft WORD templates;
2. Entering all details of the contract (e.g. value, deadlines, supplementary clauses etc) into Unifier (Quantity Surveyor / Senior Quantity Surveyor);
3. Production of the Procurement Justification on Unifier (Quantity Surveyor / Senior Quantity Surveyor);
4. Printing out of the draft contract (Quantity Surveyor / Senior Quantity Surveyor);
5. Scanning of the contract and uploading to Unifier (Quantity Surveyor / Senior Quantity Surveyor);
6. Forwarding of the Unifier contract from Quantity Surveyor / Senior Quantity Surveyor to the Project Manager for approval;
7. Forwarding of the Unifier contract from the Project Manager to the Senior Project Manager for approval;

8. Forwarding of the Unifier contract from the Senior Project Manager to the Commercial Team Leader for approval;
9. Forwarding of the Unifier contract from the Commercial Team Leader to the contractor for approval;
10. Negotiation and possible amendments of the contract with the Quantity Surveyor / Senior Quantity Surveyor by the contractor;
11. Once the contract had been agreed on Unifier, contract would then be signed electronically by the contractor and then the Commercial Team Leader and the Commercial Manager at Alba Water.

Unifier was considered, even by its initiators, to be a relatively complex system and was therefore rolled out to the largest contractors first. After six months only some of the MDPs were using the system and none of the RDPs. For those contractors not yet 'on Unifier' the system was as follows:

1. Production of the draft contract by Quantity Surveyor / Senior Quantity Surveyor using Microsoft WORD templates;
2. Entering of all details of the contract (e.g. value, deadlines, supplementary clauses etc) into Unifier (Quantity Surveyor / Senior Quantity Surveyor);
3. Production of the Procurement Justification by Quantity Surveyor / Senior Quantity Surveyor on Unifier;
4. Production of the Procurement Justification by the Quantity Surveyor / Senior Quantity Surveyor using Microsoft EXCEL template;
5. Printing out of two copies of the draft contract, hole punching and binding both copies by hand (Quantity Surveyor / Senior Quantity Surveyor);
6. Scanning of the contract and uploading to Unifier (Quantity Surveyor / Senior Quantity Surveyor);

7. Forwarding the Unifier contract from the Quantity Surveyor / Senior Quantity Surveyor to the Project Manager for approval;
8. Forwarding the Unifier contract from the Project Manager to the Senior Project Manager for approval;
9. Forwarding the Unifier contract from the Senior Project Manager to the Commercial Team Leader for approval;
10. Forwarding the Unifier contract from the Commercial Team Leader to the contractor for approval;
11. Signing of the hand copies of the Procurement Justification by the Quantity Surveyor. Senior Quantity Surveyor, Commercial Team Leader, Project Manager and Senior Project Manager;
12. Photocopying of the Procurement Justification (2 copies) and binding into contracts (Quantity Surveyor / Senior Quantity Surveyor);
13. Scanning of the contract by the Commercial Team Leader, emailing with the Procurement Justification from the Commercial Team Leader to central contracts department;
14. Posting both copies of the contract to the contractor with covering letter for their consideration (Quantity Surveyor / Senior Quantity Surveyor);
15. Negotiation and possible amendments of the contract by the contractor with the Quantity Surveyor / Senior Quantity Surveyor, followed by possible reprinting, re-scanning, re-photocopying and re-binding and re-postage of contracts (Quantity Surveyor / Senior Quantity Surveyor);
16. Once both contracts have been signed by the contractor, the contractor would return both copies of the contract to the Quantity Surveyor / Senior Quantity Surveyor, who would then forward them by post to the central contracts department in Edinburgh.

17. Once the contract has been agreed on Unifier, the contract would then be signed electronically by the contractor and then Commercial Team Leader and Commercial Manager at Alba Water.

It appears to have been anticipated that Unifier would replace the paper-based contract production system much more quickly than turned out to be the case. Despite extensive testing Quantity Surveyors had to find 'work-rounds' for contracts that did not fit the Unifier mould. This is illustrated in the extract below:

'SQS3 *[It just takes] you twice as long.*

SQS4 *It's not really a contract management system like we thought it would be, is it? It's more a contract storage system, that's how I'd describe it. [I mean]…*

SQS1 *[having to print out contracts for RDPs and send them out in the post!*

SQS4 *That's what I mean. Like we used to type them up and print them out and send them to the contractors. Now we have to do it all on Unifier…*

SQS2 *…which takes forever because you have to know all the work -rounds to get a contract through it…*

SQS4 *Exactly. And then you've still to print the thing out and send it in the post.*

(SQS1, SQS2, SQS3 and SQS4 in Observation 12, lines 70 – 92)

Crucially, Alba Water did not train all staff in the use of a new IT system introduction; instead, a few staff were upskilled and these then became 'super-users' who could advise other members of staff. Unsurprisingly, this process was subject to criticism:

'SQS3 *I don't understand why the super-users don't get some kind of enhancement for what they do? I mean there's no incentive for them, it's all just goodwill. I feel like I don't want to ask a super-user because they've got their own work [to do]*

SQS2 *[Well]*

SQS3 *[Of] course, I know (SQS2) that if I ask you or (SQS1) that you'll stop and help [me]*

SQS1 *[or] we'll say 'Eff off, I'm busy!'*

SQS3 *Yeah! But, I mean you've always helped me. But I do feel guilty when I'm taking someone away from their own work.*

(SQS1, SQS2 and SQS3 in Observation 12, lines 103 – 113)

Of course, Alba Water had an IT department with overall responsibility for the implementation of the new system. However, Unifier assistance from the IT Department appeared to rely on one particular staff member who, the Quantity Surveyors feared, would leave shortly:

'SQS4 *I don't think we would, (CTL) (0.2) with respect, without (mentions Unifier staff member) I know I'd be struggling.'*

(SQS4 in Observation 12, lines 102 – 103)

It is interesting to note that, given that the majority of the Quantity Surveyors had extensive experience of other workplaces, their comments on Alba Water's systems were so negative:

'SQS2 *[The systems] here are so complicated.*

SQS3 *I agree. I've never worked anywhere where it takes so long to get to the point where you can actually do a normal QS's job. I feel like all I do is ask endless questions – 'how do you do this?', 'how do I do that?''*

(SQS2 and SQS3 in Observation 12, lines 117 – 122)

Even Quantity Surveyors who had developed at Alba Water had very negative comments about the IT systems:

'SQS1 *Alba Water always goes for bottom dollar when they're buying stuff, always get it on the cheap.*

SQS4 *None of the systems are intuitive. You know, everything I have (0.2), all the apps on my phone, well they're just 1000 times easier to use than anything here.'*

(SQS1 and SQS4 in Observation 12, lines 123 – 127)

SQS4's comment that *'none of the systems are intuitive'* is fascinating and perhaps can be considered an example of how Alba Water failed to 'human engineer' its systems.

The ways in which Alba Water managed the change to this new IT system poorly are summarised in table 37 below.

Table 37: Alba Water Management of the introduction of the new IT system

Area	Details
Training	Carried out only 'awareness raising' and not specific new systems training for all affected employees
Management support	Relied on un-remunerated staff members to train and assist other staff members with problems with the new system
Breadth and Depth of Knowledge of New System throughout Organisation	Appeared to focus all working knowledge on one person in the IT department
Testing	Failed to properly test the system for 'non-compliant' contracts, thus requiring staff members to learn 'work-rounds' to get contracts through the system
Assessing Impact on Smaller Partners	Did not seem to have given much thought to how very small contractors might be able to respond to such a new introduction and, having realised how difficult this would be, then had to resort to operating two parallel systems which caused QSs much more work

Another fascinating phenomenon was the extent to which the Quantity Surveyors regarded the processes and policies - such as the Commercial Procedures - as far more important than the IT systems. An example is shown below. Here, the Quantity Surveyor ignores a question about Unifier and, instead, carried on discussing the Commercial Procedures. This perhaps shows a significant disconnect between the senior management team and the project teams in terms of where resources might best be focused to effect positive change.

'CTL *[Yeah yeah].*

Has Unifier changed anything?

SQS3 *I was thinking as well that a lot of stuff talks about Solutions and AW Horizons and there's usually no mention of Managed Delivery…'*

(Commercial Team Leader and SQS3 in Observation 8, lines 22 – 26)

Unifier was not the only IT system subject to criticism. In the extract below the Commercial Team Leader and one of the Quantity Surveyors discuss the shortcomings of the EQS system, the principal storage system for all forms, documents, protocols etc. within Alba Water:

'CTL *(pauses and raises second finger) 2. Does accessibility hinder use?*

SQS3 *Sorry, what do you mean?*

CTL *Er (pauses), I suppose I mean is it hard to find what you're looking for?*

SQS3 *Oh right, I see. Yeah, I suppose that is a thing. It's hard to find a lot of stuff here to be honest. Like with EQS, the documents aren't always the most up to date version.*

CTL *That's been a problem for years.*

(Commercial Team Leader and SQS3 in Observation 8, lines 12 – 20)

Whether the Commercial Procedures were originally intended to be incorporated into EQS or whether they were established as stand-alone procedures is not clear. It is perhaps reasonable to envisage from the Commercial Team Leader's comment – *'That's been a problem for years'* – that EQS was an elderly system. Perhaps as the system aged and the organisation began to discuss its replacement the incentive to maintain EQS adequately had diminished.

Certainly, since the most up to date of commercial documents were no longer to be found on EQS, the issue of whether to update EQS or abandon it altogether and only refer to the Commercial Procedures had not been resolved:

> *'SQS3* *Well, there's a lot in this. All the EQS referenced documents are old versions. Should we just abandon EQS and maintain the current documents on the Commercial Procedures pages?*
>
> *CTL* *(nodding and writing in notebook). I think that's really what's happening in practice to be honest.'*
>
> (Commercial Team Leader and SQS3 in Observation 8, lines 93 – 97)

Again, it can be seen from the Commercial Team Leader's response – *'I think that's really what's happening in practice to be honest'* – a certain informality within Alba Water with regards to the development of practices and protocols.

Allied to Subtheme 4.4 was the issue of the senior management teams' attitudes towards dispute resolution and, in particular, adjudication and this is now discussed below.

5.47 Subtheme 4.5: Alba Water's Attitude Towards Adjudication

The only formal dispute resolution mechanism within Alba Water's NEC contract was adjudication. However, during the observations, Managed Delivery North Staff claimed that its use was frowned upon by the senior management team:

'SPM2 *I don't think adjudication would have sat well with us, with us, I mean, with (names senior management at AW). It wouldn't have gone down well at all.*

MDPD *That's what we thought, so we took the hit.*

(Senior Project Manager and Director of MDP in Lessons-Learned meeting, Observation 7, lines 35 – 37)

This is a fascinating insight into the concept of collaboration within Alba Water. As the Director of the MDP (DMDP) in question well knew, discussions for the tendering of the next Framework were already underway when the company launched an £800,000 claim against Alba Water:

'MDPD *Honest answer? We're in a Framework. You know, we're in the middle of SR15, SR21's already kicking off. We had to take the hit on it this time.'*

(Director of MDP in Observation 7, lines 31 – 33)

In fact, the mere mention of adjudication as an option for the contractor appeared to be contentious as can be seen in this extract below:

'SQS3 *(MDPD), if you did feel you had such a strong case, why*

didn't you adjudicate? I was really surprised (0.2) (SPM2), don't look at me like that. This is what Lessons Learned are for…'

(SQS3 in Observation 7, lines 34 - 36)

Of course, the contractors were mainly serial framework MDPs or RDPs who had contracted with Alba Water for – in some cases – many years. So, Alba Water's antipathy towards adjudication and indeed any form of external dispute resolution may have been well known to them and the potential impact of this inability to refer cases to adjudication may well have been built into their framework prices.

The ways in which the MDPs and RDPs were viewed and treated by project staff is the subject of the next two themes.

5.48 Theme 5: MDPs (Tier 1 Contractors) within Managed Delivery North

Alba Water operated three frameworks for its delivery partners; for Tier 1 contractors, known as Main Delivery Partners (MDPs); for Tier 2 contractors, known as Rural Delivery Partners (RDPs); and for designers, known as Consultant Delivery Partners (CDPs). Each framework ran for six years and was managed by a Central Procurement Department, based in the Central Belt. The framework operating at the time of the observations was due to run from 2015 to 2020 and was known as SR15.

MDPs Tier 1 contractors were responsible for the delivery of major works over £250,000 in value. They also delivered projects less than £250,000 in value, where design input from the contractor was required or the projects had third party issues attached to them which needed to be resolved before construction could begin. MDPs operated in particular geographical locations and their works were further divided into either civil engineering or mechanical and electrical.

It was the MDPs' ability to deliver design and management as well as construction services which distinguished them from RDPs. Several RDPs were in fact larger in size and turnover than some MDPs but had either not applied to be MDPs or had failed the Tier 1 tendering process.

The MDPs and RDPs were very heterogeneous groups. Table 38 below illustrates the turnover and employee numbers of the MDPs appointed to the Managed Delivery North area.

Table 38: MDPs in the Managed Delivery North Area

MDP name	MDP Type	Turnover	Number of FT staff	Head Office
ARM Ltd	Mechanical and Electrical	£2.2B	19,000	London
Highland Engineering Ltd. (HLE)	Civil Engineering	£53M	223	Highlands
MacCallum Construction Ltd. (MCL)	Civil Engineering	£32.54M	82	Central Belt

The performance of the MDPs was the subject of much comment during the observations. Staff within Managed Delivery North had no direct input into the 6-yearly tendering process for either MDPs or RDPs. Although it was possible for Quantity Surveyors to provide feedback on the performance of the MDPs – two boxes on the payment certificates allowed QSs to rate the quality of the contractors' payment applications – this was discouraged by the Commercial Team Leader. Instead, most Quantity Surveyors simply inserted 10 (out of 10) into the boxes on the certificates as directed by middle managers.

Much of the commentary by the Quantity Surveyors on the MDPs was negative and focused on a view of these Tier 1 contractors as adversarial and non-collaborative. How the Quantity

Surveyors (or, in fact, all the project teams since this view was widespread) dealt with this perception was also the subject of much discussion.

The following sub-themes emerged during the observations:

Subtheme 5.1: The adversarial and untrustworthy nature of the MDPs;

Subtheme 5.2: The inappropriateness of using Option Cs and Option E contracts with the MDPs;

Subtheme 5.3: The use of Early Contractor Involvement (ECI) to deal with MDPs;

Subtheme 5.4: Decision Tree Manipulation;

Subtheme 5.5: Overturning the Framework;

Subtheme 5.6: Collaborative MDP as an Anomaly.

Each of these sub-themes is now discussed in turn below.

5.49 Subtheme 5.1: The Adversarial and Untrustworthy Nature of the MDPs

The MDPs were viewed by most of the Managed Delivery North staff in a negative light. The following quote suggests one of the MDPs were held in very low regard indeed:

'SQS2 They're (swears) crooks.

SQS3 Haha, that's something we all agree on!'

(SQS2 and SQS3 in Observation 2, lines 157 – 158)

It is important to note that there appeared to exist within the minds of the staff a hierarchy in terms of the MDPs' level of 'adversarial-ness', as exemplified in this extract below:

'SQS1 At least HLE aren't as bad as ARM

(another MDP).

SQS2 *Oh yeah, charging you for quotes.*

SQS3 *They don't?! (swears)*

SQS1 *I can better that. They charged (names PM) for <u>not</u> providing a quote.*

SQS3 *What?!*

SQS2 *<u>You're kidding?</u>*

SQS4 *<u>What happened?</u>*

SQS1 *We asked them for a quote for (names a project), we gave them 2 weeks to return and they had a look at it, came back and said 'We need another 2 weeks'. So we gave them another 2 weeks and then they came back and said, 'We don't want to do it.' And then, six weeks later, they sent us a quote for their time.*

SQS2 *<u>What</u> time?*

SQS1 *Their time for looking at the project and deciding they didn't want to do it.*

SQS2 *Jesus! What happened? You didn't pay it?*

SQS1 *I didn't. But (names PM) wanted it escalating, so it's gone up the chain and (names Commercial Manager) might pay it.*

SQS2 *No?! I don't believe that (swears).'*

(SQS1, SQS2, SQS3 and SQS4 in Observation 2, lines 84 – 104)

The extract above requires some further explanation. The framework contract made it clear that framework contractors should respond positively to all invitations to provide quotations. They were, in fact, expected to provide quotations upon request. However, in practise, contractors would usually be approached before the pricing process began to ask if they would be interested in the work:

'SPM2 *Anyway, what are we going to do about this?*

PM1 *Well, what we're suggesting is that we go out with Expressions of Interest to all the Highland RDPs and see what comes back.'*

(Senior Project Manager and Project Manager in Observation 5, lines 106 – 109)

In most cases, contractors' reasonable reasons for not providing quotations (for example, the work was too distant for them, they already had a backlog of work with Alba Water due to start, or they lacked the expertise to undertake a particular project) would be accepted. However, continued refusals to quote for work were taken more seriously and might promote an internal review, ending most likely in an approach to the contractor by either a Senior Project Manager or the Commercial Team Leader.

In the case of the contractor, ARM, it was their habit of charging for quotations and, as expressed here, not providing quotations, that led to so much comment and, even to changes in practice by Managed Delivery:

'SPM2 *I'm not paying for ARM to not give us a (swears) quotes. And I know (names Delivery Manager) would*

back me up on that too. They can (swears) off.

PM1 *That's why we wanted to go straight to DE*. They're local, we trust them, they've got a quarry, this is their dream job.'*

*DE – a civil engineering RDP

(Senior Project Manager and Project Manager in Observation 5, lines 55 – 59)

DE Construction were a locally based RDP civils contractor. In fact, the Decision Tree would not allow DE to be substituted for ARM where the project had third party issues (for example, access to the asset over another's land) and / or required design input. But there were continued suggestions throughout the period of observations that the difficulties with ARM had led the middle management to consider breaching the framework contract in this way.

In this observation and in others the Commercial Team Leader is much more cautious about this potential breach but suggests that it could proceed on a project by project basis:

'PM1 *Yeah, exactly. What'd be the ideal situation is if we could put it straight to DE, but (names CTL) you don't think we can do that, right?*

CTL *Well (pauses), I think we'd just need to justify it, something this big. I think (names Commercial Manager) would stretch the Commercial Procedures…I think.'*

(Project Manager and Commercial Team Leader in Observation 5, lines 25 – 30)

In the end, because of a serious breach of health and safety by DE Construction (using an excavator without a restrictor close to an overhead power line), the plan to replace ARM with DE never materialised:

'SPM2 *...But any ideas we had of letting DE take over the civils from ARM, that's just out the window now.*

SQS3 *For the time being...or for ever?*

SPM2 *It's not going to happen [now].*

CTL *[It can] still be reviewed in the next Framework.'*

(Senior Project Manager, SQS3 and Commercial Team Leader in Observation 5, lines 88 – 93)

In respect of this particular project though, a decision was taken in the meeting to place the design with a CDP (Consultant Delivery Partner) and, once the design was complete, tender the project to a group of RDPs. It was not clear from this observation whether this would include DE Construction or not. Perhaps, as suggested by the Senior Project Manager it would depend on the outcome of the health and safety review:

'SP *But what sanctions will there be?*

SPM2 *I'm not sure yet. I've had various conversations with (names Delivery Manager) and (names Health and Safety Manager) and (names Director) and they're telling me that, you know, on the one hand, they're satisfied with what DE are telling*

[them]…

SQS3 *[I can't] believe they, of all people, allowed that to happen. I mean, DE! They're normally so well organised. Like (names DE's Construction Director), he's so, well like, I'd say, he's OCD. I just can't believe something like that happening you know like on his watch.*

SPM2 *He's just held his hands up to it. But trouble is, from the business's point of view, it's just way too serious.*

CTL *You can't…*

SP *Using an excavator without a restrictor under live electricity (indistinct) mains…*

CTL *You just can't ignore that, the business can't, it's too [serious].'*

(Senior Planner, SQS3, Commercial Team Leader, Senior Project Manager in Observation 5, lines 69 – 87)

In many ways the often-difficult position of the MDPs was given very little consideration by the Managed Delivery staff. The Tier 1 framework covered vast areas of the country (in the cases of some of the pan-Scotland programmes of work, the contractors had to cover the whole country from the borders up to the Shetland Isles, a range of 450 miles). The following extract exemplifies how little sympathy there was for the MDPs' position:

'*SPM2* *(writing in notebook) I'm just really wary about using them for*

> *anything after what (names two PMs) and you (names CTL) have told me about them. I don't want a massive bill from them for sitting in the Central Belt talking about this project (0.1) cos I'm telling you there's no way (names Delivery Manager) is (0.2) or me (0.2) is paying it.'*
>
> (Senior Project Manager in Project Review meeting, observation 4, lines 12 – 17)

The framework contract was definitive in requiring both Tier 1 and Tier 2 contractors to provide quotations every time they were asked. ARM's reasoning for requesting reimbursement of their invitation to tender costs was that Managed Delivery staff failed to provide all the documentation and information required by the framework contract. Since this then necessitated additional work on their part they felt it not unreasonable to be reimbursed for these costs.

The Commercial Team Leader attempted to negotiate a middle way between the two extremes of replacing ARM with DE Construction or paying for *'sitting in the Central Belt talking about the project'.* Instead, the Commercial Team Leader suggested using Early Contractor Involvement:

Early Contractor Involvement (ECI) allowed the Contractor to be appointed under a two-stage NEC Option C contract before details of what was to be constructed had been fully developed. This enabled the Contractor to take part in the design development and construction planning stage of a project.

The Commercial Team Leader's approach involved using ECI as a way of 'testing out' ARM, but his suggestion met with a very mixed response:

'CTL *It's a good way of testing out their goodwill.*

QS3 *<u>What</u> goodwill?'*

(Commercial Team Leader and SQS3 in Observation 4, lines 23 – 24)

At this point the Commercial Team Leader persisted with the approach, explaining the benefits as follows:

'CTL *... If we <u>don't</u> get co-*

operation with them on this, we're going to know about it <u>sooner</u>

rather than <u>later</u>. We can make alternative plans.'

(Commercial Team Leader in Observation 4, lines 26 – 28)

However, this failed to convince the Quantity Surveyor for the project:

'SQS3 *They just take the (swears) all the time. They think we're zipped*

up the back.'

(SQS3 in Observation 4, lines 39 – 40)

In fact, one of the MDPs themselves suggested something similar to early contractor involvement. In the extract below the Project Manager and Senior Project Manager discussed the request by HLE for a design contract and then a design and build contract:

'PM2 *They say they want a design contract <u>and then</u> a design and*

build contract to <u>build it.</u>

SPM2 *You're <u>joking?</u> So they want two bites of the cherry? (swears).*

What <u>on God's earth</u> are their reasons?'

(Project Manager and Senior Project Manager in Observation 9, lines 6 – 9)

Perhaps, the idea of testing the other party's commitment was not a one-way street!

In spite of the frequently mentioned issue of ARM charging for not providing quotations, most of the staff's opprobrium was reserved for Highland Engineering. The following extracts are typical:

'SQS2 Same old (swears) then. I told you there were at it.'

(SQS2 in Observation 10, line 7)

'SQS1 Well, I don't work with HLE at all if I can help it.'

(SQS1 in Observation 12, line 6)

The low confidence with which the MDPs were held led to an increasing insistence by Managed Delivery North staff on the use of Option A, rather than Option C and E contracts and this is now discussed below.

5.50 Subtheme 5.2: The inappropriateness of Option C and Option E Contracts for the MDPs

One of the main issues with HLE appeared to be the perceived suitability of the different contract options for them. The default contract for all the MDPs was an Option C (Target cost with activity schedule), with Option A (Priced contract with activity schedule) and Option E (Reimbursement contract) as alternatives. There was widespread agreement amongst the Quantity Surveyors that, in spite of the framework contract, HLE should be restricted to an Option A:

'SQS3 I work with them all the time and I agree. No Option Es ever and Option As a preference. Make them commit to a price.'

(SQS3 in Observation 12, lines 8 – 9)

'SQS2 It's got be an Option A every time, (CTL).'

(SQS2 in Observation 12, line 20)

'SQS2 It's gonna be an Option A with me every time. And if they don't like it, well…'

(SQS2 in Observation 12, lines 39 – 40)

'SQS3 I'm not using Option Cs with any of the MDPs, to be honest. It shouldn't be the default for the MDPs. Option Cs and Option Es are just a licence to print money.'

(SQS3 in Observation 12, lines 45 – 47)

The reason for the reluctance to give HLE an Option E were described by one of the Quantity Surveyors in Observation 12:

'SQS3 Like (CTL), the other thing is you can't query anything. It's supposed to be Open Book but if you see something that looks dodgy (0.2) like say fifty hours for a commissioning

engineer and you know they were only there a day (0.1) so

you query it and lo and behold back comes a timesheet

like magic showing 50 hours.'

(SQS3 in Observation 12, lines 21 – 26)

SQS3 appears to be suggesting that HLE often submitted labour costs for an Option E contract which needed to be queried; when they were, there was a suspicion that retrospectively-compiled timesheets would be returned.

In terms of the Option C contracts, the dissatisfaction appeared to arise from a belief that the target cost did not result from free and open negotiations between Managed Delivery North and HLE. Instead, there was a suspicion that HLE took an excessive time producing costs; that these costs were accompanied by many contract derogations; and that HLE would continue to stall until the point at which the project became urgent when the costs and derogations would be escalated to senior management and agreed:

'CTL *What's wrong with the Option Cs? What they doing?*

SQS2 *It's meant to be an agreed target cost, but basically the target*

cost is whatever [they want it to be]…

SQS3 *[They just drag their] heels and they give you*

a price that's got 53 derogations on it. They wait [until]

SQS2 *[You're]*

desperate to start on site and then you've just got to agree it all.

SQS3 *And if you don't they just escalate it anyway and it all gets*

agreed.

(SQS2, SQS3 and Commercial Team Leader in Observation 12, lines 28 – 36)

Option Cs were also considered inappropriate for one of the other MDPs, MacCallum Construction Ltd., who were contracted to carry out a large pan-Scotland programme or repairs to concrete water tanks:

'SQS1 *What option is it?*

SQS3 *C…they're all Cs now. They shouldn't be in my opinion. You don't know the scope til you start the job.*

SQS1 *That's not a C!'*

(SQS1 and SQS3 in Observation 2, lines 12 – 15)

The Quantity Surveyors' concern here was that it was not possible to drain down and inspect the water tanks prior to the start on site. This meant that the scope of works was not known when the target cost was defined, and the contract signed. These works did not seem appropriate for an Option C contract. However, as SQS3 further explained, and as has been noted above, Option Cs were the default contract option for all MDPs (Tier 1 contractors):

'SQS1 *That's not a C!*

SQS3 *(Tuts) You're telling me! It's stupid. It's just cos the default option for Tier 1s is a C. So, all of these (names programme of work) A's to start with. But [now]…*

SQS2 *['Cos] it's the default contract…*

SQS3 *Exactly! It's got to be a C.'*

(SQS1, SQS2 and SQS3 in Observation 2, lines 15 – 20)

As already noted, a further way of dealing with the perceived adversarial nature of the MDPs was the use of Early Contractor Involvement and this is now discussed below.

5.51 Subtheme 5.3: Using Early Contractor Involvement (ECI) to deal with MDPs

As has been mentioned above, one method of dealing with the supposed reluctance of the MDPs to fully collaborate was the strategy, designed by the Commercial Team Leader, to use Early Contractor Involvement (ECI).

In the following extract, the Commercial Team Leader suggested that Early Contractor Involvement could ensure that there was no possibility that the MDP could use ignorance of the early stages of the project (perhaps the site conditions or design issues) to launch compensation events later in the project:

'CTL *It's got to go through ARM, but basically*

what we need to do is try and manage them better through

the process. What I'm suggesting is we get early contractor

involvement in this so there's no way they can say later they

didn't know anything about the project.'

(Commercial Team Leader in Observation 4, lines 4 – 8)

As well as using Early Contractor Involvement, the Project Manager, Quantity Surveyor and Commercial Team Leader also agreed to split the project up into smaller parts and to only issue one part of the overall scope at a time:

'PM1 *We're going to split the scope up into three parts and just give*

one part at a time. We know what we need and we know what we want. But we've got to be really clear about it with ARM.'

(Project Manager in Observation 4, lines 19 – 22)

In this project it was believed that a Site Investigation (SI) was required before any further design work could proceed. The project team therefore decided to use Early Contractor Involvement to ask the MDP to appoint the engineer. This small piece of work would be used to assess the attitude of the MDP:

'CTL *Well (0.3) we just give them the first part of the SI scope and get them to engage the engineer. If we don't get co-operation with them on this, we're going to know about it sooner rather than later. We can make alternative plans.'*

(Commercial Team Leader in Observation 4, lines 25 – 28)

The Senior Project Manager also then clarified that time must be made to review the MDP's attitude and price before proceeding further with the project:

'SPM2 *Good. Let's make sure we definitely review what comes back from ARM before we go any further.*

PM1 *(nodding and looking at QS)*

(Senior Project Manager and Project Manager in Observation 4, lines 46 – 48)

Dissatisfaction with the performance and attitude of the MDPs led some Managed Delivery North staff to contemplate manipulation of the Decision Tree for contractors and this is now considered below.

5.52 Subtheme 5.4: Decision Tree Manipulation

In the following example, the Managed Delivery North staff wanted to manipulate the Decision Tree in an attempt to deal with the perceived adversarial tendencies of the MDP. The essence of the Decision Tree was that, if the value of the proposed work was to be greater than £250,000 or the project required design input or had third party issues, it had to be issued to an MDP. This contrasted with the Managed Delivery staffs' preference which was for the project to be awarded to an RDP:

'*PM1* *(groaning, turning notebook page over). Ugh, this is <u>another</u> one we should just be able to put to an RDP.'*

(Project Manager in Observation 4 , lines 2 – 3)

'CTL *It's got to go through ARM…'*

(Commercial Team Leader in Observation 4, line 4)

Here, the person who most clearly attempted to pursue a policy line with the Decision Tree (and, therefore, the Commercial Procedures) was the Commercial Team Leader. This person acted as a counterweight to the Project Managers, Senior Project Manager and most of the Quantity Surveyors who saw little reason to abide by the Decision Tree. The most prevalent view within Managed Delivery North staff was that abiding by the Decision Tree would damage the prospects of the project being delivered on-time, on-budget and with the required quality. The Senior Project Manager's view shown below is typical:

'SPM2 *(writing in notebook). Right, well I'm still really worried about*

this. I want to see the scope before it goes out to ARM

and if we get any (swears) from them, we just might as well

go consultant, RDP and I'll argue the case with (names Delivery

Manager) and whoever.'

(Senior Project Manager in Observation 4, lines 29 – 33)

'CTL [Yeah], but it's still got design and potentially third

party issues. It's got to go through an MDP, it can't

just go straight to an RDP.'

(Commercial Team Leader in Observation 4, lines 36 – 38)

One further argument for bypassing the Decision Tree was that the MDPs (particularly those based in the Central Belt) were not interested in Managed Delivery North projects anyway:

'SQS2 Well, I just think they don't want to do it <u>at all.</u> So (0.1) we were

<u>thinking</u> could we put the design out to (names CDP) and then

just tender it to RDPs?'

(SQS2 in Observation 9, lines 14 – 16)

Whether this assertion had any basis in fact was not shown in the observations (there were no situations in which an MDP was observed declining to take part in a project). It may have been the MDPs' insistence on asserting their contractual rights under that led the Managed Delivery staff to believe that the MDPs were not interested in delivering projects in the North area. Under the framework, MDPs were required to provide prices for all projects. Perhaps high prices, the production of many derogations or ARM's habit of producing invoices for not

pricing works led the Managed Delivery staff to perceive this as a contractually acceptable way of declining work.

Manipulation of the entire framework is now discussed further in subtheme 5.5.

5.53 Subtheme 5.5: Overturning the Framework

As well an manipulation of the Decision Tree, there also appeared to be a general perception that the entire framework could be overturned by granting all civils works (not just that under £250,000) to the RDP, DE Construction Ltd, rather than to the MDP, ARM Ltd. Under the framework, all civil engineering works over £250,000 and all works requiring design input or the resolution of third-party issues should have been granted to ARM.

It is not clear from the observations from where the idea to overturn the framework arose, how far it had senior management support and how developed it was. What is clear from the observations was that, following a serious health and safety breach by DE Construction, the idea had been abandoned. Whether this meant complete abandonment or a temporary halt in proceedings is not also clear.

'SPM2 *[Serious]. But any ideas we had of letting DE take over the civils from ARM, that's just out the window now.*

SQS3 *For the time being…or for ever?*

SPM2 *It's not going to happen [now].'*

(Senior Project Manager and SQS3 in Observation 5, lines 88 – 91)

The idea of replacing ARM with DE Construction may have arisen for a number of reasons. Firstly, it was perceived that ARM, as an English contractor, was reluctant to work in the north area. When they did undertake work in the north, they usually appointed DE Construction as a

subcontractor. Secondly, unlike the majority of the other RDPs (although not all of them – several very large companies including Morrison Construction and Morgan Sindall were RDPs under the Alba Water Rural Framework), DE Construction was a sizeable local contractor with a group structure and a design office. Within the north area it had a good reputation amongst Alba Water staff and was – until one of the later observations – considered to be a relatively collaborative partner.

One MDP, MacCallum Construction Ltd (MCL) was also considered to be largely collaborative in nature and this anomaly is now discussed below.

5.54 Subtheme 5.6: Collaborative MDP as an Anomaly

In contrast to the other MDPs, the contractor MacCallum Construction (MCL) was widely viewed as collaborative.

The reasons for this are complex. Firstly, it is important to realise that MCL were not the main MDP for civil engineering works in the north area. Instead, they were the appointed contractor for several pan-Scotland sub-frameworks such as the replacement of sample taps and concrete repairs to water storage tanks. They therefore had a much smaller, less complex remit than the main MDPs contractor, ARM and HLE.

Secondly, they were viewed by many Managed Delivery North staff as commercially incompetent:

'SQS2 *Oh well (pauses)…they don't really know what they're doing, do they?*

SQS1 *Nope, they're clueless, absolutely clueless.'*

(SQS1 and SQS2 in Observation 11, lines 5 – 7)

It is interesting to note that MCL's 'cluelessness' was then queried by one of the other Quantity Surveyors who felt it may actually have been a deliberate tactic on the part of the company, as shown in the following extract. However, it is also important to note that SQS1 may actually have been joking here:

'SQS1 *It might be a double bluff though, they might be a wee bit cannier than we give them credit for. I think they know exactly what they're [doing]…*

SQS2 *[laughs]… could be.'*

(SQS1 and SQS2 in Observation 11, lines 10 – 13)

The Quantity Surveyors did all appear to agree that the company's payment applications were so poorly presented that they were forced to amend them before processing:

'SQS1 *Their payment apps are so bad, they know we'll sort them out for them.*

SQS2 *That's the thing about MCL – you feel like you're their QS as well as your own.'*

(SQS1 and SQS2 in Observation 11, lines 14 – 16)

The curious phenomenon of a relatively large construction company producing payment applications which were (whether intentionally or not) so poor that they needed to be amended by the client's surveyors was also discussed:

'SQS1 *That's what I mean. I think they (swears) know that. I mean how can you have an MDP with millions of pounds worth of*

work with us and they don't have a commercial team.

SQS2 *Have they <u>never</u> had their own QSs?*

SQS1 *Not as long as I've worked with them, they haven't. They just get in these young engineers and they teach them how to do payment apps...*

SQS2 *Badly…'*

(SQS1 and SQS2 in Observation 11, lines 18 – 25)

MacCallum Construction, in spite of being a relatively large and Central-Belt-based contractor, had chosen not to have a traditional commercial department staffed by Quantity Surveyors. Instead, the payment applications were produced by the (often inexperienced) engineers who were also responsible for the day to day management of the projects. This was unique amongst Alba Water's Framework Tier 1 contractors.

In this sense, and perhaps only in this sense, MacCallum Construction was closer in structure to the RDPs, very few of whom had commercial departments.

This unusual structure for an MDP led to much discussion between the Managed Delivery North Quantity Surveyors. On the one hand, SQS2 believed that MacCallum Construction were essentially honest contractors one could trust:

'*SQS2* *…They wouldn't know how to put one over on you, MCL.'*

(SQS2 in Observation 11, lines 8 – 9)

However, when SQS3 then went on to claim that the company had actually tried to defraud Alba Water, SQS2 said 'they're always at it'. It is not clear whether, in this assertion, SQS2

was actually referring to the actions of all the MDPs, rather than to MacCallum Construction in particular:

'SQS3 *(leaning over from another desk). You know I found them trying to defraud us, [they were claiming]…*

SQS2 *[they're always at it]*

SQS1 *[what d'you mean?]*

SQS2 *[I had a (names project type)]…*

SQS3 *They put in a payment app for (names project type) and it was an Option C and they'd claimed costs for a bridge project for (names Scottish council), nothing to do with Alba Water…'*

(SQS1, SQS2 and SQS3 in Observation 11, lines 29 – 36)

Following SQS3's description of MacCallum Construction submitting costs for a council project which was unrelated to Alba Water, SQS1 expressed surprise followed by recognition. SQS3 then explained that, when confronted with the attempted fraud, MacCallum Construction immediately admitted the error and offered up a surprising explanation:

'SQS1 *No?! Actually it doesn't surprise me.*

SQS3 *Yeah. And when I asked them about it (names staff member) just said, 'Yeah, well sorry about that, but the we were a bit short on the cash-flow that month.'*

SQS1 *Oh my God! [That's so bad].'*

(SQS1 and SQS3 in Observation 11, lines 38 – 41)

In spite of this, the Quantity Surveyors seemed to agree that owning up to an attempt to defraud Alba Water was preferable to some of the more underhanded methods of recovering costs attempted by the other MDPs. In view of the seriousness of what MacCallum Construction attempted this is really quite surprising:

'SQS1 *I'd rather work with them than HLE.*

SQS2 *Definitely. They're too honest. I can't imagine any other MDP owning up to something like that…*

SQS3 *God no. I'd have said it's just a mix up and it won't happen again. I'd never have actually said, 'Yeah, we were just a bit short that month. Sorry about that.'*

SQS2 *Amazing. (picks up cup). Coffee (SQS1)?'*

(SQS1, SQS2 and SQS3 in Observation 11, lines 49 – 55)

This exchange is perhaps one of the most startling of the **e**ntire period of observations. The Quantity Surveyors appeared to prefer an apparently incompetent contractor who submitted such poorly produced payment applications that they had to spend large amounts of their own time altering and amending the applications so that they could be processed; and who submitted fraudulent costs from non-Alba Water projects, but immediately owned up and apologised, than the MDPs who vigorously defended their contractual rights.

The position of the Tier 2 (RDP) contractors is now discussed in theme 6 below.

5.55 Theme 6: RDPs (Tier 2 Contractors) Within Alba Water Managed Delivery North

RDPs (Rural Development Partners) were the Tier 2 contractors under the Alba Water framework. They too were divided by region and by work type, usually mechanical and electrical or civil engineering. However, the RDP framework also included specialists in pump fitting, landscaping and chemical dosing. The majority of RDPs operating in the north area were civil engineering companies. Unlike the MDPs, RDPs were not expected to undertake pan-Scotland wide programmes of work.

There were several important differences between the RDP and MDP frameworks. Firstly, RDPs were to only carry out works less than £250,000 in value. Where a project was under £250,000 in value but required design input or had third party issues which required resolution before work could begin on site, it had to be carried out by an MDP. Secondly, the default contract for an RDP was an Option A and Option Cs could not be used. It was considered that, on the whole (some RDPs were, in fact, large contractors such as Morgan Sindall), RDPs did not have the financial recording systems in house to enable them to operate an Option C. Only Option A (Price contract with activity schedule) and Option E (Reimbursement) contracts could be awarded to RDPs.

Several RDPs predominated within the work of Managed Delivery North. DE Construction, a medium sized civil engineering company, based in Polness, thirty-five miles from Location I, was often used. In addition, for contracts on the West Islands, several of the RDPs based there were frequently chosen.

Several sub-themes emerged in discussions of the Rural Development Partners. These were:

Subtheme 6.1: Competence of Rural Development Partners (RDPs);

Subtheme 6.2: Weaknesses of Rural Development Partners (RDPs);

Subtheme 6.3: Decision Tree Manipulation;

Subtheme 6.4: Overturning the Framework.

5.56 Subtheme 6.1: Competence of Rural Development Partners (RDPs)

There was, in general, much greater warmth in the way RDPs were viewed by the Managed Delivery North staff and this is illustrated in the extract below:

'PM1 *That's why we wanted to go straight to DE. They're local, we trust them, they've got a quarry, this is their dream job.'*

(Project Manager in Observation 5, lines 58-59)

The staff also seemed to feel a real sense of responsibility towards the RDPs and wanted to give them every opportunity to price for projects in their area:

'SPM2 *All Highlands RDPs? Including the Islands' RDPs?*

CTL *Well (0.2) I think, yeah, why not?'*

(Senior Project Manager and Commercial Team Leader in Observation 5, lines 111 – 112)

In fact, the situation was even more favourable for RDPs as SQS1 claimed that they direct-awarded 95% of their contracts to RDPs.

However, RDPs were also perceived to have weaknesses and these are now discussed below in subtheme 6.2.

5.56 Subtheme 6.2: Weaknesses of RDPs

Whilst Quantity Surveyors often expressed a preference for working with RDPs, they were not unaware of the contractors' weaknesses and faults. However, they appeared to view the RDPs' mistakes as regrettable and spoke sympathetically about them on these occasions:

'SPM2 *Hm. What a shame they've screwed up so badly on (names island).'*

(Senior Project Manager in Observation 5, lines 60 – 61)

On the occasions where the RDPs made mistakes, Managed Delivery North staff also seemed to appreciate the honesty with which the RDPs approached reviews of these events:

'SPM2 *He's just held his hands up to it. But trouble is, from the business's point of view, it's just <u>way too serious.</u>*

CTL *You can't…*

SP *Using an excavator without a restrictor under live electricity (indistinct) mains…*

CTL *You <u>just can't ignore</u> that, the business <u>can't</u>, it's too [serious].'*

(Senior Project Manager, Senior Planner and Commercial Team Leader in Observation 5, lines 81 – 87)

In spite of an obvious preference in many instances for the use of an RDP rather than an MDP, Quantity Surveyors did often recognise that RDPs had been pushed beyond their own competence levels:

'PM1 Their project management was just hopeless. I mean, that's the lesson for me, that we won't be engaging an RDP for a job of this, er (0.2) you know, complexity. Without an MDP providing the project management on top.'

(Project Manager in Observation 9, lines 14 – 16)

Managed Delivery North staff were often prepared to manipulate the Decision Tree to award a contract to an RDP rather than an MDP and this is now considered below.

5.57 Subtheme 6.3: Decision Tree Manipulation

It is clear that many of the Managed Delivery North staff preferred to use an RDP rather than an MDP:

'PM1 (groaning, turning notebook page over). Ugh, this is another one we should just be able to put to an RDP.'

(Project Manager in Observation 4, lines 2 – 3)

Some Managed Delivery North staff were prepared to manipulate the Decision Tree to award a project with design issues to an RDP. They proposed that this could take place by firstly awarding the design to a CDP and then, once the design as complete, awarding the construction phase to an RDP. This manipulation is described in the extract below:

'SPM2 (writing in notebook). Right, well I'm still really worried about this. I want to see the scope before it goes out to ARM and if we get any (swears) from them, we just might as well go consultant, RDP and I'll argue the case with (names Delivery

Manager) and whoever.'

(Senior Project Manager in Observation 4, lines 29 – 33)

However, some staff, notably the Commercial Manager, attempted to block manipulation of the Decision Tree in this way:

'CTL [Yeah], but it's still got design and potentially third party issues. It's got to go through an MDP, it can't just go straight to an RDP.'

(Commercial Team Leader in Observation 4, lines 36 – 38)

In this case, the excuse that the MDPs were not interested in small projects like this was used to justify the proposed course of action:

'SQS2 Well, I just think they don't want to do it <u>at all.</u> So (0.1) we were <u>thinking</u> could we put the design out to (names CDP) and then just tender it to RDPs?'

(SQS2 in Observation 9, lines 14 – 16)

As well as manipulation of the Decision Tree, there was an attempt to overturn the entire framework for civil engineering works and this is now discussed below in subtheme 6.4.

5.58 Subtheme 6.4: Overturning the Framework

Because of widespread dissatisfaction with the performance and adversarial attitude of ARM Ltd, a plan to overturn the framework and grant all large-scale civil engineering works to the RDP, DE Construction was discussed in the observations. As noted above, it was not clear how or where this plan arose and the level of senior management support it had. Perhaps the

intention was to award DE Construction projects where ARM had already indicated they were not interested. Or perhaps, DE would have been allowed to take over ARM's work by stealth over a period of months and years. None of this is clear from the observations. In any case, the plan was abandoned when DE committed a major health and safety breach (allowing an excavator without a restrictor to operate on a housing estate with overhead power lines). The abandonment of this plan is discussed below:

'SPM2 *[Serious]. But any ideas we had of letting DE take over the civils from ARM, that's just out the window now.*

SQS3 *For the time being…or for ever?*

SPM2 *It's not going to happen [now].'*

(Senior Project Manager and SQS3 in Observation 5, lines 88 – 91)

The final theme to emerge from the thematic analysis of data was that of dispute resolution and this is now discussed below.

5.59 Theme 7: Commercial Dispute Management within Managed Delivery North

Much of the dissatisfaction expressed in the observations concerned the difficulty Participants experienced in trying to resolve commercial disputes, particularly with the MDPs. Whilst Alba Water as a whole had an espoused theory of collaboration with its delivery partners and chose to use the NEC contract because it was widely believed to encourage collaboration (e.g. Latham, 1994), disputes both large and small did occur within Managed Delivery North. Although the default contract dispute mechanism was adjudication this was never used in the period of the observations.

The most common form of dispute resolution for the contractors – especially the MDPs – was the so-called Escalation Process or Escalation Procedure. This informal custom allowed

contractors who were unhappy with a decision taken by a project team to ‘escalate’ the dispute to the team’s line managers. In most cases this meant the Commercial Team Leader or the Senior Project Manager but, disputes were sometimes referred directly to the Delivery Manager and the Commercial Manager who were both based in the Central Belt.

There was not a single line manager for project teams. Project teams were comprised of Quantity Surveyors and Project Managers, each of whom were managed by a different line manager. The Quantity Surveyors were line-managed by the Commercial Team Leader and the Project Managers by one of the two Senior Project Manager. The choice of who to escalate to – the Commercial Team Leader or the Senior Project Manager - was left to the discretion of the contractor. The matter might be escalated to the Commercial Team Leader or the Senior Project Manager or both. The contractor did not always have to refer the matter in stages, i.e. to the Project Manager, the Senior Project Manager and, in turn, the Delivery Manager. They could go straight to the Delivery Manager or even a Board member if they felt the matter was serious enough.

Where a matter was referred to more than one manager, that manager might be unaware of who else had also received a referral. And they might therefore choose to make a decision alone or discuss it with their counterpart. It was perhaps his flexibility and lack of formal procedure that causes so much discomfiture amongst team members.

Several subthemes emerged during the observations. These were:

Subtheme 7.1: Unhappiness with the Escalation Procedure;

Subtheme 7.2: MDPs’ Attitude Towards Adjudication;

Subtheme 7.3: Alba Water’s Attitude Towards Adjudication.

5.59 Subtheme 7.1: Unhappiness with the Escalation Procedure

There was a widespread and general dislike of the Escalation Procedure. A perception existed that the higher the matter could be escalated by the contractor the more likely Alba Water was to agree with the contractor's position:

'SQS1 *...it's gone up*

the chain and (names Commercial Manager) might pay it.

SQS2 *No?! I don't believe that (swears).*

SQS1 *Well, (names auditor) says (names Commercial Manager) is in*

ARM's pocket.

SQS2 *They're all the same.*

SQS1 *(Names auditor) says he keeps pulling things in the audits and*

(names Commercial Manager) tells him he's got to allow them.

SQS2 *(swears).'*

(SQS1 and SQS2 in Observation 2, lines 102 – 110)

It was not clear whether the use of the Escalation Procedure required the consent of the team members being complained about. Often only the Project Manager was aware of the escalation and sometimes, it could occur without the Quantity Surveyor's consent or even knowledge as shown below:

'SQS1 *...And, to be*

honest, I'm not very happy about him going behind my back to

you. It just makes me look stupid to DE.'*

* DE Construction

(SQS3 in Observation 6, lines 13 – 15)

In this case, as in many other instances, the Commercial Team Leader attempted to smooth over the issue:

'CTL …er…but I didn't give him

advice one way or another. I told him he needed to discuss it

again with you.

SQS1 Well, he didn't. He just told (DE's MQS) he'd pay it. And

I've only just found out about it now.'

(Commercial Team Leader and SQS1 in Observation 6, lines 27 – 31)

There seemed to be a common feeling amongst the Quantity Surveyors that - if they had refused to pay something it was for good reason and that, by over-riding this – senior managers were failing to protect public monies:

'SQS1 [You've got} to take a stand sometimes, (CTL).

We can't just let the contractors get away with stuff. It's public

money and we're just (swears) away sometimes.'

(SQS1 in Observation 6, lines 33 – 35)

'SQS1 [You've got to stand] up for stuff. You can't cave in on

everything, it's public money.'

(SQS1 in Observation 6, lines 80 – 81)

Of course, when presented with an escalated dispute, senior managers – whether at Commercial Team Leader or Senior Project Manager level or above – were duty bound to consider both the contractors' and project teams' viewpoints. Having done this they would, of course, sometimes have sided with the contractor against the project team. However, the perception amongst the project teams was that due consideration was not always given to the rights and wrongs of particular dispute and that the decisions taken by the management were much more arbitrary:

'SQS2 *(names HLE member of staff) was threatening to escalate it.*

Observer *Right. What happens then?*

SQS2 *Well (0.6) it depends. Sometimes, they'll back you and let you do it your way, sometimes they'll just tell you to pay it.*

Observer *That must be frustrating?*

SQS2 *Everything about this place is frustrating. It's the blind leading the [blind]…'*

(Observer and SQS2 in Observation 10, lines 43 – 48)

Some of the Quantity Surveyors felt strongly that their position was hopeless; that, in the event of a dispute, they had to either do what the contractor wanted or the issue would be escalated anyway and the contractor would get their own way:

'SQS3 *And if you don't they just escalate it anyway and it all gets agreed.'*

(SQS3 in Observation 12, lines 35 – 36)

It is important to realise that the Escalation Procedure was not formalised in, for instance, the Commercial Procedures. It appeared to be a form of custom and practice that had become established over time.

The extent to which it was used may have been due, in part, to the widespread belief amongst the contractors, that they should not risk their relationship with Alba Water by resorting to contractual dispute through the use of adjudication. Both MDPs' and Alba Water's senior management's attitudes towards the use of adjudication are discussed now below.

5.60 Subthemes 7.2 and 7.3: MDPs' and Alba Water's Attitudes Towards Adjudication

The importance to contractors of the Escalation Procedure can perhaps be partially explained by Alba Water's attitude towards adjudication, the default dispute resolution mechanism in all contracts. Contractors felt strongly that adjudication was not a realistic option in a dispute as can be seen in the following extract. Here a Director of an MDP was asked why they didn't use adjudication in a large dispute with Alba Water:

> *'MDPD* *Honest answer? We're in a Framework. You know, we're in the middle of SR15, SR21's already kicking off. We had to take the hit on it this time. Whether that would happen again, I can't say. we might well adjudicate next time.'*
>
> (Director of MDP in Observation 7, lines 31 – 34)

SR15 was the title of the existing 6-year framework. At the time of the observations, discussion for the tendering of SR21 the next 6-year framework were underway. The contractor felt strongly that they could not risk jeopardising their relationship with Alba Water - and hence their chances of being selected for the upcoming framework - by taking a dispute to adjudication, in spite of the fact that this dispute involved a sum of over £800,000.

The contractor's suspicion that taking a dispute to adjudication would be judged unfavourably by Alba Water seems to be borne out in the following exchange:

'SPM2 *I don't think adjudication would have sat well with us, with us, I mean, with (names senior management at AW). It wouldn't have gone down well at all.*

MDPD *That's what we thought, so we took the hit.*

SQS3 *It's a big hit, though, int it? Four hundred grand?*

MDPD *It is. It's a big write-down in the accounts for us, big pain. It was felt right through the company…you know, there's a lot of stuff gone on internally that results from that write-down. I can't tell you what, but it's major, major, major stuff. I can tell you that.'*

(Director of MDP in Observation 7, lines 35 – 43)

The Director of the MDP suggested that the failure to make good on this claim had caused serious problems within the company and led to a major write-down in the accounts. Could their reference to *'a lot of stuff gone on internally that results from that write-down'* have been a reference to redundancies, restructures or demotions? Whatever the nature of the consequences, it is clear from the tone of the Director's comments that the failure to resolve this claim to their satisfaction was painful to the MDP.

Following this discussion of the thematic analyses, a short section now considers the semi structured interviews which were conducted but not used in the final report.

5.61 Semi- structured interviews

Semi-structured interviews were conducted with two of the Participants – SQS1 and SQS2. The initial intention was to 'tease out' these Participants' espoused theories and – perhaps – also indications of their actual theories in use. The interviews covered the Participants' backgrounds as Quantity Surveyors, their experiences within Alba Water, their attitudes towards commercial risk management and their experiences and thoughts on any commercial risk management training they had received whilst at Alba Water.

Once the observations commenced it became clear that covering only the observed work of the two QSs, SQS1 and SQS2, without that of the other staff members they interacted with (for example, the Commercial Team Leader, the Senior Project Manager or the Project Managers), would make little sense. At that point the value of the initial interviews with SQS1 and SQS2 appeared to decline. SQS1 and SQS2 operated within their own project teams (with different Project Managers), were part of the Alba Water North Commercial Team (with four other Quantity Surveyors and the Commercial Team Leader) and were also part of the Managed Delivery North team (comprising all the Project Managers based in Location I, the two Senior Project Managers, the Senior Planner and the Project Co-ordinator).

SQS1 was a member of two project teams, each comprising a Senior Quantity Surveyor and a Project Manager. In addition, they were a member of the North Commercial Team, comprising five Senior Quantity Surveyors and one Senior Cost Engineer. Finally, they were also a member of the Managed Delivery North Team, comprising one Commercial Team Leader, two Senior Project Managers, fourteen Project Managers, five Senior Quantity Surveyors, one Senior Cost Engineer, one Project Co-ordinator and one Senior Planner.

However, a further confusion was that the Major Projects Team – a project team dealing with major projects which were late being delivered – and comprising a Project Manager, Senior

Quantity Surveyor and a Senior Cost Engineer – were managed by Delivery Manager 3 and Commercial Manager 3, both based in the Central Belt, whilst being – for day to day purposes – also managed by Senior Project Manager 1 (based in Location I), but not by the Commercial Team Leader based in Location I. Clearly, all these confused lines of responsibility and line management caused problems on a daily basis. It was often not clear to Quantity Surveyors or Project Managers from whom they should take instruction. Neither was it clear to managers to whom they should offer instruction. It may have been that a management structure which suited offices based in the Central Belt (there were three – Edinburgh, Dundee and Glasgow) simply did not work when transferred to Location I. Or it may have been a legacy of the relatively recent merger of the different Alba Water companies (North, East, West and South). Whatever the cause, it was clear that the confusing and often contradictory lines of management responsibility both served to reinforce the notion that Quantity Surveyors were independent professionals who should ultimately rely on their own judgement; it also acted as a block to those wishing to make change and simplify and reinforce strong lines of responsibility and management, as well as develop robust procedures and policies which staff members were expected to follow. At the time of the observations it was unclear which philosophy – Quantity Surveyors as independent professionals or Quantity Surveyors following clear set procedures – would win out. Clearly each philosophy had its own merits and drawbacks.

In reality, staff members were aware of these tensions and sometimes exploited them to put themselves in the strongest position. This was particularly true of the Major Projects Team. Line reporting was to a Delivery Manager and Commercial Manager based in the Central Belt, whilst project reporting was to the Managed Delivery Team North Senior Project Manager (SPM1). It seemed clear that the staff members – all highly experienced and competent professionals in their own rights – used this anomaly to render their team somewhat outwith Managed Delivery and – in fact – an independent team with their own internal procedures and

scrutiny. Other project teams used the Managed Delivery's rather remote location and its distance from senior staff – as a reason for not complying with centrally developed procedures. In essence staff members – particularly the Quantity Surveyors – appeared to view new procedures as 'points of interest', the starting point for actual practise was very much their own opinion on the matter.

The study now proceeds to consider the issue of validity and reliability.

5.62 Validity and Reliability – establishing trustworthiness

5.62.1 Introduction

Lincoln and Guba (1985, p300) claim the four terms 'credibility', 'transferability', 'dependability' and 'confirmability' as the naturalists' equivalents of the conventional terms 'internal validity', 'external validity', 'reliability' and 'objectivity'.

Table 39 below illustrates how the strategies recommended by Wolcott (1994) and Lincoln and Guba (1985) to establish trustworthiness were used in Study 2. The application of several of these methods to the study, negative case analysis, Member Checking and the use of a Reflective Diary, are then discussed in detail below.

Table 39: The Trustworthiness Strategies used in Study 2

Author	**Method**	**Relevance in this study**
Wolcott (1994, p348)	Talk little, listen a lot	Over thirty hours of observations were made. The Observer's comments amounted to less than 2% of the dialogue recorded.
Wolcott (1994, p349)	Record accurately	Observations were recorded using shorthand. Verification of 20% of the transcriptions were made by a fellow student.
Wolcott (1994, p349)	Begin writing early	Writing commenced once the thematic analysis had been made.
Wolcott (1994, pp350-351)	Let readers 'see' for themselves	Data analysis section used a high percentage of direct quotes and transcriptions are appended to report

Wolcott (1994, pp351)	Report fully	No attempt to restrict findings to any theme or to provide evidence for particular theories was made.
Wolcott (1994, pp351-352)	Be candid	No attempt was made to 'sanitise' the findings of the observations.
Wolcott (1994, p353)	Seek feedback	Feedback was sought from the Supervisor, fellow students, Participants and non-Participant Alba Water employees.
Wolcott (1994, p354)	Try to achieve balance	A Reflective diary and Supervisory feedback were used to attempt to achieve balance and not overstate the findings.
Wolcott (1994, p354-356)	Write accurately	Two Participants and the study's supervisor read through the data analysis chapter and initial findings and provided comment which was incorporated into the final report.
Lincoln & Guba (1985, pp301-304)	Prolonged engagement	The study was based on over twelve months of engagement and three months of non-participatory observations.
Lincoln & Guba (1985, pp304-305)	Persistent observation	The three-month period of non-participatory observations was an attempt to record a high percentage of the interactions between team members. However, whether this constitutes 'persistent observation' is not clear.

Lincoln & Guba (1985, pp305-307)	Triangulation	The decision to extend the Participant group from two to six QSs reflected a desire to triangulate findings between different QSs.
Lincoln & Guba (1985, pp 308-309)	Peer debriefing	Debriefing with the supervisor, one of the Participants and the Commercial Manager took place during the observation phase.
Lincoln & Guba (1985, pp309-313)	Negative case analysis	Negative case analysis was used in case of MacCallum Construction.
Lincoln & Guba (1985, pp313-314)	Referential adequacy	There were insufficient resources available to allow for the use of referential adequacy.
Lincoln & Guba (1985, pp314-316)	Member checking	Two Participants provided member checking and provided feedback on the initial and revised findings.

5.62.2 Negative Case Analyses

Negative case analysis is one of the five major techniques suggested by Lincoln and Guba (1985) as methods which make it *'more likely that credible findings and interpretations are being produced'* (p301). Lincoln and Guba follow Kidder's (1981) technique, but with important amendments. Essentially, Kidder prescribes negative case analysis as the continuous refinement of hypotheses until all known cases are accounted for without exception. Lincoln and Guba, however, contest that Kidder's insistence on zero exceptions is unrealistic:

> *'In situation where one might expect lies, fronts, and other deliberate or unconscious deceptions (as in the case of self-delusions) some of the cases ought to appear to be exceptions even when the hypothesis is valid simply because the false elements cannot always be penetrated.'* (Lincoln & Guba, 1985, p312).

In their conclusion, Lincoln & Guba suggest that a fit to the hypothesis of as low as sixty percent is *'substantial proof of its acceptability'* (Lincoln & Guba, 1985, pp312-313).

Whilst the MDPs were widely regarded as adversarial and the RDPs as collaborative, there were two important exceptions to this. MacCallum Construction (MCL) was an MDP regarded by most of the Quantity Surveyors as collaborative. DE Construction (DE) was an RDP initially viewed as collaborative but, following a change of personnel in the commercial office, then increasingly regarded as adversarial.

These negative case analyses are now considered below. The discussion concludes by considering the impacts of each negative case analysis on the overall case.

5.62.2.1 MacCallum Construction (MCL)

The distinctive case of MacCallum Construction (MCL), an MDP which did not fit the adversarial stereotype of Alba Water's Tier 1 contractors, was commented on several times by different Participants in the study, for example:

> *'SQS1* *I'd rather work with them (MCL) than HLE.*
>
> *SQS2* *Definitely. They're <u>too</u> honest. I can't imagine any other MDP owning up to something like that… '*
>
> (SQS1 and SQS2 in Observation 11, lines 49 - 51)

Their more collaborative nature was also commented on in the written feedback provided by one of the Participants:

> *'…over a period of time, we worked as one. This trust/good faith, whatever you wish to call it, worked and resulted in both companies' systems becoming aligned, allowing MCL to catch up on submissions and replenish their cash flow situation. We have since continued to follow this process to work more closely together commercially and as a result, we have found ourselves in a stronger, more sustainable relationship. This was a good example of a sound Collaborative working environment, hopefully it will continue.'*
>
> (Member Checker A feedback, lines 59 - 63)

At first sight, this appears to be a negative case, disproving an early finding that all the MDPs (Tier 1 framework contractors) were adversarial and uncollaborative in their dealings with Alba Water staff.

It is interesting to consider whether the fact of MCL's perceived collaborative nature suggests greater similarities with the RDPs rather than the MDPs. The three contractors used most frequently by the Managed Delivery North team were MDP's Highland Engineering Ltd (HLE) and MacCallum Construction Ltd (MCL) and RDP, DE Construction Ltd (DE). In the observations, the contractors MacCallum Construction (an MDP) and DE Construction (an RDP) were often ranked as similar in terms of their competences, reliability and collaborative natures. This was usually contrasted with the MDP contractors, Highland Engineering, (HLE) and ARM Ltd (ARM), widely viewed as extremely adversarial. One might expect, therefore, that DE Construction and MacCallum Construction's turnovers might be similar. Table 40

below illustrates the four companies' turnovers and rates them relative to the largest, ARM Ltd:

Table 40: Turnover comparisons of three most commonly used contractors in Managed Delivery North with that of the largest available to them

Contractor	**MDP or RDP**	**Turnover to y/e 31/03/2018**	**Proportion turnover to that of largest MDP**
ARM Ltd	MDP	£2.2b (2017)	n/a
HLE	MDP	£53m	2.4%
MCL	MDP	£33m	1.5%
DE	RDP	Less than £6.5m	0.3%

In fact, MacCallum Construction were – in terms of their turnover - much closer to Highland Engineering than to DE Construction, the largest RDP. And both MacCallum Construction and Highland Engineering were tiny in comparison to the largest MDP, ARM Ltd (2.3% and 1.5% of ARM's turnover respectively). The perception of MacCallum Construction and DE Construction as 'similar' therefore, can be said to be unrelated to their size.

MCL were strongly criticised in one observation for submitting a payment application which included monies for a non-Alba Water project. The Participants' opinion of this are instructive:

'SQS1 *I'd rather work with them than (names other MDP).*

SQS2 *Definitely. They're too honest. I can't imagine any other MDP owning up to something like that…*

SQS3 *God no. I'd have said it's just a mix up and it won't happen*

again. I'd never have actually said, 'Yeah, we were just a bit short that month. Sorry about that.'

SQS2 *Amazing. (picks up cup). Coffee (SQS1)?*

(SQS1, SQS2 and SQS3 in Observation 11, lines 49 - 55)

It seems that it was MacCallum Construction's honesty that the teams appreciated, even when this involved an alleged attempt at deception on the part of the contractor!

5.62.2.2 DE Construction

It is also interesting to consider the general perception of the RDPs as collaborative. Certainly, this was apparently subject to exception too.

'SQS1 *'[You've got to stand] up for stuff. You can't cave in on everything, it's public money.*

PM1 *(putting tupper-ware box on worktop). Aye, but, you know.*

SQS1 *You can't let some little (swears) like (Managing Surveyor at RDP) bully you all the time.*

PM1 *Mm.'*

(SQS1 and PM1 in Observation ??, lines 80 – 85)

In this case of the contractor, DE Construction, a change in the managing surveyor had seemed to herald the advent of a more adversarial approach to contracts than had previously been the case. The Quantity Surveyor in question was complaining about a disputed payment being escalated to the Commercial Team Leader who had told the Project Manager to discuss the matter first with the Quantity Surveyor in question. The Project Manager seems to have ignored

this advice and contacted the contractor themselves to confirm that the payment would be made. Although it was the Project Manager who had escalated the dispute (and not the contractor, which was the usual case), the Quantity Surveyor believed that the change to a more adversarial position resulted from the promotion of one of the contractor's Quantity Surveyors to the position of Commercial Manager.

In terms of amending the hypotheses, 'all MDPs are adversarial in nature' and 'all RDPs are collaborative', although Lincoln and Guba state that a fit to hypothesis of as low as 60% is sufficient evidence, in this case it would seem more credible to assert that 'the majority of MDPs were viewed as adversarial' and 'the majority of RDPs were viewed as collaborative.' This incorporates the negatives cases of MacCallum Construction, viewed as a collaborative MDP and of DE Construction, viewed in the observations as an increasingly adversarial RDP.

It seems then that, although the teams' working hypothesis that RDPs tended to be more collaborative and MDPs to be more adversarial in nature, they did in fact take each contractor as they came and judged them on their own merits.

5.62.3 Member checking

Three Quantity Surveying Participants were asked to give feedback on the initial findings. Two agreed and one declined. Although reluctant, the third Participant may have offered feedback if pushed; however, they felt they had 'given enough' to the study already in allowing their work to be observed in the first place. Clearly, this had to be respected.

Feedback from the two Member Checkers was initially given verbally in meetings outwith Alba Water premises (in a café and in a restaurant in Location I). The meetings were not recorded but detailed notes were kept. One Member Checker then asked if they could give written feedback and 'validation' questions were prepared with the study's supervisor. For consistency, the second Member Checker was then asked to provide written feedback. Both Participants were Quantity Surveyors from the six studied in the main research and written responses were received by email. For the purposes of the member checking exercise they were given the pseudonyms of Member Checker A and Member Checker B.

Both Participants provided interesting and thoughtful commentaries on the initial findings. Unsurprisingly, the written feedback from the Member Checker who had suggested providing it in the first place was more detailed than that provided by the second Member Checker. These written questions, developed with the supervisor, are shown below in Figure 13. Extracts from the Member Checkers' written and verbal feedback and discussion are shown below.

Figure 13: Written Feedback Questions for Participants

Testing initial findings with Member Checker A and Member Checker B

Introduction

In the1980s and 1990s construction litigation was extremely common, particularly in England (in Scotland, disputes had traditionally been settled by arbitration not litigation). By the early 1990s, construction and civil engineering cases accounted for more court time than any other industry.

Governments responded to the failings of the industry by producing two reports (Latham, 1994 and Egan, 1998), both of which recommended collaboration, more emphasis on teamwork and greater risk-sharing as some of the solutions to the industry's problems. Both Latham and Egan recommended that NEC (which was first published in 1993) be more widely used, specifically because of its emphasis on teamwork and collaboration.

Q1: Could you say a little about what you understand by the term 'collaboration' and where you first encountered it in relation to construction and engineering projects?

Initial Findings

I have been using interviews and observations over the past 5 years to explore commercial risk management, risk sharing and collaboration in both construction contractors and clients. Some of my initial findings are that:

- People generally recognise when they're working in a collaborative arrangement (and also when they're not), but collaboration – a human process – is very difficult to test or measure;
- Collaboration is only one tool contractors use to 'get what they want' (timely payments, agreement of compensation events, agreement of derogations etc);
- Smaller contractors (RDPs in the case of Alba Water) tend to be more collaborative than larger ones (MDPs), but this may be because they lack the commercial resources to use other more contractual tactics. There are also exceptions to this rule (e.g. MacCallum Construction, who are an MDP, but generally considered to be collaborative).
- Because NEC offers no advice on how to act if a contractor is not minded to collaborate, client project teams are forced to develop their own strategies to 'silently' manage this situation (e.g. manipulating decision trees to 'choose' more collaborative contractors, insisting on an Option A rather than an Option C with non-collaborative contractors, using specialised teams (see below));
- QSs often seek to specialise in working with particular types of contractors, in line with their own experience and levels of confidence. For instance, QSs may specialise in dealing only with small projects and smaller contractors (e.g. RDPs in the case of AW) or they may choose to work with more adversarial contractors. This specialisation can cause conflict within teams of QSs but it may actually be a sophisticated way of dealing with such a wide spectrum of contractors.

Q2: Could you comment on my initial findings about AW. Do they 'ring true' or has your experience at AW been different?

Q3: Could you also say a little about AW Solutions 1 and how and why you think this model was so effective?

5.70.3.1 Findings from the Member Checking Exercise

Both Member Checkers agreed with the broad findings of the study; B stated that *'The findings outlines above certainly ring true with AW'* (Member Checker B feedback, 2019, line 1), whilst A said, '*I have to somewhat agree with you.'* (Member Checker A feedback, 2019, line 49).

B and A agreed that project teams developed their own strategies for managing contractors they considered to be adversarial and that these included manipulating the Decision Tree, using specialised teams of Quantity Surveyors and insisting on Option A contracts rather than Options Cs. They also agreed there was confusion about the Quantity Surveyors' role and that the organisation was largely focused on deadlines rather than costs. However, as might be expected, A and B had different perspectives and points of emphasis within their feedback. An attempt to give full and due respect to these differences is detailed below.

B described the lack of consistency within the organisation, how they thought this arose and also that it was business-wide in its nature:

> *'One thing that is certainly apparent is the lack of formalisation of processes within AW. A lot of the scenarios such as specialised teams discussed above, have been adopted by means of coping with challenging contractors and lack of collaboration, however the business is yet to recognise these as formal strategy or look to make them redundant by bettering relationships and promoting 'actual' collaboration. In consistency in approach is common within AW and this goes across regions, across teams and then across line managers.*' (Member Checker B feedback, 2019, lines 1 – 9)

A agreed that there was much inconsistency in approach and gave several examples:

> *'We have indeed seen more reluctance within certain elements of the Commercial Team to offer up an Option C contract in preference to an Option A…this has only been with certain MDP's not all.'* (Member Checker A feedback, 2019, lines 94 – 98)

> *'If an Option C has been used, then retention is becoming more widely used.'* (Member Checker A feedback, 2019, line 99)

> *'Finally, as you state, there have also been occasions when the Project Team's (sic) would like to utilise other possible contractors, to avoid suspected future pitfalls/hurdles.'* (Member Checker A feedback, 2019, lines 113 – 115)

> *'I agree that certain QS's do exclusively specialise/deal with RDP's and small value projects, where others deal more with MDP's and higher value projects.'* (Member Checker A feedback, 2019, lines 120 – 122)

Like B, A gave explanations for how these inconsistencies had arisen. For instance, in respect of the specialisation of certain Quantity Surveyors A stated:

> *'This is due to a few factors, two of which you correctly state as down to levels of confidence and experience, but it also down to the setup that was implemented by senior management.'* (Member Checker A feedback, 2019, lines 122 – 124)

A also indicated that, where Quantity Surveyors were unable to implement their ideal amendment to the Decision Tree (in choosing a preferred contractor), they may have used a further manipulation:

> *'…but unfortunately, the specialisation of many of the works AW are required to carry out, limits us to certain contractors. This then goes full circle to the start of my answers*

on this point, where Option A becomes preferred to Option C contracts.' (Member Checker A feedback, 2019, lines 115 – 118)

In other words, Quantity Surveyors may have wished to choose a different contractor for a project but, because of the specialised skills required for the job, this was not possible. Instead, they used a contractor they trusted less, but insisted on an Option A contract.

In essence then, the issue here appeared to be the concept of collaboration. In response to Question 1 *('Could you say a little about what you understand by the term 'collaborative' and where you first encountered it in relation to construction and engineering projects?'*) A gave a full and detailed response to this question, whilst B chose not to answer it.

A commented that *'For me, collaboration means combining the knowledge, experience and talent of the personnel within both the client and contractors' teams, to allow for a more efficient, profitable and ultimately successful project.'* (Member Checker A feedback, 2019, lines 1-3).

On the other hand, A later expressed ambiguity about whether or not collaboration took place at all within construction:

'I doubt if many know or even care, if and when it is being implemented or not. What I mean by this, is, that no matter how good the intentions, people / companies are, for another word, selfish in their outlook.' (Member Checker A feedback, 2019, lines 36 - 39)

A expanded on this, saying:

'I believe if a situation arises within a collaborative arrangement, where an issue/incident arises that could be negative to yourself or company, the individuals will

find it difficult to 'undermine their own' and will instinctively go on the defensive, which defeats the whole purpose.' (Member Checker A feedback, 2019, lines 42-45)

Here A seems to have suggested that collaboration works well when everything is going smoothly but falls down when there is conflict. In fact, A believed that collaboration may naturally fail:

This unfortunately is a 'Con' not against the theoretical thinking behind collaborative working, but simply down to human nature.' (Member Checker A feedback, 2019, lines 46-47).

B also believed 'human nature' has a role to play in the development of collaboration:

'A lot of the scenarios, such as specialised teams discussed above, have been adopted as means of coping with challenging contractors and lack of collaboration, however the business is yet to recognise these as formal strategy or look to make them redundant by bettering relationships and promoting 'actual' collaboration.' (Member Checker B feedback, 2019, lines 2-7)

In terms of Managed delivery North's default contract B believed that NEC does encourage collaboration:

'Managing NEC contracts which promote collaboration' (Member Checker B feedback, 2019, lines 33-34)

Furthermore, B believed that the fact the Quantity Surveyors failed to abide by the clauses within NEC was negatively impacting collaborative working:

'As simple as it may be, I believe there is a distinct lack of contract adherence which by default, hinders collaborative working.' (Member Checker B feedback, 2019, lines 40-41)

One interesting aspect of the discussions on collaboration was a misunderstanding of the level of financial information required from MDP contractors. A stated:

> *'As a result of our tightly controlled Cost System, AW had a comprehensive record of all transactions between both parties and in light of this we suggested that MCL permit us access to their records, so we could align them with AW.'* (Member Checker A feedback, 2019, lines 81 – 84)

However, in fact, all MDP contractors were required to provide access to Alba Water staff to their financial records. There was nothing unusual in what MacCallum Construction allowed.

Both B and A agreed that the Escalation Procedure was widely disliked. B gave a typical example of how the Participants felt the contractors misused the Escalation Process. They described a 'Collaboration Meeting' between senior staff and MDPs:

> *'For example, project with large outstanding CEs are discussed and generally the Contractor will inform the relevant PM that monies are outstanding and for these to be processed. Unfortunately, there is very little effective discussion between project level and above prior to 'collaboration meetings' so the most common output from this conversation is that the SPM will then address the project tea post meeting and ask why they haven't paid / if they can process payment. This is after the event when the contractor has effectively been told that they are correct in their understanding and it will be rectified from AW without checking with the project team for a full rundown of how and why CEs are not agreed.'* (Member Checker B feedback, 2019, lines 21 – 31)

A made similar assertions:

> *'I have seen rather too many instances, were (sic) a CE has been submitted by a contractor simply to counter an earlier failing or to recover lost costs. This itself is in direct opposition to a collaborative agreement! In these instances, due to either*

insufficient or in most cases, no real backup, the PM/QS has not accepted the CE. Instead of the Contractor then going into negotiations with the PM/QS, to establish their claim, they have instead gone directly to Senior Management, using the terms 'Collaborative/Collaboration' within the text to complain. The result on too many occasions has seen the Project Team overruled and instructed to accept the CE.' (Member Checker A feedback, 2019, lines 53 – 62)

In respect of successful collaborative relationships, Member Checker A was asked to comment on his experiences in Alba Water Solutions, a multi-agency partnership which had been used to deliver major upgrades to water quality and which A had worked within:

'For me, AWS1 (Alba Water Solutions 1) worked and was probably the best example of a collaborative working environment I have witnessed. It did have its drawbacks at times, but in the mainstream, it worked well.' (Member Checker A feedback, 2019, lines 138-140)

When asked to describe the reasons why they thought the model was so effective they described teams which were geographically based:

'I was part of the North West Coast team. There was, also, West Islands, Northern Isles and East Coast Team.' (Member Checker A feedback, 2019, lines 143-144).

Crucially, these teams covered much smaller geographical areas than the project teams in Managed Delivery North. And, in addition, each team was multi-company:

'No team was made up of one company. All teams had members from at least 4 of the 8 teams in the consortiums.' (Member Checker A feedback, 2019, lines 147-148)

Furthermore, each team was also multi-disciplinary:

> *'Each Team had an SPM, 4 or 5 PMs, QS, Cost Engineer, Planner, Mech Engineer, Electrical Engineer, CAD…All teams were made up randomly of personnel from any number of the teams.'* (Member Checker A feedback, 2019, lines 149 – 150 and 152 – 153)

And finally, each team was small:

> *'Commercially it worked perfectly, with the closeness of the teams meaning every decision, date change, scope change, etc was filtered immediately to all members of the teams.'* (Member Checker A feedback, 2019, lines 159 – 161)

A suggested that it may have been the combination of the huge capital investment programme required to upgrade the water infrastructure in Scotland and the fact that Alba Water had only recently emerged from the combined water companies which meant had led to the organisation considering a somewhat 'riskier' strategy such as collaboration with the private companies:

> *'This is turn meant that in this early stage of its conception, AW would be required to deliver a Capital Investment Programme worth circa £2billion over a 5-year period on hundreds of projects. Apparently, AW at the time believed it did not have the resources or knowledge to deliver such a programme of works. It came up with the idea of going into partnership with private sector companies, who had substantial knowledge and experience in construction and in doing so could also hand over control on all aspects of delivering the programme.'* (Member Checker A feedback, 2019, lines 14 – 19)

Since B had not worked in Alba Water Solutions 1, they were instead asked to either describe a project they had worked in which they felt was collaborative or describe the attitudes, behaviours and models which they thought were crucial to collaboration. They chose the latter:

> *'As simple as it may be, I believe there is a distinct lack of contract adherence which by default, hinders collaborative working. In my experience. QSs and PMs alike are*

uncomfortable in administering an NEC contract and abiding by the clauses within…By deviating from the contract, ambiguity blooms and from ambiguity creates tension in project teams and a lack of communication.' (Member Checker B feedback, 2019, lines 40 – 43 and 44 – 45)

B felt this had four main causes:

1. Procurement:

'Poor procurement practices which do not fit the business needs and create ambiguity, which forces project teams to 'make do and mend'' (Member Checker B feedback, 2019, lines 47 – 48)

2. Lack of support from senior management:

'Instances have occurred where contractors have escalated issues to senior managers who have processed payments without consideration of the facts and an understanding of why monies were held (CE not paid)' (Member Checker B feedback, 2019, lines 49 – 52)

3. Poor training, in particular, Quantity Surveyors and Project Managers not being trained together:

'E learning modules available to do in your own time, however this is in isolation.' (Member Checker B feedback, 2019, lines 53 – 54)

4. Lack of accountability:

'People are not monitored or held accountable for performance of contracts (aside from milestone hitting) so they continue bad / poor practices.' (Member Checker B feedback, 2019, lines 55 – 57)

5. Lack of empowerment for Quantity Surveyors:

> *'There is also a challenge within AW to recognise commercial team (sic) and their full capabilities. Often, QSs are not given the opportunity to carry out their 'typical' contractual roles and functions and at times activities can become very admin heavy and less about managing the risk of the project or encouraging collaborative working practices. In turn and in my own opinion this looks at deskilling QSs.'* (Member Checker B feedback, 2019, lines 9 – 14)

In terms of the impact of these inconsistences, B appeared to find them more problematic than A. Member Checker A make a distinction between conflict between the Quantity Surveyors and the MDPs and that within the Quantity Surveying team. In respect of conflict with the MDPs they stated:

> *'This has on occasion led to some conflict between parties.*' (Member Checker A feedback, 2019, lines 96 – 97)

But in terms of conflict between the Quantity Surveyors, A was clear that:

> *'Your summarisation on these specialised teams, that it can cause conflict, I have to say I personally haven't seen any such signs amongst the QS's.'* (Member Checker A feedback, 2019, lines 125 – 126)

A's comments may speak to the ability of the Quantity Surveyors to manage differences of opinion between them without damaging their own relationships with each other.

B did not distinguish between tensions between the Quantity Surveyors and between the Quantity Surveyors and the contractors. They referred to 'project level' tensions which appeared to include both categories. Talking about the Escalation Process they commented:

'From a project level, managing NEC contracts which promote collaboration, these situations increase tensions and if anything hinders collaborative working.' (Member Checker B feedback, 2019, lines 33 – 35)

'These behaviours (senior management discussing projects in which they have little detail) promote a blame culture, a 'them and us' scenario which destabilise project relationships and risk the success of the project for both parties.' (Member Checker B feedback, 2019, lines 36 – 39)

In terms of how Managed Delivery North's commercial service might be improved, A and B took different routes. Perhaps with different ages, different genders and different work and life histories this was to be expected. But, of course, it also reflected their different perspectives and different realities.

B focused on greater contract adherence as a way forward:

'By deviating from the contract, ambiguity blooms and from ambiguity creates tension in project teams and a lack of communication.' (Member Checker B feedback, 2019, lines 44 – 45)

They also felt that Quantity Surveyors should be more effectively utilised within the business, with perhaps basic administration tasks perhaps given to others:

'There is also the challenge within AW to recognise commercial team and their full capabilities. Often, QSs are not given the opportunity to carry out their 'typical' contractual roles and functions and at times, activities can become very admin heavy and less about managing the risk of the project or encouraging collaborative working. In turn, and in my own opinion, this looks at deskilling QSs and this is a concern particularly considering public monies being invested and spent by private contractors.' (Member Checker B feedback, 2019, lines 9 – 15)

Finally, they saw a role for senior management in recognising why inconsistencies arose and how they might be resolved:

> *'A lot of the scenarios such as specialised teams discussed above, have been adopted by means of coping with challenging contractors and lack of collaboration, however the business is yet to recognise these as formal strategy or look to make them redundant by bettering relationships and promoting 'actual' collaboration.'* (Member Checker B feedback, 2019, lines 2 – 7)

By contrast, A chose to use examples from their own practice for how Alba Water might improve the commercial service within Managed Delivery North. Finally, A used their experience of Alba Water Solutions 1 (AWS1) described above, to proffer an example of true collaboration:

> *'For me, AWS1 worked and was probably the best example of a collaborative working environment I have witnessed. It did have its drawbacks at times, but in the mainstream, it worked well.'* (Member Checker A feedback, 2019, lines 138 – 140)

> *'For me, AW got it right with AWS1, they should look at this option again for future programmes.'* (Member Checker A feedback, 2019, lines 163 – 164)

In the absence of restructuring into something akin to AWS1, A suggested better financial monitoring and reporting could assist in promoting collaboration and better outcomes for projects. They gave two examples. In the first they discussed the 'non-adversarial' contractor, MacCallum Construction. They described a situation in which the commercially-weak MDP had fallen behind with payment applications and was becoming unclear of their overall financial standing. Because of their 'tightly controlled Cost System' this project team was able to help MacCallum get back on track:

> *'This trust/good faith, whatever you wish to call is, worked and resulted in both companies systems becoming aligned, allowing MCL to catch up on submissions and replenish their cash flow situation. We have since continued to follow this process to work more closely together commercially and as a result, we have found ourselves in a stronger, more sustainable relationship'* (Member Checker A feedback, 2019, lines 85 – 91)

In the second, they suggested that rigorous monitoring and examination of projects' actual, estimated and forecast costs could assist in the proper application of Option C contracts:

> *'IF the Project Team believes the Contractor's forecast is a bit over forecast or for a better term, optimistic, based of course against the latest programme, then we reduce payment on this particular element. However, I would like to point out, that this scenario has indeed been reversed by AW, where the Project Team have felt the Contractor has under forecast and as such, have requested a resubmission of the (Application for Payment) and have been proving correct to do so on numerous occasions.'* (Member Checker A feedback, 2019, lines 104 – 110)

It is important to recognise that A's and B's suggestions for making improvements may have been affected by their own skills and experience both within and without Alba Water. Although relatively young, B had many years' experience as a Quantity Surveyor in both contracting and private practice. They also had a first and a Masters' degree, something that was relatively unusual within the Commercial department at Alba Water. Their advice that greater contractual adherence might improve matters may have been influenced by this. By contrast, A worked within a team which, unusually, had its own full-time Cost Engineer, as well as input from an auditor, so their advice for greater financial monitoring and scrutiny is perhaps unsurprising.

Both A and B considered the Escalation Process to be a poor way of managing disputes with contractors and felt that it had serious, negative consequences for the organisation and the people working within it. Neither specifically stated that it should be abandoned but perhaps that was implicit in their words:

> *'These behaviours (senior management discussing projects in which they have little detail) promote a blame culture, a 'them and us' scenario which destabilise project relationships and risk the success of the project for both parties.'* (Member Checker B feedback, 2019, lines 36 – 39)

> *'I am not sure where (the Escalation Process) first occurred, but it set a precedence (sic) and has had the negative effect on the relationship between the AW Project Team and respective Contractor. This again is in complete contradiction of collaborative working.'* (Member Checker A feedback, 2019, lines 62 – 65)

A and B's feedback has been incorporated into the findings for Study 2.

5.62.4 Reflective Diary

Throughout Study 2 this work attempted to follow Wolcott's advice in his seminal work on the transformation of qualitative data (Wolcott, 1994):

> *'When we describe, we hope and intend that those in the setting will, at the least, find them acceptable. When we analyze (sic) we carefully select a few factors for scrutiny; we rely on the weight of our evidence and the systematic nature of our procedures to be convincing. But when we interpret it is our colleagues' presence we feel over our shoulders; our interpretative "rightness" is judged within traditions, not in the correspondence between our accounts and truth or a strict adherence to procedures.'* (Wolcott, 1994, p258).

In respect of the interpretation phase, which this study has now reached, Wolcott goes onto to say:

> *'I would rather err on the side of too little interpretation than too much. I strive first to present an adequate descriptive account and then – marking the threshold – suggest what I make of it.'* (Wolcott, 1994, p259).

In other words, the author must avoid the temptation to overstate their case. In an essay reviewing the findings of a study carried out many years previously, Wolcott advised that the interpretation phase should not be something which follows quickly from the data collection and analysis phases, but rather *'…comes about as a result of an ongoing, reflective process. The process can be stimulated and nurtured but, as I caution, it cannot be rushed.' (Wolcott, 1994, p260).*

At the same time, the study must not shy away from uncomfortable truths and must assert these findings in ways which the study's readers will find convincing. As Wolcott stated, *'If our goal is to contribute to knowledge, our knowing is not enough: We must recruit other "knowers" as well.'* (Wolcott, 1994, p258).

With this in mind a reflective diary was kept during and after the data analysis phase with the aim of assisting the process of reflection and interpretation and attempting to avoid the temptation of jumping to conclusions which were not, in fact, strongly rooted in the data.

The reflective diary recruited other readers (for example, another doctorate students and the study's supervisor) to review and comment on the developing interpretation. This was useful in, for example, preventing the study's interpretations from veering off along interesting, but largely unsubstantiated tangents. An example of this was when the study's supervisor strongly advised against interviewing Martin Barnes, one of the principal drafters of the NEC contract in an effort to answer the meaning of the concept of collaboration. Whilst the writer felt this

was an important for contextualising the difficulties encountered by the Participants in both studies in implementing collaboration, the study's supervisor felt it was an unnecessary diversion.

The negative case analyses, member checking exercise and reflective diary, together with the other techniques table 36 above all contributed to the data interpretation and findings for Study 2 which are now listed and discussed below.

Chapter 6

Results from Study 1 and Study 2

6.1 Study 1

6.1.1 Objectives 1 and 2

The data analyses showed that Participant A was being trained for commercial construction risk management in a broad epistemological and mainly applied spectrum of subject disciplines. The human-social-interpersonal aspects required for effective commercial risk management were not completely neglected, however less emphasis was given to them. References to the need for technical skills were explicit whist the requirement to develop other 'softer' skills such as collaboration and negotiation were referred to by Participants less often and more implicitly. This aspect of the skills framework developed during the Literature Review (see Table 10) can therefore be said to have been validated with amendment.

In response to the original research question for Study 1 - *Is too little attention paid to human-social-interpersonal factors in training for effective commercial risk management?* – the answer is a cautious yes. Effective commercial risk management requires an epistemologically-broad range of skills and the focus of an industry which still largely views itself as positivistic on only the technical needs to change.

Other aspects of the skills framework in Table 10 have also been validated by this empirical work. There was a clear understanding within Company X of the role elites and social networks play in the risk management of socio-technical systems and of the need to fill information gaps and make links between seemingly unrelated events. And simulation was being used to help the early career stage Quantity Surveyor; both she and the Commercial Director – her most important mentor – understood its limitations.

6.1.2 Objective 3

Data analysis from Study 1 also established a gap between the company's rhetoric (*'being a tightly-knit group of local, experienced and skilled construction professionals has helped us survive the recession; you can trust us with your projects'*) and its practices, which focused much more on the commercial imperative (*'We must make money'*). Yet, the analysis also established a clear link between the rhetoric and the practices; each acted upon the other. Without the trust of its clients, Company X would fail to be awarded contracts – or, at least, be included on tender lists for projects – and would, consequently, lose money. And a company that fails to focus on its commercial survival and becomes insolvent, perhaps part-way through a project, is of no use to its clients.

6.1.2.1 Generalisability

As Argyris and Schön state:

> *'Versions of the same model of theories-in-use result from similar upbringing within a culture'* (Argyris and Schön, 1974, p11).

However, this study was small-scale and time-limited. In terms of generalisability, all that can be reasonably said is that the tension evidenced here between the company's expressed aim of acting in its clients' best interests and the internal requirement to make a profit mean that a gap between espoused theory and theories-in-use might also be seen within similar construction organisations; that is, medium sized construction companies based in the Highlands and Islands of Scotland and engaged in a range of different public and private sector projects, principally housebuilding.

6.2 Study 2

6.2.1 Introduction

Study 2 moved the focus of attention from a contractor to a utility company. The contextual differences between Study 1 and Study 2 were, therefore, many. Study 1 concerned a medium-sized contractor; Study 2 focused on a large public sector client. The contractor in Study 1 was involved in private and public sector housebuilding; the utility company's work in Study 2 mainly concerned civil and mechanical and electrical engineering. The contractor in Study 1 was based and worked in the mainland Highlands only; in Study 2, the utility company worked across Scotland including on all the islands, however remote. Study 1 was small-scale and time-limited; Study 2 was much larger, involving a greater number of Participants and situations over a much longer period of time. Caution must, therefore, be exercised when drawing links between the two.

As Wolcott (1994) states:

> *'The point at which data-driven interpretations become free-floating conjecture may be difficult for researchers themselves to discern, but all too evident for readers who cannot help but wonder: "how did we get here from there?". The temptations of interpretive excess can be held in check with careful stocktaking: Is there a basis in this research (and / or in the work of others) for the interpretation I offer? Am I trying to rise above my data to gain perspective, or have I cut myself loose from the data to free myself to say whatever I want? If the latter, is this the place and way to do it?'* (Wolcott, 1994, p264)

> *'If it is a call for reform, it is a muted. It invites – rather than insists on – another way of thinking, to help – rather than to castigate…' (Wolcott, 1994, p265)*

In order to abide by Wolcott's seminal advice, and to avoid the temptation to move too quickly towards definitive conclusions and links between the two studies, discussion of the findings for Study 2 begins at theme level before stepping back to view them at Objective level.

6.2.2 Theme 1: Commercial Risk Management Systems within Alba Water

The Risk Management Toolkit was a relatively new system addition to Managed Delivery North. The organisation required Project Managers – with the assistance of the Quantity Surveyors - to complete and update a risk register monthly. This risk register (the Risk Management Toolkit) was simply a spreadsheet with a partially pre-populated list of common risk derived from previous Alba Water projects. However, what might be seen as a straightforward way of recording and managing potential risks, was widely derided. In many instances it was only used in a 'transactional' way by project teams, to clear an alert or to pass through a project gateway. At other times, staff members attempted to alter or manipulate the Risk Management Toolkit system to better reflect their needs at project level.

The practice of what staff members often perceived as '*being shouted at later'* (Senior Project Manager, Observation 3 line 25) for failing to update the Risk Management Toolkit monthly was heavily resented.

Some project teams maintained their own off-line risk registers which they viewed as superior to the Alba Water Risk Management Toolkit. Within these they were able to include opportunistic risks as well as maintain a greater degree of ambiguity over how likely the risk was to occur and what the possible commercial implications of it might be.

The actual way in which the Risk Management Toolkit was used, as opposed to the ways in which senior staff envisaged its use, may be an example of the difference between Alba Water's espoused theory (*'we use a commercial risk management toolkit rigorously across the*

business') and its staffs' theories-in-use *('the commercial toolkit doesn't work properly so we maintain our own risk registers off-line, plan for commercial risks in our own meetings and discussions and use the business's toolkit in only a transactional way'*).

Argyris and Schön highlight a highly analogous example when they quote Sarson's (1972) description of the implementation of a new maths curriculum in the United States:

> *'…Teachers quickly learned about the new maths curricula in ineffective, understaffed workshops. Many teachers quickly learned not to raise questions, especially not objections. Because they had never satisfactorily learned the new math(s) themselves, their technical theories-in-use tended in their classrooms to become highly incongruous with the espoused theories.'* (Arygris and Schön, 1974, p174)

The causes of such incongruence at Alba Water were perhaps best encapsulated in the Senior Project Manager's quote in Observation 3 – '*The trouble with the business is, they <u>never</u> take advice off the people who are gonna be affected by the change before they introduce it. They just shout at people later.'* (lines 23-25).

In terms of organisational learning, the suggestion made several times in the observations that projects under £250,000 should be added to the list of projects which must use the Risk Management Toolkit – a risk management toolkit which the staff in question had very little confidence in - may be an example of the project teams engaging in single-loop learning. At the same time, it seems certain team members wished to participate in double-loop learning by tearing up the toolkit and starting again. This perhaps illustrates the way in which staff may not always have an option to engage in double-loop learning at all. The risk management system in question had been devised and was managed entirely by the Risk Management Department based almost 200 miles away. The desire to engage in double-loop learning may be there but

engaging in it was not an option. Staff instead resorted to single-loop learning by viewing it as a ‘next best option’.

6.2.2.1 Recommendations

In terms of possible improvements that could be made, it may be that the maintenance of the Risk Management Toolkit by the Quantity Surveyors (as commercial specialists) rather than the Project Managers would be more appropriate.

The ability to include more opportunistic risks and to allocate to them a greater degree of uncertainty would be appreciated by project teams. And the wider inclusion of the regions in a development and oversight role would also have found favour. The suggestion that a risk manager from the Risk Management Department might be allocated to each Delivery Manager would have helped to ‘regionalise’ the service offered by this heavily centralised department.

The problems surrounding the Risk Management Toolkit seem to represent a real missed opportunity. The Risk Management Toolkit itself was relatively simple to use and the Risk Management Database did contain a great number of potential risks which projects within Managed Delivery North might encounter. Poor implementation – from a distance, without on-site training and with a degree of punishment for recidivists – helped to ensure it was instead widely derided and resented.

A few changes - the use of the toolkit for projects under £250,000, the inclusion of provisional opportunity risks, more local oversight and ‘ownership’, more training and more respectful reminders for staff who failed to update the register regularly - might have seen better, more effective use made of the toolkit.

6.2.3 Theme 2: The Role of Quantity Surveyors within Alba Water

Quantity Surveyors' roles within Alba Water's Managed Delivery North Department were unclear. On many issues individual Quantity Surveyors were able or forced by circumstances to choose their own courses of action. Roles and responsibilities tended to be agreed between individual Quantity Surveyors and their Project Managers rather than imposed from above. Some Project Managers undertook commercial roles themselves, others did not. Neither the NEC contract nor the Commercial Procedures were always used to inform decisions.

Project Managers, who were the named party in the contracts, could not access copies of their own contracts. They did not have permission to access the Commercial Procedures and had not been trained in how to use them.

Whilst there was no evidence of any direct causal links for this lack of consistency, there are hints within the observations as to why this situation may have arisen. As a relatively new addition to Alba Water, the Commercial Department was 'feeling its way'. Being so heavily reliant on Quantity Surveyors trained in other organisations and industries, senior managers were keen to bring in new ideas and reluctant to be too proscriptive. In fact, they seemed to encourage Quantity Surveyors to rely on their own expertise and experience and there appeared to be no penalties for not adhering to Alba Waters commercial policies and procedures.

There was evidence of conflict, or at least, concern and unease between the Quantity Surveyors and Project Managers. Whilst there was an acceptance that the Project Managers were the named parties in the contracts and the Quantity Surveyors were there to advise and support, the Quantity Surveyors felt their advice was often ignored.

Again, there appeared to be a huge gap between the organisation's espoused theories in the form of its policies and procedures - in particular, the Commercial Procedures - and the

Quantity Surveyors' theories-in-use. Where these clashed, the Quantity Surveyors usually relied on their own theories-in-use.

Perhaps significant in this theme is that, in contrast to Argyris and Schön's concept, here the staff felt little compunction to publicly concur with the business' espoused theories and were openly dismissive of them.

Overall, the observations suggested an atmosphere of conflict within Managed Delivery North; conflict amongst the Quantity Surveyors as to the right approach to take in particular circumstances; conflict between the Project Managers and Quantity Surveyors; conflict with line managers (for example, the Senior Project Manager and the Commercial Team Leader); conflict between the junior staff and senior management and conflict with the contractors. However, on a day to day basis the Managed Delivery North office appeared to be a harmonious one. Individual Quantity Surveyors and Project Managers managed huge numbers of projects across much of northern Scotland and beyond. A certain level of co-operation was necessary simply to see the monthly and annual work targets met.

The level of conflict expressed in the observations would not have been immediately apparent to a casual onlooker. Many of the observations were of private conversations or took place in closed meetings. Given the difficulties of producing experienced Quantity Surveyors internally, it was necessary to allow or even encourage a certain level of debate as a method of reaching agreements for procedures. The formal Commercial Procedures could be viewed as temporary - a work in progress. The encouragement of debate and of differing opinions can be seen as a positive.

Perhaps the most obvious cause of concern amongst the Quantity Surveyors in particular was the confusion around their role. The autonomy granted to them, particularly to experienced

Quantity Surveyors from outwith Alba Water, meant that each Quantity Surveyor operated essentially as a small private practice.

The role of the Commercial Team Leader in attempting to both respect the individual opinions of the Quantity Surveyors and the existing Commercial Procedures was an important one. It was a role for which they received in fact very little support or personal appreciation, being instead viewed as indecisive and as always taking the easiest route out of a problem. However, it is clear from, for example, their attempt to introduce early contractor involvement into the process that they were attempting to bridge this gap. Table 40 below illustrates how they attempted to achieve this:

Table 41: The Commercial Team Leader's attempt to bridge the QSs' individual views with the Commercial Procedures

No.	Problems	Solution	Backstop Solution
1	A project in excess of £250k requiring design and having 3rd party issues	Use Early Contractor Involvement and splitting of the scope into small chunks to 'test' the goodwill of the MDP and develop a price piece by piece	Use a CDP to do the design and resolve the 3rd party issues followed by tendering to an RDP
2	Decision Tree states that, in this case, an MDP must be used to deliver the work		
3	The perception amongst Managed Delivery North staff that MDPs tend to exploit the design and build process to increase costs and profits		
4	The dislike of the MDPs by the individual Quantity Surveyors		
5	The preference of the Project Managers and Senior Project Manager for the use of an RDP rather than an MDP		

Far from being an 'easy way out', the Commercial Team Leader's strategy was, in fact, a sophisticated solution to a problem which appeared several times during the period of the observations. The solution can be seen to have dealt with the immediate problem – the Decision Tree stating that the project must be carried out by an MDP – whilst also moving the Commercial Procedures on by introducing the use of the ECI process and the division of the scope into smaller bite-sized chunks. It also respected the views of the majority of the Managed

Delivery staff – the Quantity Surveyor, the Project Manager and the Senior Project Manager – that the project should be given to an RDP contractor.

However, as previously stated, the solution was not viewed as a positive development by any of the project team. They saw it merely as an attempt by the Commercial Team Leader to refuse to recognise the inevitable, that the MDPs were not-collaborative, not minded to work in the North area and should be replaced by a reliable RDP.

Again, it is interesting to consider how dynamic these processes were. At the beginning of the observations DE Construction was widely respected as a reliable RDP. Staff felt that this contractor who should be allowed to take over the works of the MDP civils contractor. However, over the course of the observations DE Construction committed a serious health and safety breach which suggested they were not in fact ready to take over the majority of larger jobs in the Managed Delivery North area, nor to take on design commitment and dealing with third parties. A new Commercial Manager at DE Construction was appointed towards the middle of the observation period, one who took a less collaborative and more adversarial approach towards contract management and commercial issues and this altered the way the company was viewed:

'PM1 *... I've got trouble with (Managing Surveyor of DE)*

myself to be honest with you…too big for his boots.

Observer *Is that a new problem or an old one?*

PM1 *Ah, new, since he got brought up to that new job. I can't believe*

(mentions MD of DE) made him up to Managing Surveyor.

He used to be a Stop/Go boy on the roads.

Observer *(laughs) I suppose we all have to start somewhere?*

PM1 *Aye, but I <u>wouldn't</u> have thought he was management material to be honest.'*

(Observer and PM1 in Observation 6, lines 91-99)

The description of DE Construction's Managing Surveyor as an ex 'Stop/Go boy on the roads' is perhaps merely pejorative but the Project Manager's further description of him as not 'management material' may also suggest that their commercial department was not well resourced enough to take on the work of an MDP. Perhaps the Commercial Team Leader was alone in recognising this risk and in arguing that the division of contractors into MDPs and RDPs was appropriate and should be adhered to.

The tension between the Quantity Surveyors and Project Managers may simply have been a response to the differing priorities and tensions each group experienced. For the Project Managers the senior management's focus on delivery time as a priority may have made it more tempting to use the Escalation Procedure to resolve disputes quickly. For the Quantity Surveyors this emphasis on delivery time as a priority made little sense. Their view was that they were responsible for the sensible expenditure of public monies; merely escalating payment disputes in order to settle them early was believed to be a mistaken approach. In the main, the specialisms within project teams – the Project Managers on time and quality and the Quantity Surveyors on cost - worked well. But when a dispute arose (and they usually arose around costs issues) the Quantity Surveyors' opinions that 'settling this now is wrong, it just creates a precedent. It's public money, we need to stand up for the council-tax payers of Scotland' contradicted the Project Managers' view that this project simply needed to be completed. They felt it pointless to worry about the longer-term impact of one isolated decision. Better resolution of the Quantity Surveyors' role – both separately and in alliance with the Project Managers - could have helped this situation.

6.2.3.1 Recommendations

In terms of improvements, greater involvement of Managed Delivery North's Quantity Surveying staff in the development and implementation of new commercial procedures and systems might have led to greater consistency and better uptake amongst staff. Better training of Quantity Surveyors and Project Managers (rather than the 'awareness-raising' of new policies and procedures which often took its place) might also have led to greater adherence to the espoused theories and less conflict within the project teams.

As the study progressed it became clear that many of the projects within Managed Delivery North were actually urgent, arising either from water quality failures or reputational issues. Re-classification of projects or, at least, a better recognition within the staff teams of the projects as urgent is necessary. The Quantity Surveying team were expected to provide commercial management for every project in Managed Delivery North which meant that each surveyor had a huge caseload. Better recognition or classification of which projects were truly urgent and a refocusing of the Quantity Surveying resource on other routine or cyclical projects would have enabled the surveyors to manage their own stress levels, provided the organisation with more effective commercial management and might have led to better adherence to the organisation's policies.

6.2.4 Theme 3: Commercial Procedures within Alba Water Managed Delivery

Given that the Commercial Department itself was a relatively recent addition to Alba Water, it is understandable that the Commercial Procedures were not well understood by many team members. No training in the use of the Commercial Procedures had been provided to either the Quantity Surveyors or the Project Managers. Significantly, the Project Managers were unable to access the Commercial Procedures file themselves but could only be forwarded relevant sections by the Quantity Surveyors with whom they worked. It is unsurprising then that there

was little understanding amongst the Project Managers about the role of the Quantity Surveyors in commercial management.

The Procedures had been drafted by consultants and were, in some cases, not well suited to an organisation where delivery time rather than value for money played such a significant role. In principle, the drafting of the Commercial Procedures by a consultancy should not have been a problem, a 'best practice' approach having been applied by the consultancy. However, individual Quantity Surveyors within Managed Delivery North had large caseloads and the emphasis was on throughput rather than commercial rigour.

It seemed possible that the 'pick'n'mix' attitude of the Quantity Surveyors towards the Commercial Procedures had developed gradually. Perhaps there had been instances where Quantity Surveyors had either decided or been instructed to take short cuts through the Commercial Procedures in an effort to keep up with their workloads in the short term. These short cuts had then gradually become established practice when no negative consequences of ignoring the procedures had emerged. Possibly, Quantity Surveyors had then faced other situations of over-work and made decisions themselves to ignore elements of the Commercial procedures, once more as a short-term fix. Again, noticing no negative consequences to these actions, they had then adopted a take it or leave it attitude towards the whole of the Commercial Procedures. As new people joined the business, they might have then been instructed that adherence to the procedures was not mandatory and the current situation where each Quantity Surveyor (and indeed each Project Manager) adopted their own unique attitude towards them had developed.

It is even possible to speculate that the flexibility to adhere to or ignore large parts of the Commercial Procedures was mandated by management. Certainly, as shown in the observations, middle managers such as the Commercial Team Leader and Senior Project

Manager were aware of the non-adherence. It again shows that delivery time, rather than commercial rigour or best value, was the primary matric used within Managed Delivery North.

Here, in respect of Argyris and Schön, it is clear that the business' espoused theory – that the Commercial Procedures were used consistently throughout the business - contrasted with the Quantity Surveyors' theories-in-use that they were in fact optional. Interestingly, the Quantity Surveyors appeared to have different theories-in-use for the Commercial Procedures. The more experienced team members – those who had been at Alba Water longest – were most comfortable in not adhering to the Commercial Procedures. The level of anxiety felt by newer members in not adhering to the business' standing orders meant that they seemed to make greater attempts to adhere to them.

6.2.4.1 Recommendations

At the time of the observations, the Commercial Procedures were being reviewed by the Private Practice who drew them up initially. There needs to be greater input, or at least feedback, from the Quantity Surveyors into this process.

A consistent model for the Commercial Procedures needs to be agreed.

Clearly, training for both Quantity Surveyors and Project Managers in the use of the Commercial Procedures would have been beneficial. Such training could have been used as a jumping off point for discussions on agreement on roles in project teams. The Commercial Procedures then could have been used to help alleviate some of the tensions between the Quantity Surveyors and Projects Managers as well as to standardise roles within the project teams.

In addition, the ability of the Project Managers to be able to access the Commercial Procedures file as well as have access to their project contracts would have been useful**.**

6.2.5 Theme 4: Alba Water's Senior Management Influence on Commercial Risk Management within Managed Delivery North

Delivery time rather than the value for money appeared to be a focus of Alba Water's senior management team. However, a review of Managed Delivery North's projects has shown that the majority (68%) arose from either water quality failures or reputational damage. Because the categorisation of projects happened remotely from Managed Delivery North and the staff there had little contact with either the Regulators (responsible for initiating the water quality failure projects) or the senior management (responsible for initiating the reputational-damage projects) this sense of the projects as urgent was not well appreciated within the department. Instead - particularly because of the Commercial Department's over-reliance on Quantity Surveyors who were trained outwith Alba Water - a tendency to apply the 'normal' standards of commercial risk management in construction and engineering was applied. This cognitive dissonance – repeatedly insisting that contractors worked to tight deadlines whilst insisting on 'normal' standards of commercial scrutiny, was a marked phenomenon within Managed Delivery North.

At project level there was a strong perception of senior management as 'soft' on contractors, particularly the Tier 1 MDPs. This appeared to result primarily from the outcomes of the Escalation Procedure. These outcomes were perceived by staff to side with the contractor and be against the advice of the Managed Delivery North staff team.

However, it is unsurprising that the contractors resorted so often to the Escalation Procedure when use of the contractual dispute resolution process (adjudication) was viewed so negatively by Alba Water's senior management.

Alba Water was widely understood by staff to be a young organisation and one therefore that might be subject to constant change and evolution. However, staff widely perceived the

management as focusing on IT systems (the ‘technical’) as the primary method of effecting change, at the expense of the human / social / interpersonal aspects.

The staff also felt that such changes were poorly managed. Where changes were made there was often no training, instead ‘awareness raising’ of the alteration was adopted. Certain staff would be appointed as ‘super-users’ (this was non voluntary and not remunerated), who would then be expected to train other members of staff in the use of the new system. In practice this put great pressure on super-users who often found themselves not just as the focal point for knowledge of the new system, but as input technicians responsible for putting through the entire workload of the Quantity Surveying group through the new system.

6.2.5.1 Recommendations

Greater discussion on the nature of most of the Managed Delivery North projects as urgent – whether they arose as water quality failures or reputational issues – could then prompt discussion on how much commercial rigour should be applied to them.

A greater emphasis on other procedural changes and not just new IT systems could also have improved the functioning of the department. Training – rather than awareness raising – and either the deletion of the super-user role or its remuneration – would also have increased efficiencies.

The senior management’s attitude towards dispute resolution – particularly adjudication which is mandated by the NEC contract – needs to be resolved.

6.2.6 Theme 5: MDPs' (Tier 1 Contractors) within Managed Delivery North

With the exception of MacCallum Construction, the MDPs were widely viewed as adversarial and untrustworthy in nature. They were certainly not viewed as collaborative. They manifested this in behaviours such as exploiting their positions as both designers and deliverers to increase costs (in essence, requiring two contracts, a design contract and a design and build contract to claim twice for elements of the same design). A further behaviour was the MDPs' tendency to be too quick to use the Escalation Process to resolve payment disputes or acceptance of contract derogations.

The perceived adversarial nature of the MDPs led many of the Quantity Surveyors to insist on the use of Option A (fixed price) rather than Option C (target cost) or Option E (cost reimbursement) contracts. With regard to Option C contracts, the Quantity Surveyors felt that contractors refused to negotiate target costs and would, instead, simply delay producing costs until such a point as the agreement of the target cost became urgent, at which point the contractor's target cost became a fait-a-compli.

Quantity Surveyors and Project Manager often attempted to manipulate the Decision Tree within the Commercial Procedures to choose a contractor they felt was more collaborative and open to risk sharing. They were often supported by the Senior Project Manager in this. By contrast, the Commercial Team Leader suggested using Early Contractor Involvement together with scope splitting to effectively 'test' an MDP's commitment to the project and to risk sharing before proceeding to contract the entire project to them. In this way, the Commercial Procedures could still be adhered to. As a 'backstop' option they suggested that, if Early Contractor Involvement showed the MDP to be adversarial, then the design portion of the project could be let to a Consultant Design Partner (CDP) who would also deal with any third

party issues. Once these had been resolved and the design was complete it would then be let to an RDP.

An attempt to overturn the entire framework (by letting all civils work within the region to an RDP) was clearly in development in the period just before the observations began. However, following a serious breach of health and safety by the RDP in question, by the time the observations began, this had been abandoned. Whether this abandonment was temporary or permanent was not clear.

MacCallum Construction (MCL), the smallest MDP by turnover, was widely viewed as an anomaly, an MDP who was considered by all the Quantity Surveying staff as collaborative. This was perhaps the strangest issue to emerge from the observations. One of the Quantity Surveyors disclosed that this MDP had actually attempted to defraud Alba Water by claiming monies on an Option C project for a bridge contract with a local council. However, far from viewing this action as an aberration, the Quantity Surveyors instead viewed this MDP favourably for simply immediately admitting to the error when confronted. MacCallum Construction was widely viewed as commercially incompetent and the fact of their favourable assessment by the project teams perhaps alludes to the importance at project level of the human-social-interpersonal element in contracts.

6.2.6.1 Recommendations

There was little understanding or appreciation of the difficult role of the contractors within Alba Water. Unable to use the default dispute resolution method of adjudication, it is not surprising that they resorted so often to the informal Escalation Procedure for the resolution of contractual and payment issues.

The Commercial Team Leader's use of the Early Contractor Involvement felt clumsy and unwieldy to many Participants, but it offered a solution to the perceived adversarial nature of the contractors without breaching any of the Commercial Procedures.

Again, greater recognition of the projects as urgent (although they were not described as such) might also have led to a review of the contract options. Quantity Surveyors were increasingly insisting on Option A contracts (Priced Contract with Activity Schedule) because they believed they were being 'held to ransom' with Option Cs (Target cost with Activity Schedule). However, the reality was that contractors were often presented with tight deadlines for the project which made it impossible to design and price the contract fully before work had to begin on site.

The ability of the Quantity Surveyors and Projects Managers to be able to review and offer feedback on the performance of the Tier 1 contractors is clearly required.

6.2.7 Theme 6: RDPs (Tier 2 contractors) within Managed Delivery

RDPs (Rural Development Partners) were Alba Water's Tier 2 contractors. The majority of RDPs in the North area were small or medium-sized, local civil engineering contractors. However, the framework also included specialists such as pump replacement and chemical dosing companies. Additionally, several large construction companies such as Morgan Sindall and Morrison Construction were included.

The essential difference between MDPs and RDPs were that RDPs were restricted to projects under £250,000 in value and they could not undertake either design works or the resolution of 3rd party issues (such as where Alba Water did not own the land on which an asset was located). It was not clear from the framework whether larger RDPs had restricted themselves to the smaller, simpler projects out of preference, or that they had failed in their applications to be MDPs.

RDPs were viewed much more favourably than MDPs by the project teams, both Project Managers and Quantity Surveyors. Most were considered to be competent in their delivery and collaborative in their approach.

Managed Delivery North's relative remoteness meant that RDPs were often used to deliver projects in excess of £250,000 where a Central Belt-based MDP had simply sub-let the work to them. In these cases, the positive experiences of most of the Managed Delivery staff of the work of RDPs led to widespread resentment of the payment of management fees to the MDPs for the oversight of the RDPs' work.

At the same time, it was clear that some RDPs had overstretched themselves. The example in Observation 7 of a Lessons Learned meeting which followed the resolution of a claim of over £800,000 shows that, occasionally, Alba Water's choice of an RDP specialist to carry out complex works without the management assistance of an MDP had serious consequences for both Alba Water, its stakeholders and the RDP.

In respect of Decision Tree manipulation and an attempt to overturn the framework, these were discussed in the MDP section above.

6.2.7.1 Recommendations

It might be helpful to the organisation as a whole and to project team members to review what the function of the RDPs was. Whilst most of the RDPs were locally-based civil engineering contractors, some were large companies (such as Morrison Construction and Morgan Sindall), whilst others were specialists in areas such as pump replacements and chemical dosing. Applying the same policies and protocols to such a heterogeneous group may not be appropriate. For instance, some RDPs clearly required the additional management support provided by being subcontracted to an MDP, others did not. The £800,000 claim discussed in

the observations arguably arose because Alba Water failed to recognise at an early enough stage the management limitations of the subcontractor involved.

It needs to be recognised by senior management why team members attempted to manipulate and overturn the Decision Tree. At the same time, Managed Delivery North staff need to recognise that attempting to overturn or at least subvert the framework at a local level – without due cause - would have been a serious breach of contract.

6.2.8 Theme 7: Commercial Dispute Management within Managed Delivery

The principal outcome from this theme was the universal dislike amongst project staff and middle managers of the Escalation Process. Both Quantity Surveyors and Project Managers felt that contractors, particularly the MDPs, were too quick to use the Escalation Process to resolve disputes around payments, compensation events and contract derogations. Instead of involving themselves in discussions with project team members, contractors would instead – according to the Managed Delivery North staff members – delay such conversations until resolution became urgent; at which point they would simply escalate the issue over the heads of the project teams to more senior staff. Rather than taking the issues back to the project team members senior staff would then usually merely agree the contractor's point of view and instruct the project team members to resolve the issue in favour of the contractor.

This dislike and distaste for the Escalation Process can only be understood by considering the context the MDPs worked within. The actual dispute resolution method available to them under the contract (adjudication) was effectively rendered out of bounds to them by Alba Water's senior management. In a situation where they could not avail themselves of adjudication, it is therefore not surprising that they resorted to the Escalation Process so often.

Occasionally, as shown in Observation 12, senior managers within Alba Water did take a hard stand on certain claims and, in these cases, MDPs had no option but to sustain sometimes heavy losses.

6.2.8.1 Recommendations

The Escalation Process was the single most disliked aspect of Alba Water's processes for the Quantity Surveyors. Clearly, it needed to be reviewed. Adjudication – which was the default dispute mechanism within all Alba Water contracts – has been described as a 'quick and dirty' method of resolving issues. Ironically, the Escalation Procedure appears to have developed as a 'quicker and dirtier' method of dispute resolution within Managed Delivery North.

One particular problem with the Escalation Procedure was that it was not a formal process. It appeared to have evolved through custom and practice and there seemed to be no rules attached to its use.

A review of dispute mechanism which included representatives from both MDPs, RDPs, CDPs and internal staff is clearly necessary. A situation in which contractors are 'not allowed' to use the default dispute mechanism within contracts and, instead, resort to an informal process which inflamed users and led to a deterioration in relationships between Alba Water and its delivery partners is unsustainable.

A further short section now considers the thoughts, feelings and motivations of Managed Delivery North staff informing their behaviours and practices described above.

6.2.9 The Thoughts, Feelings and Motivations of Managed Delivery North staff informing their Practices.

Although the organisation's literature repeatedly emphasised the need for its contractors to share its six 'vision pillars' (1. Serving, 2. Responsible, 3. Strong, 4. Growing, 5. Leading, and 6. Committed), there was little opportunity for consideration of these traits by the project teams. Instead, contractors were assessed against the six pillars at Framework tendering stage (that is, prior to the initiation of any projects) by a centralised procurement team. Ongoing assessment of the pillars was allowed for by feedback to the procurement team, but project teams reported that they were discouraged from participating in this process by more senior managers.

Team members therefore found other ways to incorporate their evaluations of these traits into the management of the projects, for example through the choice of contract, level of scrutiny applied to payment applications and claims. In addition, the Decision Tree was manipulated to allow for the choice of contractors considered by project teams to be 'easier' to work with (a euphemism for less adversarial and more likely to share commercial risks with the client).

It might be considered that such manipulation and amendment of Alba Water's policies and procedures constituted the development of informal commercial risk management plans and this possibility is now considered below.

6.2.9.1 The Project Teams' Informal Commercial Risk Management Plans

In spite of a voluminous internal documentation on the subject it is striking that what Alba Water projects really lack is a simple commercial risk management plan. Cost certainty depends on a number of variables. It is not surprising therefore that what became apparent in the observations is that projects teams began to put together their own informal commercial risk management plans. These 'plans' were not formalised in any sense, they were not written

down. They were, however, usually agreed - albeit sometimes tacitly - by Senior Project Managers and the Commercial Team Leader. Such plans usually comprised the following:

1. An informal assessment of the likely accuracy of the Latest Best Estimate (LBE) for the project. Alba Water did not maintain historical costing data for different types of projects. Where these existed at all they were kept by individuals (who tended to specialise in particular types of project as a result of their experience prior to joining the organisation or who specialised in particular types of projects post joining the company). This meant that opportunities for scrutinising construction prices were severely limited;
2. An informal assessment of the contractors' commercial awareness. For instance, West Islands' contractors were widely thought of as the most commercial unaware and therefore more likely to share costs (whether willingly or unwillingly). By contrast, most Tier 1s (MDPs) were considered to commercially ruthless and unwilling to share risks and costs. One Tier 1 contractor, in particular, was avoided by Project Teams because of their habit of charging for *not* providing quotations;
3. The possibility of appointing an RDP rather than a Tier 1 contractor. Because of the relative isolation of Alba Water's Managed Delivery North team, experience had taught the project teams that, where the Decision Tree indicated that a Tier 1 contractor should be appointed, it was more than likely that the MDP would then go onto to appoint an RDP to actually carry out the work. Much energy was expended in considering whether the Decision Tree could be manipulated to allow the project teams to appoint the RDP directly;
4. An assessment of how the timescales determined at an earlier stage for the project would be likely to affect the contractor's costings. For example, if a project was

considered urgent with tight timescales, it was likely that design would have to occur simultaneously with the construction and that therefore time available for either scrutiny or renegotiation of the construction price would be limited;

5. The possibility of appointing a contractor with a particular skill for providing a service at a lower cost. For example, one team had a project which required the appointed contractor to empty and backfill a sludge lagoon. Much time was given to considering whether an RDP with a network of quarries locally could somehow be appointed as it was thought that they would offer Alba Water substantial savings on the costs of the aggregate required to fill the lagoons;
6. The commercially advantageous (to the client) appointment of specialist contractors. It was widely believed that though some subcontractors possessed important technical skills (for example, skills in chemical dosing), they lacked project management expertise which could only be adequately provided by larger contractors. Therefore, although it was possible through the frameworks to appoint contractors with these specialisms directly, poor past experience (often resulting in costly claims) had taught the project teams that it was less risky and more commercially astute to appoint a larger contractor to manage the project;
7. Manipulating the choice of contract. During the period of the observations an informal decision was made not to award Option Es or Cs to Tier 1s because of the perceived power this gave Tier 1 contractors to increase costs and profits;
8. Manipulating the framework. During the period of the observations much discussion took place around the replacement of the Tier 1 contractor for civils with one of the RDPs for all civils work in the north. This was entirely informal. The informal plan to do this was only abandoned when the RDP in question committed a serious health and safety breach;

It can be seen then that project teams developed informal commercial risk management 'plans' in a system which excluded the formation of formal commercial risk management planning. Evaluation of these informal plans is outwith the scope of this study, but the plans were formulated and enacted with the intention of saving the client money. The framework contractors, it seems, were entirely unaware of their existence. Project team motivations for these plans appeared to include:

1. Dislike of particular contractors;
2. Dislike of individuals within the contractors' teams;
3. 'Rebalancing' the perceived excessive profits of the contractors;
4. 'Poacher turned gamekeeper' – individuals within the client's project teams with backgrounds in framework contractors felt a pressure to use this 'insider' knowledge to reduce contractor prices;
5. Protecting tax-payers and the public purse;
6. Forcing down the perceived excessive costs of projects within Alba Water;
7. Wanting to increase the presence / importance of the commercial team within Alba Water. The commercial department was a relatively recent addition to Alba Water; it had grown both organically and through department mergers. There was a sense that individuals' worth was connected to the importance of the commercial team in general;
8. Believing that the 'default' option contracts described in the Commercial procedures were incorrect. During the period of the observations much discussion took place around the idea of only awarding Option A contracts to Tier 1s. Because in practice, the target price required by an Option C contract, was not in fact negotiated by the client and the contractor but presented as a *fait-accompli* by the contractor, it was widely believed that this was open to abuse.

9. Wanting to be seen as a ‘good’ Quantity Surveyor. Generally, this was perceived to be a person with a very high level of technical knowledge, a ‘mixed’ background (in contracting and clients) and a ‘hard-nosed’ approach towards contractors.

A discussion of the studies’ findings, together with their limitations and recommendations for further studies are now considered below in Chapter 7.

Chapter 7

Discussion, Limitations and Contribution to Knowledge

7.1 Introduction

Once again, in respect of discussion, limitations and conclusions this work turns to Wolcott (1994) for advice:

> *'In this role, the researcher now tells us - or at least invites us to ponder with him – how things mean. This is the part of the qualitative / descriptive work that readers often anticipate most keenly, but it can put author and reader at cross- purposes as each waits for the other to reveal what it all means. It is not a time when researchers must remain silent, but it is the time for an appropriate tentativeness as the researcher* ***proposes*** *what one might make of it all.' (Wolcott, 1994, p267)*

Again, Wolcott urges caution and rigour in respect of the conclusions:

> *'I urge you to make doubly certain that what you say in the final paragraphs of a study follows from and relates to the argument of the rest of the text. Do not sell out at the end or allow yourself to be pressurised into writing something that satisfies conditions imposed by someone else but overextends or overstates your case.' (Wolcott, 1994, pp259-260)*

At the same time, Wolcott is clear that a certain boldness is also appropriate:

> *'They represent…efforts to extend beyond the boundaries of a particular case to find broader application or meaning. They are…answers, tentative but not timid, to the nagging question faced by everyone who conducts research in the qualitative / descriptive, or for that matter, any other mode: "So what?"' (Wolcott, 1994, p256)*

The study now discusses each research objective in turn, details the limitations of the study before finally outlining the contribution to knowledge.

7.2 Research Objective One – to critically analyse the historical development of normative commercial risk management practices within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands

The literature review in chapter 3 has shown that traditional methods of managing commercial risks in construction projects, for example traditional procurement, standard methods of measurement and measured bills of quantities, developed very early in the history of the Quantity Surveying profession. As new methods of procurement developed in the late twentieth century the risk profiles between client and contractor changed too; with these changes commercial risk management of construction projects became more complex. Following several disastrous, high profile construction projects, successive governments launched enquiries into the failure of the industry. Collaboration, risk-sharing and the development of longer-term working relationships were key themes for improving the performance of the industry. New tools, such as NEC, construction frameworks and adjudication were also developed to aid this transition to a less-adversarial culture.

Within the industry contractors have always been forced to support low margins by means of the acquisition of work and of other contractors, as well as by diversification. The experiences of Carillion and, to a lesser extent, that of Kier and Interserve within this new culture of collaboration and risk sharing have illustrated the risks of this approach. Whilst culture change does appear to have reduced construction disputes, it has failed to stem the numbers of insolvencies, increase profitability or reduce risks. The construction industry remains one whose failings are myriad, long-standing and complex.

A clear stumbling block to the better implementation of collaboration and risk-sharing is the absence of measurable outcomes. How is the degree of collaboration to be assessed? What is a reasonable average profit margin for a large contractor? Or for a medium-sized regional builder like the one in Study 1? What percentage of risks (and most contractors interpret 'risks' to mean 'extra costs') should a public-sector client take on? And what proportion should remain with the delivery partner? It seems unlikely that any U.K. government will mandate acceptable ranges of profit margins or risks. And, if they did, what would be the effect on construction education and construction professionals such as Quantity Surveyors? Would their role then be reduced to that of a cost engineer?

7.3 Research Objective Two – to critically analyse the epistemological and cultural norms underpinning current commercial risk management practices within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands

The literature review in chapter 3 has shown that the acquisition of effective commercial risk management skills requires training across an epistemologically broad, principally applied, spectrum of subject disciplines with as greater weight given to soft subjects as hard ones. Commercial risk management skills are highly valued and mainly tacit; for historical and cultural reasons the domain of skills acquisition is still considered to be industry rather than academia.

The historical review has shown that the first construction professionals, the civil engineers, viewed their work as the application of a single science. This simplistic view of civil engineering as a technical, mono-disciplinary, consulting profession aided its early institutionalisation. Later professions, such as quantity surveying, fought against, or were ignorant of, the interdisciplinary nature of their work; as a consequence, the RICS formed much later than the ICE. Even today, in Higher Education, many construction professions are still

viewed as largely mono-disciplinary. This emphasis reinforces practice rather than academia as the domain where most 'real' professional learning takes place.

The reluctance to embrace the actual interdisciplinary (technical *and* human-social-interpersonal) nature of the professions has created a long-standing gap between rhetoric and reality in all the construction professions. Biglan's 1973 model shows that this gap persisted into the twentieth century, at least in Higher Education. Most AEC professions contain an element of inter-disciplinarity and inter-disciplinarity is much further advanced in practice than in academia. The specific skills of commercial risk management are also inter-disciplinary with an emphasis on applied rather than pure skills.

7.4 Research Objective Three – to critically assess whether there is a tension between the technical and the human-social-interpersonal aspect of commercial risk management in both contracting and client organisations within the Scottish Highlands and Islands

The literature review in chapter 3 showed that construction is a socio-technical industry, but socio-technical is a spectrum and different project types occupy different places on the spectrum. The design and construction of a nuclear power plant lies much further along the technical axis than does a project to repaint the kitchen in a domestic dwelling. Socio-technical also has a temporal aspect; a project may move between different places on the spectrum during its lifespan.

Lessons from the fields of Accident Learning in Engineering and Behavioural Economics and Finance reinforce Argyris and Schön's assertion that the technical is primaried in professional learning. Further, these writings suggest that an appreciation of human factors rather than over-reliance on technology and technical warning systems, an understanding of the role social networks and elites play in accident causation and prevention, an ability to fill information gaps

and link seemingly unrelated events and the use of simulation for practicing risk management are key to effective risk management.

Against this background of the industry as largely positivistic and mono-disciplinary in nature it is unsurprising that the repeated calls for construction to change have been problematic. Collaboration, risk-sharing and the development and sustaining of longer-term working relationships require high levels of human-social-interpersonal skills, such as team-working, collaboration and compromise.

However, the industry continues to view itself as technical, an impression validated within both Studies 1 and 2. Within the construction company 'good practitioners' - people to be admired and emulated - were seen as those with high technical capabilities. The interpersonal skills valued were those of a 'hard-nosed businessman'; repeatedly saying 'no' was often seen as a skill to be coveted. Although human-social-interpersonal skills were not ignored completely in the training of the Quantity Surveyor in Study 1, greater emphasis was given to the importance of their technical skills. Within Study 2 Participants within the Member Checking exercise repeatedly recommended 'technical' improvements such as better adherence to contracts and more effective use of cost monitoring spreadsheets.

It is clear from both the epistemological and historical reviews in the study, as well as the empirical studies that effective commercial risk management requires both hard and soft skills. Health and Safety, one area of construction to have undergone measurable improvements over the last twenty years, initially brought about change by the use of new tools mandated by the CDM Regulations. Whilst there has been – since the advent of the regulations in 1998 - a substantial reduction in accidents on larger projects, a stubborn rump of accidents remains in smaller projects and amongst small contractors. Whilst one option might have been to extend the Regulations to all projects and contractors, no matter how small, recent attempts have

instead concentrated on challenging and changing behaviours and attitudes in workers and within organisations. Behavioural health and safety training is now standard practice in the construction industry. Perhaps the epistemological widening of Health and Safety training can serve as a model for other areas of the construction industry such as commercial risk management.

7.5 Research Objective Four – to test Argyris and Schön's concept of theories-in-action in both contracting and client organisations within the U.K. construction industry, with a particular focus on the Scottish Highlands and Islands

The literature review in chapter 3 showed that construction is an industry of low profit margins, high operational risks and – consequently – high numbers of company failures. The Parliamentary Committee enquiry into the 2018 insolvency of Carillion suggested that a gap may have existed between the company's and clients' optimistic commercial risk management rhetoric and their practices.

This gap between rhetoric / policies ('espoused theory') and practice ('theories-in-use) is common to all professions and was established in the academic writings of Argyris and Schön.

Study 1 established a tentative gap between the company's rhetoric (*'being a tightly knit group of local, experienced and skilled construction professionals has helped us survive the recession; you can trust us with your projects'*) and what might be called its practice theory (*'We must make money'*). There were also clear links between the two, each theory acting upon the other.

Some gaps between espoused theory and theories-in-use are inevitably contradictory. The contractor in Study 1 would not survive unless everyone in the company understood its Commercial Director's theory-in-use (the need to make a profit). At the same time, it did need to appeal to potential clients with its espoused theory of 'You can trust us with your projects'

to win work and put its theory-in-use into practise. Crucially, each theory acted upon the other and its Commercial Director was daily involved in attempting to make the company's espoused theory and his own theory-in-use congruent.

Argyris and Schön were clear in stating that observations – used to form influential concepts such as HRT – must be used to establish espoused theories as well as theories-in-use. Study 1 relied on the re-analysis of semi-structured interviews and it is for this reason that the company's espoused theory and its staffs' theories-in-use are here described as tentative.

Study 2 was unique in using non-participatory observations within construction to seek to validate the theory of Argyris and Schön. It found a substantial gap between Alba Water's espoused theories and the theories-in-use of its staff. Whilst the organisation strongly believed it collaborated with its contractors, the staff viewed Tier 1 contractors as adversarial and their resulting treatment of those contractors strongly resisted collaboration. Whilst senior management believed they were effective in their commercial oversight, staff instead saw management as being 'obsessed with delivery times' and uninterested in achieving value for money.

This evidence of the industry from both literature and the empirical studies as essentially (and wrongly) positivistic and mono-disciplinary helps to explain why public-sector clients keen to accept more risk sharing and to take a more collaborative approach in commercial management are failing to see the progress they seek. The gap between their espoused theory and their project teams' theories-in-use, their own cross-cutting policies (such as the Escalation Procedure in Study 2) and their staffs' view of themselves as essentially positivistic are hindering the use of the new tools, such as NEC and construction frameworks. Congruence between the industry's espoused theories and its practitioners' theories-in-use can only be achieved if there is greater, wider acceptance of all construction professions as

interdisciplinary. Acquisition of softer skills such as negotiation, compromise, problem-solving and developing and maintaining trust must be encouraged in young professionals and modelled and nurtured within the industry itself.

7.6 Research Objective Five – to critically analyse the gap between policies and practice in the commercial risk management of U.K. construction and civil engineering projects, including the validation of new insights into the interpersonal motivations and organisational drivers of this gap, with a particular focus on the Scottish Highlands and Islands.

Within the empirical work of Studies 1 and 2, staff within the contractor showed greater adherence to the company's policies and procedures than within the client organisation. Indeed, in the semi-structured interviews of Study 1, the Commercial Director frequently cited the example of a young Quantity Surveyor who was dismissed for failing to place a margin on subcontractors' quotations. Such adherence is understandable in the context of Company X as a medium-sized contractor, a private company focused on profit and with a very small commercial team. The senior managers who established the procedures worked closely with junior staff and were able to socialise them into their ways of working. Anyone who demurred from these was eventually dismissed.

By contrast, the Quantity Surveying staff at Alba Water were given a great deal of autonomy to act as they saw fit. This led to great divergences between policies and practice. Given Alba Water's status as one of the country's largest construction client by value, this may seem surprising. However, Alba Water was a relatively young organisation, having arisen from the merging of three water companies in the early 2000s. The Commercial Department was also a recent addition, and this meant that most Quantity Surveyors had developed outwith the organisation. Wishing to encourage a flow of new ideas and expertise, senior managers

encouraged a certain level of autonomy to the extent that, each surveyor in Study 2 appeared to be acting as a small private practice.

Managed Delivery North was based in Location I, four hours' drive away from Alba Water's main offices and it had to contend with specific issues not common to the other regional offices. These included its own geographical isolation, the geographical isolation of many of its projects, a lack of contractors either based in or willing to work in its area and third-party issues such as not owning the land its assets sat on.

Many of the issues surrounding the divergences in practice arose from different interpretations of the concept of collaboration. Since collaboration is a human process and, therefore, very difficult to measure or test, Alba Water staff relied on their own interpretation of collaboration and used conversations with colleagues – other Quantity Surveyors, Project Managers and more senior managers – to test their theories and feelings. Alba Water offered little or no guidance as to what collaboration was or what behaviours it should engender.

In the case of the contractors at Alba Water, collaboration (in their own interpretation of the word) was only one tool they used to achieve their objectives – timely payments, early agreement of compensation events and contract derogations. The NEC default dispute mechanism, adjudication, was a tool they felt unable to use because of the perceived effect it might have on their long-term relationship with the client. Instead, an informal and highly disliked method of dispute resolution, the Escalation Procedure, developed.

Smaller contractors, the RDPs, were believed by the Quantity Surveyors to be more collaborative than the larger contractors, the MDPs. However, this may have been simply because they lacked the commercial resources to use more conventional contractual procedures. There were also exceptions to this rule, for example, an MDP who was considered

to be more collaborative and an RDP who had recently moved to be more conventionally contractual.

Perhaps because NEC offers no advice on how to act if a contractor is not minded (or perceived) to be collaborative, the Alba Water Quantity Surveyors were forced to develop other strategies to manage this situation. For instance, they attempted to manipulate the Decision Tree to choose more collaborative contractors, used the Early Contractor Involvement option of NEC to contract early and to a limited degree with non-collaborative contractors and thereby test their goodwill. A move to remove one of the Framework MDPs and replace them with a locally based RDP was discussed, although it is important to realise that this was later abandoned after a serious breach of health and safety by the RDP. It is also unclear how serious the projected move was. Given the autonomy allowed to Quantity Surveyors within Managed Delivery it is unsurprising that they also chose to use Option A contracts rather than the default Option C contracts with perceived non-collaborative contractors. The use of a 'horses for courses' approach to contract management within Managed Delivery was also seen. Quantity Surveyors comfortable with more adversarial contractors were encouraged to work with these contractors whilst other colleagues apparently were able to 'choose' to work with more collaborative contractors. This habit of specialisation and the autonomy given to the Quantity Surveyors appeared to be a source of conflict within the Managed Delivery teams but may also have been a sophisticated way of dealing with such a wide spectrum of contractors. However, it increased the divergence amongst the Quantity Surveyors; there was little agreement about what an appropriate role for a Quantity Surveyor within Alba Water should be. Perhaps, the new tools of collaboration and risk sharing contributed to this confusion. In the more adversarial culture of the recent past, the role of the Quantity Surveyor was much clearer; whether as a contractor's or a client's surveyor the role of the QS was simply to protect their employers' contractual positions. That role now is much more ambiguous.

The drivers of the gap between policies and practice were varied. Some were personal, a dislike for a particular person within a contracting team, but, often, the motivations were more admirable, for example wanting to offer tax-payers greater value for money.

Each Quantity Surveyor had to contend with a huge workload; an individual surveyor might be responsible for two hundred separate projects with a total value of over £50m. The Quantity Surveyors attempted to apply similar level of commercial scrutiny to many different projects, large and small, urgent and routine. Within the utility company definitions of urgent were contextually very specific; however, viewed from a wider perspective, it can be seen that many - perhaps over two thirds – of the projects were actually urgent. This re-defining of urgent might have allowed Quantity Surveyors to focus their efforts on a smaller number of larger, more routine projects. Such a move would have lessened their workload, and thus perhaps permit the development of more collaborative relationships with contractors. In the future, such prioritisation of projects might be a role undertaken by machine learning. In this way a technical advance (the sifting of large data sets by machine leaning) might actually promote the development within construction of much-needed human skills, such as collaboration.

7.7 Limitations and Recommendations for further study

7.7.1 Objectives 1 and 2

In respect of Objectives 1 and 2, the principal limitations of the study stem from the paucity of theory in the field of commercial risk management in the construction industry and the consequent reliance for concepts on other academic specialisms. These specialisms, for example, accident prevention in engineering and behavioural finance and economics are, themselves, developing areas of knowledge.

Biglan's work, which heavily influenced this study, is contextualised within higher education although this study explores knowledge production in a very different domain, that of practice.

Perrow's work in the risk management of socio-technical systems concerns itself with '*high risk'* systems. Whilst some construction (giving construction a wide definition) projects, such as oil and gas extraction, are '*high risk'* by Perrow's definition, others such as house repairs and house building - which the contractor in Study 1 was involved in - are not.

High Reliability Theory concerns itself with highly technical systems which have high reliability and safety records; few would argue convincingly that construction is a high reliability industry and neither does it have a particularly good safety record, although this is gradually improving.

Tett and Shiller's work is situated in economics and finance. It is reasonable to argue that the desirability and better working terms and conditions of these industries, as well as their much higher profit margins, are important contextual differences.

As these academic fields develop, there may be opportunities to repeat the study with the benefit of greater theoretical insights.

As a consequence of this lack of formal theory currently there is a high reliance on Argyris and Schön's work on theories of action. This work is pre-eminent in nursing, social work and teaching, but – although Schön's work on professional reflection has been hugely influential within construction and engineering - *this particular theory* (my italics) has not been tested within this context. This makes comparisons of the results within the same or related disciplines currently impossible. Additionally, although Argyris and Schön state that theories of action cannot be ascertained by asking people, they must be observed, they ignored their own advice. Observations were not used in the testing of their work; instead, they used case studies and semi-structured interviewing. Possible observer bias, as well as differences in perspective (observer v interviewee) again make meaningful comparisons difficult. Whilst testing of this seminal theory in a new field (construction) and using the methods prescribed by the authors (observation) for the first time, makes this a useful addition to the literature, comparisons must wait.

7.7.2 Objective 3

A crucial limitation for Objective 3 was the reluctance of Participant A's line manager, Freelance Worker D, to take part in Study 1. This meant Study 1 losing an important perspective, that of a very experienced Quantity Surveyor. Because of this, greater efforts were made – through the work with Participant A, Participant B, Employee G, and the documentary analysis – to triangulate the findings around Freelance Worker D. However, future studies might benefit from a longer preparation phase in which workers who perhaps view themselves as peripheral to a company can instead be encouraged to understand the importance of their contributions to the research.

7.7.3 Objectives 4 and 5

In respect of Objectives 4 and 5 there was a lack of time in Study 1 to undertake non-participatory observations; this meant that the status of Company X's rhetoric as an espoused theory and of its practice theory as a theory-in-use remain unproven. Although Argyris and Schön themselves used interviews to establish espoused theories and theories-in-use their strong recommendation is the use of non-participatory observation as the principal methodology. This was employed in Study 2.

The extent to which Company X employs defensive routines and how and where such defensive routines influence theories-in-use within the company and lead to the development of new theories-in-use was outside the scope of Study 1.

A crucial limitation of Study 2 - in terms of its generalisability - was the very uniqueness of the Managed Delivery North team, in particular, their remoteness from senior management and the main offices of Alba Water. How widespread the practices such as manipulating the Decision Tree were – or whether they were in part a reaction to the particular problems faced by a remotely based project teams - is not known. Anecdotally, the Commercial Manager expressed the opinion that Managed Delivery North was one of the most compliant offices within Alba Water. However, it was not possible to verify this claim during the course of Study 2. This leads to a limitation in terms of generalisability. A further study might benefit from a widening to include more than one Managed Delivery team, perhaps one more centrally located and in an area of greater population?

7.7.4 Reflexivity

Within Study 1 generally, too little time was allowed in the work for data analysis and interpretation. Within Study 2 at Alba Water, the commercial risk management of construction and engineering projects was a very broad area of study. Commercial risk management had

many different aspects; the initial data analysis of the observations produced eight major themes and numerous sub themes. Additionally, each aspect had a policy and it had a practice and each needed to be described and analysed. Because the themes arose naturally from the observations, there were of course aspects of commercial risk management which the Participants chose not to discuss. This meant that Study 2 produced theory and practice of a great many, but not all, the aspects of commercial risk management pertinent to a large utility company. A greater focus on one or two specific aspects of commercial risk management from the start would have produced a more concise and perhaps more impactful report.

7.7.5 The Hawthorne Effect

The construction industry of the Highlands and Islands is a very small and closely knit one. In Study 1 there were many overlapping interests between the Participants and the researcher. In particular, one of the Participants was also a student of the researcher in her other capacity as a lecturer at the University of the Highlands and Islands. Additionally, the researcher had also acted as referee for Participant A in her application for the position of trainee Quantity Surveyor at Company X. The Participant's desire to impress upon the researcher her appreciation for that reference and communicate her delight in her new job can clearly be heard in the transcript.

Within Study 2, there were also many overlapping interests between the Participants and the researcher. The researcher had worked as a Quantity Surveyor at Alba Water, although was not employed by them at the time of the data collection. In addition, the researcher and some of the Participants had worked in the same organisations in the past, although not always at the same time. In some previous projects, the Participant and the researcher had been on different sides in contractual disputes.

The access that Professional Doctorate candidates often have to rich data sources can be viewed with envy by full-time PhD students; however, it is not without problems or impacts.

Participants who knew the researcher assumed a certain amount of prior knowledge on their part, some assumed that their views and opinions would naturally be shared by the researcher. It was clearly difficult to view the researcher as a colleague one minute and an independent and unbiased data collector the next. Whilst most qualitative writers now agree that the researcher always impacts the research setting, it would still be interesting to repeat the study with perhaps a team of researchers, some known to the Participants and others not. It might then be possible to contrast and compare the impact of the known researchers on both the setting and results.

7.7.6 Axiology

Initially, the researcher adopted an ethnographic stance of '*learner amongst the experts*' (Payne & Payne, 1991) in the interviews forming part of Study 1. However, the Participants' reactions to this seem to indicate that they found it, at best, confusing and, at worst, disingenuous. The Participants knew the researcher to be a Quantity Surveyor as well as the Programme Leader for the Quantity Surveying courses at the University of the Highlands and Islands. Once this had been recognised the researcher began to loosen the ethnographic stance and the interviews became more conversational in nature with the researcher occasionally adding her own experiences into the discussions. The interviews then became more of a social construct, more naturalistic in tone but also more problematic to interpret.

Perhaps, one of the most difficult axiology aspects of Study 2 was the way in which the Participants sometimes looked towards the researcher to confirm their own thoughts and observations. The researcher had a background as a claims' surveyor and expert witness and, as a result, some of the Participants were aware of the researcher's probable sympathies and bias. Knowing the researcher as a Quantity Surveyor and having worked with them in the past, it seems probable that the Participants would have take a view on what 'kind' of Quantity

Surveyor the researcher was, as well as make assumptions about what 'kind' of Quantity Surveyor the researcher thought the Participants were. The Participants' responses may, on occasion, have been influenced by this. Perhaps, a more team-based observation strategy – in which researchers, who were both known and unknown to the Participants – would have enabled Participants to refine or finess their responses and allow more nuanced observations or commentary to develop. Certainly, team-based observation teams have been common in recent construction research and, perhaps, the close-knit nature of the industry, makes this desirable.

For future studies a better understanding of these issues and of the axiological stance of the interviewer is required. Better triangulation of findings through the use of other methods e.g. observation and naturally occurring data, is also important.

7.7.7 The Production of Obsolete Data

Discourse analysis, Membership Categorisation Analysis and non-participatory observation were all attempted in Study 1, but the results were not considered worthy of inclusion in the final report. It was felt that the researcher was not sufficiently skilled in the use of these methodologies and the results too uncertain. However, each method has considerable merits and offers opportunities in future work for deepening meaning. Further background reading and training in each of these methods (and perhaps others), before use, is considered vital.

In addition, a social network diagram and explanatory notes produced by Participant A were also excluded. The social network diagram contradicted the explanatory notes and so the information given in the interview regarding Participant A's social networks was used instead. Time should have been made to return the social network diagram to Participant A, explain the inconsistences and a request made for her to repeat the process.

Final conclusions and the contribution to knowledge of the study are now detailed below.

7.8 Final conclusions and contribution to knowledge

With very few academic writings on the subject of commercial risk management within construction this study attempted to take a wide-ranging and holistic view of the subject.

It began by using original sources to trace the development of the construction professions, their institutions and the tools - both traditional and modern – used by Quantity Surveyors to identify and manage commercial risks in projects. This review showed that traditional tools as well as modern ones – bills of quantities, standard methods of measurement, traditional procurement and collaborative contracts such as the NEC, construction frameworks and alternative methods of dispute resolution – have helped reduced the level of legal disputes in the industry. However, they have apparently failed to improve profits, client satisfaction or cash flow. Construction remains an industry of low profits, high operational risks, low productivity, negative cash flow profiles and high levels of insolvencies.

The Literature Review then used concepts from accident learning in engineering, behavioural finance and economics, as well as the work of Argyris and Schön, to propose that, within industries such as construction which are viewed as primarily positivistic, there is a tendency to prioritise the technical at the expense of the human-social-interpersonal aspects of risk management. It further showed that the acquisition of effective commercial risk management skills requires training across an epistemologically broad, principally applied, spectrum of subject disciplines with as greater weight given to soft subjects as hard ones. The implication of this for construction is profound: a cultural change from adversarial to collaborative is unlikely to succeed in an industry which views itself as positivistic and in which the technical aspects of training are primaried over the human.

At the end of the Literature Review, a skills framework was developed and tested in the empirical work of Study 1. This showed that the early-career Quantity Surveyor was being trained in an epistemologically broad range of subject disciplines, although the technical was given greater emphasis than the human-social-interpersonal aspects. In addition, analysis of the semi-structured interviews indicated that there may have been a gap between the company's commercial risk management rhetoric and its practices.

The study then moved to consider how these concepts might manifest themselves in a different context, utility company client rather than medium-sized building contractor. Uniquely – and in line with the stipulation of Argyris and Schön, the empirical work of Study 2 used non-participatory observations to identify and critically analyse the gap between the client's espoused theory and the theories-in-use of its staff. It also analysed some of the organisational drivers and staff motivations responsible for the gap. Importantly, there was confusion about what collaboration meant and about what the role of the Quantity Surveyor should be in this new era of partnerships rather than adversarial relationships. The Quantity Surveyors felt a tension between collaborating with contractors and the need to protect the client's contractual rights. This tension often caused Quantity Surveyors to use the language of collaboration whilst practising more traditional adversarial techniques to protect their organisation's interests.

This study has shown that criticism in the literature of a lack of emphasis on the human-social-interpersonal aspect of risk management is a false dichotomy. Effective risk management, including effective commercial risk management, requires a range of both technical and human skills. A more holistic consideration of the skills and attributes of Quantity Surveyors – in academia and in practice - is needed.

An organisational focus on the technical at the expense of the human-social-interpersonal appears to be linked to gaps between a company's espoused theories and its employees' theories-in-use. Developing policies and procedures without considering employees' lived experiences, thoughts and feelings may be linked to widespread manipulation and, indeed, avoidance of such protocols.

Construction collaboration means different things to different people but, to many, it is a technical concept to be delivered via NEC contracts and frameworks. It is unclear what the initiators of the NEC intended when they developed the contract. Were they simply attempting to engender greater civility into construction projects? Was collaboration intended to be a series of behaviours? If so, then it is something human. Construction collaboration requires 'soft' skills such as negotiation, conflict resolution and the ability to work fully as multi-organisational teams. However, it also requires better 'hard' skills such as improved contract administration, cost reporting and cost monitoring skills.

There is a need to acknowledge both the technical and the human aspects of commercial risk management. In the one area of construction measurably improved in recent years, Health and Safety, there is now a recognition that training in areas such as risk assessment and method statement writing must also be accompanied by an allied increase in behavioural safety training. Perhaps in this respect, Health and Safety can offer those involved in the development and socialisation of Quantity Surveyors a model for the improvement of effective commercial risk management practices.

It is in the validation of this gap – the actual practice of collaboration as opposed to the theory – that this study's contribution to knowledge lies. In the most collaborative and collegiate of commercial relationships there will always be occasions when the parties' interests are at odds.

In the absence of clear paths through such disputes, it is unsurprising if resolution occurs in favour of whichever organisation is – or is able to assert that it is - the most powerful.

This study's uniqueness lies in its holistic treatment of commercial risk management in construction. It has illustrated not just the divergences in policies, practices and the theories underlying them in contracting and client organisations, but the many historical, epistemological, cultural, organisational and interpersonal drivers of this incongruence.

In terms of practical application, there are two. Firstly, there is the organisational aspect. Whilst the manipulation of and lack of adherence to policies and procedures at Alba Water seemed quite extreme, it is likely to be repeated in other similar organisations. For organisations to achieve greater congruence between their espoused policies and the theories-in-use of their staff much more cognisance of people's thoughts and feelings as well as greater knowledge of how life is lived 'at the coal face' needs to be given. The question of "What is a Quantity Surveyor for?" needs to be asked in every construction organisation. Quantity Surveying evolved in a different, more adversarial world and it is therefore unsurprising that, in the era of collaboration, many QSs should be confused about what they can and should offer an organisation in terms of commercial risk management and scrutiny. In the case of Alba Water, it eventually transpired that the Quantity Surveyors were working on projects which were, for the most part, urgent in nature. Restructuring their workloads to allow them to focus on less urgent projects may allow them to focus their skills in a way which is more appropriate and of greater value to the organisation. One does not expect to find a forensic auditor at every till in a supermarket; instead they are utilised where there is most risk, where there have been previous problems or where there is the possibility of fraud or wrongdoing. Perhaps there is a useful analogy here for the deployment of Quantity Surveyors in Alba Water and other similar organisations.

Secondly, there is a development aspect. Socialisation for commercial risk management needs to be much more holistic in character. There is a tendency in practice for Quantity Surveyors to be allowed to specialise; either they are ‘good with contracts’, ‘good with spreadsheets’ or ‘good with people’. Effective commercial risk management requires both hard and soft skills, neither the technical nor the human-social-interpersonal aspects should be ignored. Quantity Surveyors need to be encouraged to develop all three aspects within their practice; they must be good with contracts, good with spreadsheets and they must be good with people.

Chapter 8

Final reflections

8.1 Final Reflections

Before starting on the Professional Doctorate programme, I had worked as a Chartered Surveyor for over twenty-five years. I had spent much of that time feeling confused and anxious. Eventually, I developed a strategy that enabled me to cope at work – "collaborate when you can, litigate when you can't". It was this strategy that I wanted to explore in my doctorate.

My instinct was that the answers to this tension lay in the past. Exploring the origins of the construction professions and commercial risk management practices was a fascinating process but, whilst it helped me to understand who we are as Surveyors, it offered little guidance as to how the profession might be improved.

I began, of course, with wholly quantitative tendencies but, guided by my supervisor, moved through mixed methodologies to a qualitative strategy – ethnography – which I hoped would proffer new insights into commercial risk management practices. Initially, I was strongly influenced by the concepts of Natural Accident Theory, High Reliability Theory and the work of Argyris and Schön. I became convinced that there was a mistaken emphasis on the technical at the expense of the human aspects in training for risk management. In fact, Study 1 taught me that the human-social-interpersonal aspects of commercial risk management were *not* being ignored in the training of a new Quantity Surveyor, but that rather less emphasis was given them.

Ironically, it was not until the writing-up stage of the thesis when I worked as a driver on a bin lorry that I came to fully understand High Reliability Theory. Statistically, working on a refuse lorry is one of the top 5 most dangerous occupations in the U.K. Whilst also contending with the dangers inherent in driving a Heavy Goods Vehicle (HGV), bin lorries also carry highly

dangerous equipment at the rear of the vehicle – namely the 'bin lift' and the 'packer'. The bin lift automatically senses when a wheelie bin has been placed on the lift, carries the bin upwards and deposits the waste into the back of the lorry where a hydraulically operated steel plate (the packer) then crushes it. Unfortunately, bin lifts do not distinguish between a wheelie bin and a person. It is not uncommon for a loader to get part of their clothing caught in the bin lift and they too will then be lifted upwards and thrown into the well where they risk being crushed. Concepts such as redundancy (there are STOP buttons all over a bin lorry), delegated decision making (anyone working on the bin lorry can press a STOP button at any time and no one person is in charge) and the weaknesses of simulation in training (waste companies use simulation in training but, of course, such training takes place with new wheelie bins in an empty depot) all became much clearer to me. Similarly, it was whilst driving a bin lorry that I realised the most dangerous times are when multiple things go wrong at once, an important concept in Perrow's work. When two things happen at once, one has to decide which to prioritise. When events are fast moving, what often occurs is paralysis.

My time outside construction was fundamental to the conclusions I reached. It gave me the opportunity to review once-familiar phenomena from a distance. And it gave me a new-found appreciation of the complexity of the industry and respect for the people working within it.

By the time I reached Study 2, I was committed to a fully ethnographic strategy, based on my experience that "what people say in an interview may be very different from what they actually do".

In spite of this, I think recording the Participants' thoughts, feelings, strategies, intentions and philosophies in the observations in Study 2 was revelatory. The extent to which Participants manipulated, amended or ignored the organisation's policies and protocols was both a shock and completely unsurprising. There was a huge gap between the organisation's espoused

theories and the Participants' theories-in-use. However, whilst Participants often used strong language in the observations, what struck me most was how hard they worked to achieve difficult and taxing targets.

I struggled for a long time - using supervision sessions, feedback from Participants and a Reflective diary - to understand how any kind of congruence between the company's policies and the Participants' working methods, thoughts and feelings could be realistically reached. It was only after many months of reflection on the data that I reached the conclusion that most of the Managed Delivery North projects were urgent, although they were not described as such internally. The majority (around 70%) arose either from water quality failures at assets tested by the Regulator or from reputational damage (such as in Aviemore where local people publicly accused Alba Water of attempting to poison them). A water quality failure meant that the asset was producing water that was sub-par for human consumption. Regulators therefore set stringent timetables for its resolution. The use of much Quantity Surveying time in attempting to provide Alba Water with best value for projects that were urgent may have been a poor use of this resource, but it reflected the Surveyors' desire to provide the same level of commercial risk management support for all the projects placed before them. Managed Delivery North did manage projects that were routine or cyclical in nature; a greater emphasis by the Quantity Surveyors on these projects may improve the collaboration between Managed Delivery staff and the contractors, lead to greater adherence to the NEC contract, better cost reporting and costs management and effect greater savings for the organisation and the public

Whilst I learnt a great deal about commercial risk management in construction and civil engineering during the course of the Professional Doctorate I did, of course, learn much about myself. Not all of this was positive.

I learnt that I'm pretty resilient, that I can come back from setbacks and keep going until I complete something. On the negative side, I failed to make enough effort to maintain important friendships during the long course of the doctorate and I sometimes used it as an excuse for avoiding things I didn't want to. Most worryingly of all, during the course of the formal stages of the course (for examples, the Internal Assessment and the Internal Evaluation), I learnt that when I walk into a room I make an assessment – based on traditional notions of power structures – of who is 'in charge' and I then tend to defer to this person throughout the examination. I hope to be better able to challenge my own prejudices and privilege in the future as a result of this experience.

Being allowed to complete a thesis for the Professional Doctorate at Salford has been a huge pleasure. I left school at 16 and became a Quantity Surveyor through a YTS (Youth Training Scheme) programme in the 1980s. I have always had a bit of a 'chip' on my shoulder about not having been to university. I cannot adequately express how grateful I feel to my supervisors, lecturers, examiners and to the School for giving me this chance.

Chapter 9

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