Cross-Fertilising Methods in Naturalistic Decision-Making and Managerial Cognition

by

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Abstract

The aim of this thesis is to examine the potential for methodological exchange between the fields of naturalistic decision-making (NDM) and managerial cognition. The research outlined makes a contribution towards methodological choice and research design within these fields. It also contributes by highlighting the theoretical value of applying a naturalistic mode of enquiry to the study of investment professionals.

This research is situated in response to a number of calls for inter-disciplinary conversation in the study of cognition (Hodgkinson and Healey, 2008; Hodgkinson and Thomas, 1997; Lipshitz, Klein and Carroll, 2006). As such, it is located within the wider organisational debates of the social, management and behavioural sciences. Building upon the arguable inappropriateness of existing managerial cognition - behavioural decision-making (BDM) collaborations, this thesis advocates a naturalistic approach for progressing understanding of 'real-world' decision-making. In doing so, and in addressing the methodological challenges associated with these fields, the thesis examines the utility of connectionist architectures and structured qualitative approaches for the elicitation and representation of cognition.

Three studies progressively examine the boundaries of cross-fertilisation using investment professionals as a backdrop for study. The results suggest inter-disciplinary collaboration to be useful not only in developing the repertoire of methodological tools available to the social sciences researcher, but in progressing theoretical thought (i.e. through the concepts of coherence and sense-making) and in addressing epistemological debates within these fields. This thesis therefore contributes towards rapprochement of quantitative-qualitative approaches in NDM and computational-interpretative perspectives in the field of managerial cognition by modelling their dynamic interplay. The results also draw attention to the importance of understanding the socially situated aspects of expertise and the value in obtaining a multi-perspective understanding of cognition through mixed-methods designs. This thesis suggests that further collaboration both in a theoretical and methodological sense has much to offer these two fields and is an appropriate avenue for progression.
I hereby declare that this thesis has been composed by myself and has not been presented or accepted in any previous application for a degree. The work, of which this is a record, has been carried out by myself unless otherwise stated and where the work is mine, it reflects personal views and values. All quotations have been distinguished by quotation marks and all sources of information have been acknowledged by means of references including those of the Internet.

Claire-Louise McAndrew
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First, I would like to thank Dr. Julie Gore for her continued support and words of encouragement throughout the duration of this research - without which this intellectual journey would never have been possible. I cannot thank you enough for the stimulating conversation I have experienced and the knowledge you have shared. I could not have wished for a better supervisor... I would also like to express my appreciation to Professor Eugene Sadler-Smith for his editorial assistance during the completion of this thesis and extend my gratitude to Dr. Adrian Banks for first introducing me to the field of NDM and for his enthusiastic contributions during the research process.

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List of Abbreviations

ACH - *Analysis of competing hypotheses* is a method that uses a matrix used to explore and evaluate several explanations of observed data.

ACTA - *Applied cognitive task analysis* is a streamlined method of cognitive task analysis (CTA) made available for the practitioner. It is composed of a set of knowledge elicitation and representation techniques providing access to the cognitive skills that underpin expertise.

ART - An *action requirements table* is used to organise observation and interview data about work patterns (i.e. identifying and codifying the important activities involved in performing a particular task).

BDM - *Behavioural decision-making* research focuses on the biases and heuristics that make people deviate from the predictions of rational choice theory. It assumes that individuals are boundedly rational and as such acts as a mediator between descriptive and normative decision theory.

CDM - *Classical decision-making* is a prescriptive approach based on economic assumptions. Classical models include Bayesian probability theory and multi-attribute utility theory. These assert that decision-makers are logical, rational individuals i.e. that decision-makers define the options available, measure the costs and benefits attached to each option and assess the probabilities of success and failure.

CTA - *Cognitive task analysis* is a set of methods used for (i) accessing the cognitive processes underlying decision-making behaviour and (ii) the cognitive skills necessary to respond in complex situations.

ECHO - *ECHO* is the computational component of ‘convince me’ that computes the overall coherence of the causal belief map. This is achieved by correlating participants’ ratings of the believability and reliability of hypotheses and statements of evidence against those generated according to TEC’s propositions.

FSA - The *financial services authority* is the regulator of all providers of financial services in the UK.
FUM - *Funds under management* are defined as all assets managed by a Fund Manager or Fund-of-Funds Manager.

FX - FX is the industry shorthand for *foreign exchange*. This is a system of trading in which the currency of one country is converted into that of another for profit.

HCA - *Hierarchical cluster analysis* is a method used to group together concepts on the basis of similarity and represent them pictorially in the form of a hierarchical tree diagram.

IPA - *Interpretative phenomenological analysis* is a qualitative approach that focuses upon participants' perceptions in an attempt to understand how participants make sense of their world. It is both phenomenological in its use of participants' accounts and interpretative in its recognition of the role of the researcher in interpreting participants' accounts.

JDM - *Judgement and decision making* research encompasses the study of normative, descriptive and / or prescriptive analyses of human judgements and decisions. Approaches include: experimental studies, economic approaches to individual and group behaviour, physiological methods, discussion of normative models and applications of theory.

MDS - *Multi-dimensional scaling* is a set of techniques used to estimate the coordinates of a set of objects in a space of specified dimensionality. The distances between pairs of objects are used as a basis for estimations.

MIT - *Market-if-touched* are resting orders to buy (or sell) a contract below (or above) the market. The order is held in the system until the trigger price is touched, and it is then submitted as a market order.

NDM - *Naturalistic decision-making* is a field of study that seeks to understand how experts make decisions and perform cognitively difficult functions in demanding situations (i.e. under conditions of uncertainty, dynamic environments, ill-structured problems, shifting, ill-defined or competing goals, action / feedback loops, time stress, high stakes, multiple players and shaped by organisational goals and norms).
P/E - Prices / earnings is a valuation ratio of a company’s current share price compared to its per share earnings. It is formally calculated as Price / Earnings = market value per share / earnings per share.

P&L - P&L (also known as profits and losses) is a summary of the revenues, costs and expenses incurred during a specific period of time.

PINDIS - Procrustean individual differences scaling model is a group of models that are used to represent and assess individual differences within multivariate data permitting the relationship of individual differences to a group space.

RPD - Recognition-primed decision-making is a model of NDM that describes how people make quick, effective decisions when faced with complex situations. Rooted in the study of expertise, the RPD model describes how experts are able to identify a reasonable reaction as the first one immediately considered.

TEC - The theory of explanatory coherence is a theoretical account of the process by which actors establish the plausibility of beliefs asserted in an explanation or argument.

WMDS - Weighted multi-dimensional scaling is an extension of MDS that allows dissimilarities between objects to be weighted.

3P’s - People, process and performance (also known as the 3P’s) are used in addition to raw performance data when analysing investment professionals. This is used on the conviction that performance history may have little bearing on an investment professional’s future prospects.
Over the last 20 years, the social and management sciences have seen a continued
development of knowledge in the study of decision-making expertise and cognition. Despite
each school of thought being at the forefront of developments, there has been relatively little
inter-disciplinary collaboration. Indeed as early as 1995, Walsh drew attention to the
parallels that exist between cognitive psychology and management science in his extensive
review of the advances in managerial and organisational cognition. Calls for an integration
of developments in the psychological analysis of cognition in organisations (Hodgkinson and
Healey, 2008; Hodgkinson and Starbuck, 2008b; Hodgkinson and Thomas, 1997; Huff,
1997; Starbuck, 2001), and between the fields of organisational decision-making and
naturalistic decision-making (NDM) (Connolly and Koput, 1997; Gore et al., 2006; Lipshitz,
Klein and Carroll, 2006) have continued to mark the literature. It is therefore somewhat
surprising that in the decade that has since followed Walsh’s seminal review, this interface
has not been exploited more fully in order to better equip our theoretical and methodological
tools.

The mainstay of theoretical and empirical collaboration that has occurred has been located at
the intersection of managerial cognition and behavioural decision-making (BDM) (See:
Hodgkinson et al., 1999; Hodgkinson and Sparrow, 2002; Markóczy and Goldberg, 1999).
BDM is pitched against the assumed rationality of economic models and as such assumes
actors to behave in boundedly rational ways. This has formed a basis for generalisations of
‘errors’ across domains and in the creation of decision-making prescriptions (Bazerman,
2001). Drawing upon the notions of heuristics and biases, the central contribution of this
collaboration has been in understanding the nature of cognition and how decisions deviate
from normative principles.

Whilst inter-disciplinary collaboration between managerial cognition and BDM has been
(and indeed continues to be) useful, the appropriateness of normative standards within the
decision sciences has been met with criticism (Beach and Lipshitz, 1993; Lipshitz, Klein and
Carroll, 2006; Lipshitz and Strauss, 1997; Zsambok, 1997). Fields such as NDM have
emerged that question the representativeness and validity of BDM's conceptual framework. For example, the notion of a normative standard borrowed from economics has been rejected in favour of an empirical standard rooted in expertise (Lipshitz et al., 2001). NDM has also expressed discomfort with the predominance of BDM's laboratory-based methods (Connolly and Koput, 1997; Gigerenzer and Goldstein, 1996) and with the unnatural quality of decision-making studies to date, which have been deemed inappropriate for capturing decision-making in 'real-world' settings (Lipshitz et al., 2001).

On these grounds, this thesis proposes that NDM may offer a complementary approach to BDM, from which cross-fertilisation with the field of managerial cognition may occur. The focus of this thesis is inherently methodological, proposing an inter-disciplinary sharing of techniques to capture and represent decision-making. The rationale behind this methodological agenda is justified in detail in Chapter Four.

This thesis seeks to examine the boundaries of useful cross-fertilisation through the study of investment professionals. Study within this domain has been largely characterised by the field of behavioural finance:

"Behavioural finance is the study of the influence of psychology on the behaviour of financial practitioners and the subsequent effect on markets."

(Sewell, 2007: p.1)

This domain has gained momentum in response to acknowledgement of the shortcomings of modern financial economics, which has assumed actors' behaviour to follow purist forms of rationality (Janis and Mann, 1977). In the same way that BDM assumes a boundedly rational approach to actors' decision behaviour, so to does behavioural finance seeking to understand the systematic departures from rationality that occur within financial markets (Barber and Odean, 1999). The adoption of normative standards and experimental approaches to the study of these systematic deviations echoes the work of BDM. Much of the same critique therefore applies, such as dissatisfaction with laboratory-based methods and the limited insights they provide into 'real-world' decision-making.

Although it is not the aim of this research to address the shortcomings of the behavioural finance perspective per se, it is interesting to note from a contextual point of view the similarities that exist between behavioural finance and BDM. On this note, this acts as a
justification for the application of a naturalistic perspective to the context of investment professionals’ decision-making.

In summary, this thesis seeks to examine the boundaries of methodological cross-fertilisation between managerial cognition and NDM through the study of investment professionals. To this means, a mixed-methods approach is adopted that blends quantitative and qualitative techniques from across these fields. The insights provided are used as a mechanism for assessing the utility of inter-disciplinary rapprochement. To meet this aim, the thesis is organised as follows:

Chapter Two opens with a review of the NDM literature. This chapter traces the chronological origins of the NDM perspective and examines its antithetical positioning against classical decision-making (CDM) theorem. Critical inspection of the limits of the assumption of antitheticality and therefore, the appropriateness of defining NDM as a ‘paradigm shift’ within the decision sciences are considered. As a point of illustration of NDM’s propositions, one of the key theoretical models that frames thinking within NDM is outlined. Finally, a review of the naturalistic methods used within the field and their associated shortcomings are addressed.

In a similar vein, Chapter Three examines the managerial cognition literature tracing the origins of the field and the utility of this perspective. The alleged incommensurability of managerial cognition and BDM is examined, with the author suggesting that inter-disciplinary collaboration may be better approached from a naturalistic perspective. The focus of this chapter lies in review of the theoretical and methodological challenges facing the field, through critical examination of the limitations of methods used to map cognition. In conjunction with Chapter Two, this chapter sets the stage for a cross-fertilisation of methods between NDM and managerial cognition.

Chapter Four introduces the methodological framework for this thesis documenting the research rationale, epistemological assumptions and justification of a mixed-methods research design. The author’s philosophical choice is defended in line with the use of mixed-methods and the objective of inter-disciplinary collaboration across the fields of NDM and managerial cognition.

Chapter Five documents the findings from a Preliminary Study of Portfolio Managers’ decision-making. In this study an exploratory approach was adopted that first, considered the
utility of NDM’s applied cognitive task analysis (ACTA) and second, a method derived from cognitive psychology called ‘convince me’ to inform cognitive mapping approaches within managerial cognition.

Chapter Six presents the results from Study II that sought to examine the ‘convince me’ method in more detail. This second study used Fund Managers as a context for examining the utility of ‘convince me’ as an inter-disciplinary tool. Additional insights into the decision world Fund Managers inhabit, were derived through the completion of an interpretative phenomenological analysis (IPA).

Study III is outlined in Chapter Seven, which aimed to establish the utility of NDM’s ACTA techniques for mapping managerial cognition. The decision-making of Day Traders was used as a backdrop for this work. Like Study II, the acknowledgement that decision-making and cognition are inherently situated led to the completion of an IPA to contextualise the findings of this research.

In Chapter Eight a discussion unfolds that links together the work across these three studies. In doing so, it summarises the key findings, and in assessing the contributions of ACTA, ‘convince me’ and IPA considers the implications of this work for the cross-fertilisation of methods between NDM and managerial cognition. The conclusions drawn and their implications for the conceptualisation of rationality are also discussed in relation to (i) epistemological-methodological debates facing the fields of NDM and managerial cognition and (ii) the dichotomy that exists between NDM and CDM. The suitability of the notion of interactional expertise for future study in NDM and managerial cognition is also outlined, as is the utility of mixed-methods research. This chapter closes with a discussion of the limitations of this research, provides some directions for future research and recommendations for improving decision thinking. Chapter Nine provides a summary of the key conclusions derived from this research, closing with a call for increased interdisciplinary collaborations.

**Thesis Objective**

In summary, the objective of thesis is to examine the appropriateness of methodological cross-fertilisation between NDM and managerial cognition, in order to better understand investment professionals’ decision-making.
CHAPTER TWO

The Emergence of a Naturalistic Decision-Making Perspective

2.1 Introduction

This chapter provides a discursive review of the current state of debates within naturalistic decision-making (NDM). Accordingly, in order to set the scene for methodological cross-fertilisation with the field of managerial cognition, this examination explores four interrelated aspects of NDM: (i) chronological review of NDM definition, (ii) classical decision-making (CDM) as the genesis of NDM (iii) theoretical representations of NDM and (iv) critical evaluation of NDM methods.

A common thread uniting these sections is the tension that exists between CDM research and NDM, taking the dichotomous forms of decision error vs. expertise, prescription vs. description, and laboratory vs. naturalistic methods. The conceptual and methodological limits of paradigmatic antitheticality are discussed in relation to decision scenarios that exist at the interface of both NDM and CDM, from which the implications for the naturalistic study of investment professionals are considered.

The perspective advocated throughout this thesis is that whilst NDM presents a strong challenge to the CDM perspective on epistemological, theoretical and methodological fronts, they ought not to be conceptualised as mutually exclusive approaches. Further still, the NDM perspective should be considered as one that is still emerging and in a number of respects - one that is essentially embryonic and could benefit from inter-disciplinary conversation. For this reason, this chapter closes with a summary of the benefits of a naturalistic approach to the study of cognition, and as a platform for Chapters Three and Four the methodological challenges facing NDM.

2.2 NDM Definition - Chronological Review

The origins of the NDM movement can be traced to a conference held in Dayton, Ohio in 1989. This conference sought to bring together behavioural researchers united by a common goal, which was to understand decision-making in 'real-world' environments under
conditions of time pressure, uncertainty, ill-defined goals and high personal stakes. The principal forum for NDM research has been through these conferences and their associated publications (Table 2.1 overleaf, provides a summary of the International Conferences on Naturalistic Decision-Making).

The rising momentum of NDM has also resulted in a small number of special issues devoted to the topic (See: Human Factors, 1996; Journal of Behavioral Decision-Making, 2001; Organization Studies, 2006). In an attempt to establish the boundaries of this emerging perspective, Orasanu and Connolly (1993) delineated eight characteristics of decision-making in naturalistic settings that they proposed “frequently are ignored in decision-making research” (p.7):

(i) *Ill-structured problems*

The authors' proposed that ‘real’ decision problems seldom present themselves in the entirely complete and orderly form that CDM prescribes (CDM’s prescriptions are described in the next section). Rather, Orasanu and Connolly contend that decision-makers have to expend effort (a) generating hypotheses about the situation, (b) developing options as appropriate responses and (c) recognising that the situation is one permissible of choice.

(ii) *Uncertain, dynamic environments*

Given that NDM typically takes place in a world of incomplete and imperfect information (assumption (i) above), information is also likely to be ambiguous or of poor quality. Furthermore, information ambiguity and quality are likely to be allied with the dynamic nature of the task environment.

(iii) *Shifting, ill-defined or competing goals*

Orasanu and Connolly propose it to be atypical for a well-understood end-goal to emerge in ‘real’ decision environments. Instead, they suggest the decision-maker to be motivated by multiple goals, which may come into direct conflict.

(iv) *Action / feedback loops*

A critical difference between traditional decision models and NDM concern the decision event(s). CDM is concerned with decisions characterised by the selection of a single action at a specific point in time. Contrastingly, NDM purports that ‘real’ decision environments are arranged as a series of temporally segregated events. Orasanu and Connolly’s conceptualisation of NDM makes it conducive to the use of action feedback loops to rectify early mistakes, allowing corrective action.
Table 2.1: History of International Conferences on Naturalistic Decision-Making
(Adapted from: Hoffman, 2006)

<table>
<thead>
<tr>
<th>Location</th>
<th>Accomplishments</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington, DC (1998)</td>
<td>This conference documented progress with reference to earlier promissory notes and continued to foster debate on the relation of NDM to other paradigms such as human factors and ‘cognition in the wild.’</td>
<td>Salas, E. and G. Klein (eds.), (2001). Linking Expertise and Naturalistic Decision Making. Lawrence Erlbaum: NJ.</td>
</tr>
<tr>
<td>Pensacola Beach, Florida (2003)</td>
<td>This conference focused upon 'expertise out of context,' and paid particular attention to the problems and issues that arise when experts confront situations that fall outside of the range of 'the routine.' Debate also centred upon the relation of NDM to traditional laboratory science and the relation of micro-cognition to macro-cognition.</td>
<td>Hoffman, R. R. (ed.), (2006). Expertise Out of Context: Proceedings of the Sixth International Conference on Naturalistic Decision Making. Lawrence Erlbaum: Mahwah, NJ.</td>
</tr>
<tr>
<td>Monterey, California (2007)</td>
<td>This conference represented the diversity of research within NDM including: knowledge management, applications to organisations, teams, military and security operations. Debate centred upon the appropriateness of the macro-cognition construct and the methodological challenges that continue to face the field.</td>
<td>Proceedings distributed during conference.</td>
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</table>
(v) *Time stress*

Orasanu and Connolly propose that NDM occurs under time pressure. This has two implications. Firstly, decision-makers will encounter high levels of stress, and secondly decision-makers will utilise less complicated reasoning strategies (Payne, Bettman and Johnson, 1988), as decision strategies demanding comprehensive comparisons across multiple options are not cognitively feasible.

(vi) *High stakes*

NDM emphasises that for each decision, the stakes are important to the decision-makers involved. This assumption is rooted in the suggestion that decision-makers in the laboratory do not invest in the task to the same degree as those in field settings.

(vii) *Multiple players*

Fundamental to this assumption is the proposition that characteristics of ‘real’ environments often require the active participation of several decision-makers. Thus, a decision may be distributed over multiple players trying to coordinate their activities, meaning the focus is not of a single decision-maker as CDM suggests.

(viii) *Organisational goals and norms*

Finally, the prevalence of NDM in organisational settings is seen as relevant on two accounts: (a) it is too simplistic to suggest that values and goals are only a reflection of personal preferences and (b) the organisation may establish general goals, rules and standard operating procedures to respond to decision-makers’ difficulties. These factors are particularly challenging to integrate into artificial environments (Hackman, 1986).

At first sight, Orasanu and Connolly’s criteria appear constructive in defining the boundary conditions of NDM research, with their ability to capture the uncertain and dynamic characteristics of task environments and the variable role of goals. However, by limiting their focus to the characterisation of ‘field settings’ as the crucial feature of NDM, their description overlooks the importance of studying experts (Pruitt, Cannon-Bowers and Salas, 1997) and the role of situation assessment as an alternative to selection between courses of action (Klein, 1993), which were described as the cornerstone of NDM research during the 1st conference.

On this premise, the 2nd International Conference on NDM sought to re-define the criteria of Orasanu and Connolly as one of four defining markers of NDM research. The first highlighted the importance of ‘research participants,’ with particular emphasis upon the role of experience. The second ‘research purpose,’ suggested a focus upon descriptive and *not* prescriptive decision research. The locus of interest with the ‘decision episode’ comprised
the third marker of NDM research, attributing weight to situation awareness as opposed to
the process of option selection. The final marker ‘field settings,’ was employed to echo the
original suggestion of Orasanu and Connolly.

This shift towards a more equivocal emphasis of expertise and context has also been
reflected in definitions from Klein (1998) as:

“... the study of how people use their experience to make decisions in field settings.”
(Klein, 1998: p.11)

Definitions with increased specificity include that of Zsambok (1997), emphasising the
dynamic character of NDM environments as:

“... how experienced people, working as individuals or groups in dynamic, uncertain and
often fast-paced environments, identify and assess their situation, make decisions and
take actions whose consequences are meaningful to them and to the larger organization in
which they operate.”
(Zsambok, 1997: p.5)

The latter definition provided by Zsambok was used during the 3rd International Conference
on NDM to orientate the focus of research into stress and decision-making. However,
precisely where the emphasis between expertise and field settings should lie when defining
NDM continues to be the focus of debate (Lipshitz et al., 2001). Pruitt, Cannon-Bowers and
Salas (1997) suggest the primary factor in NDM to be expertise, suggesting that as CDM
treats prior experience as a nuisance variable, NDM should make it the focus of its inquiry.

The appropriateness of using CDM as a platform for the definition of NDM is critically
reviewed later in this chapter. Viewed as problematic for the widely accepted definitions of
NDM, this issue has been largely neglected since, with definitional progress during the 4th
International Conference on NDM focussing upon the formulation of increasingly more
abstract descriptions:

“[NDM is] ... the effort to understand and improve decision making in field settings,
particularly by helping people more quickly develop expertise and apply it to the
challenges they face.”
(Salas and Klein, 2001b: p.3)

The emphasis in this definition has shifted from specification of the boundaries of task
environments that make them intrinsically NDM, to stressing the field’s ‘applied’ base as
one of expertise development. An inherent difficulty of this definition is that it is embedded in the suggestion that all decision-making activities in field settings are exemplars of NDM. In fact, given the specifications of NDM by Orasanu and Connolly (1993) and Zsambok (1997) the explanatory power of NDM does not extend to all decisions in field settings, but is localised to a particular sub-set of decision-making activities that are characterised by expertise and constraints such as time pressure, high stakes and uncertainty. Further still, precisely how expertise may be developed remains under-specified (Lipshitz et al., 2001) and serves only to circumvent the question of definition.

Interestingly, during the 5th International Conference on NDM a reversion was made back to the criteria proposed by Orasanu and Connolly (1993). This was used to establish the degree to which these factors remained visible in the 5th Conference and to highlight any additional emergent factors. The general consensus was that this criterion definition was still reflective of the current research focus. This thesis however, casts doubt over the comprehensiveness of this definition through its exclusion of expertise and its narrow focus upon characteristics of field settings, which suggests to this author at least that this form of NDM definition may be inappropriately restrictive.

The conceptual difficulties of pinning down precisely what the NDM perspective purports continues to permeate the literature. Conferences held in 2003, 2005 and 2007 have done little to resolve this debate. The review article by Lipshitz et al. (2001) that featured in the Journal of Behavioral Decision-Making’s special issue, sought to rectify this anomaly, suggesting five characteristics to define NDM:

(i) **Proficient decision-makers**

NDM is concerned with the decision-making of those with relevant experience or knowledge within a particular domain and who rely on their experience directly.

(ii) **Situation-action matching decision rules**

The study of proficient decision-makers leads to the modelling of decision-making as a process of matching as opposed to concurrent choice (Carroll, 1980; March, 1982; Newell and Simon, 1972). Matching differs from concurrent choice on the grounds of: (a) the sequential evaluation and rapid scanning of options against a standard from which one or two are then compared (Beach, 1993; Montgomery, 1989), (b) compatibility with the situation as a dictator of the selection / rejection of options (Endsley, 1997; Klein, 1998; Pennington and Hastie, 1993) and (c) the predominance of pattern matching and informal reasoning processes as over-analytical forms (Cohen, Freeman and Wolf, 1996; Klein, 1998; Lipshitz, 1993; Pennington and Hastie, 1986).
(iii) **Context-bound informal modelling**

Given that proficient decision-making is driven by localised knowledge grounded in experience, the utility of abstract formal models are limited on the premise that knowledge is domain and context specific (Ericsson and Lehman, 1996). NDM models are therefore concerned with the representation of information decision-makers attend to and the arguments they use.

(iv) **Process orientation**

Unlike CDM and BDM, NDM does not attempt to predict which option will be implemented. The implication for validation of NDM is therefore inherently different. Funder (1987) suggests that to be valid, NDM models have to describe information sought, interpretations of data and decision rules implemented by decision-makers.

(v) **Empirical-based prescription**

NDM operates in response to judgement and decision-making (JDM) and BDM's descriptive models that are derived from 'normative' ideals and formal standards of optimisation. For NDM, the goal of empirical-based prescription is to improve decision-making by basing prescription on demonstrations of realistic and feasible expert performance.

Although progressive, this approach locates NDM in opposition to CDM, and in so doing has been criticised by Yates (2001). The antithetical positioning of decision-making perspectives is the focus of much discussion within the decision sciences. The following section considers the appropriateness of conceptualising NDM and CDM as mutually exclusive perspectives. Attention is given to this within this chapter, not only because of the implications it holds for NDM definition, but due to the connotations it holds for the study of investment professionals which (as briefly outlined in Chapter One) has been denoted by purist implementations of rationality and optimisation. In viewing the notion of antitheticality as inappropriate, the section that follows forms a rationale for the naturalistic study of investment professionals' decision-making.

2.3 **Classical Decision Making (CDM): The Genesis of NDM**

Chronological review of the definitional development of NDM has revealed a number of issues that warrant further examination. Accordingly, three aspects are considered below: (i) the rationale for viewing CDM as an inappropriate standard and thus as a platform for NDM development, (ii) the limits of the antithetical assumption and (iii) an examination of the appropriateness of defining NDM a paradigm shift.
2.3.1 Why describe CDM?
The rationale for describing CDM is that NDM purportedly evolved in response to the shortcomings of CDM theory. Given the evolution of decision-making theory, there is a conceptual tendency within the NDM community to characterise NDM as antithetical to CDM (Beach and Lipshitz, 1993). Whilst absolute rejection of CDM strategy is a position not endorsed within this thesis (the author acknowledges that there may be instances that demand both CDM and NDM strategies), CDM theorem nevertheless provides a relevant backdrop for the justification of a naturalistic approach to decision-making.

2.3.2 What is CDM?
In essence, the core of the CDM paradigm is characterised by two fundamental assumptions about decision evaluation. The first, 'formal theory' depicts CDM as models of uncertainty and risk (probability and Bayesian theory), and utility (multi-attribute utility theory). That is, CDM focuses upon the decision event, prescribing the optimal choice from a fixed set of known alternatives where optimality is defined by the underlying models and choice is dictated by an explicit rule (Beach and Lipshitz, 1993; Orasanu and Connolly, 1993).

The second, 'normative role' represents CDM as an abstract system of propositions designed to describe the choices of an ideal hypothetical decision-maker, i.e. as a computationally omnipotent economic man. Attributing this prescriptive role to CDM, suggests decisions made by the economic man to be the only uniquely appropriate and 'rational' method and has directed judgements of the optimality of humans' decisions by whether the decisions conform to the prescriptions of the theory.

2.3.3 CDM: An inappropriate standard
In the discussed role, there is a research base suggesting CDM to be an inappropriate paradigm in relation to 'real-world' decision-making, the essence of which is summarised below (Beach and Lipshitz, 1993):

(i) Artificial situations
Situations invoked in the CDM framework use simplistic, highly structured decision tasks that in possession of complete information have little relevance to 'real-world' decisions (Duggan and Harris, 2001).

(ii) Rationalisation
CDM is an internally consistent, logical system that reflects its origins as an attempt to rationalize observed decisions (Bentham, 1970). However, the insufficiency of decision-
makers' time and resources during CDM operations makes it difficult to rationalise in practice.

(iii) Prescriptivity assumption
Implicit is the assumption that if decision makers behave as they 'should,' CDM theory would not only be 'normative' and prescriptive it would also be descriptive of human decision behaviour. However, decision behaviour does not conform consistently to the logic or implied operations of CDM. Furthermore, it is unreasonable to expect the same mathematical precision in the behaviour that is compared to it.

(iv) Methodology: Gambling task
Human decision-making consists of many tasks that are quite different from the gambling task for which CDM was designed (Beach and Lipshitz, 1993).

(v) Multiplicity of options
Decisions involve only one option not multiple ones as CDM suggests, whereby the decision is whether to go, rather than a choice from competing options (Mintzberg, 1975; Peters 1979).

(vi) Subjective intuition
Managers seldom follow CDM prescriptions that disagree with their subjective intuitions (Gore, 1995, 1997; Isenberg, 1984, 1985). Further still, this 'subjective mode' is utilised even in the provision of computerised technology providing probabilities and projecting trends, as these are 'backward looking' records of past events presuming the world to be static. Strategic decisions are made in order to act upon the world, to make sure that the future does not look like the past (Phillips, 1985).

(vii) Control in decision behaviour
Analysis of a decision in terms of subjective expected utility is an argument by analogy, an analogy between what the decision-maker must do to decide and what a gambler must do to bet on an analogous game of chance. However, the gambler exerts little control over the events, in contrast to the control that is a part of human decisions. Thus from a control perspective the analogy between those decisions and gambling is not cogent (Shafer, 1986).

2.3.4 CDM: A platform for NDM
In response to this discontent, a shift in perspective from CDM towards NDM (Pruitt, Cannon-Bowers and Salas, 1997) represented attempts to more accurately describe the process involved in 'real-world' decision-making practice. In essence, the prototypical NDM environment focuses upon decisions embedded in larger dynamic tasks made by experienced decision-makers, recognising that the manner in which decisions are made in the laboratory
and ‘real-life’ are quintessentially different (Beach and Lipshitz, 1993; Orasanu and Connolly, 1993).

NDM's contribution was also fundamental in re-conceptualising what was deemed ‘normative’ through the notion of expertise (Lipshitz et al., 2001). In CDM and BDM research, errors are operationally defined as failures to adhere to the prescriptions of normative models i.e. subjective expected utility and Bayesian statistics. NDM sought to re-define the concept of error using departures from 'normative' strategies as both opportunities for performance improvement (Lipshitz et al., 2001) and as sources of innovation, thereby proposing decision behaviour to be met by theory and not vice versa. However, NDM has been criticised for lacking the analytical criteria that serve as signposts for error with Doherty (1993) claiming, “naturalistic decision making is simply silent on what constitutes an error” (p.380).

As suggested in Chapter One, there has been a distinctive lack of inter-disciplinary collaboration both within the decision sciences and related fields. Although the NDM community have always invited ‘opponents’ to their conference discussions, the polarisation of NDM against existing decision perspectives has perhaps served only to isolate the NDM community, rendering (from the perspective of NDM at least) intellectual cooperation purposeless. The remainder of this section outlines the limits of the assumption of antitheticality and examines the question of whether or not terming NDM a paradigm shift is useful? These arguments are used to set the scene for meaningful exchange of NDM principles to the study of investment professionals.

2.3.5 Limits of the antitheticality assumption

A progressive argument is presented suggesting that whilst it was initially advantageous to use CDM as a platform for disseminating the NDM perspective, it was also concurrently debilitating to couch NDM antithetically to CDM for the purpose of definition. That is, whilst surface representations of antitheticality such as choice vs. action and prescriptivity vs. descriptivity are able to uphold this distinction, it is more problematic for other ‘ideals.’

For instance, logical deduction suggests that if CDM is both ‘rational’ and antithetical to NDM, then NDM is ‘irrational.’ Commonsense alone tells us that this premise cannot hold, as decision-makers are unlikely to adopt ‘irrational’ actions. The principle of optimisation also presents difficulties for the assumption of antitheticality. Optimisation as defined by Klein (2001) is an attempt to find the best option out of a set of potential courses of action.
and is thus synonymous with maximising expected utility. The basis of this argument lies in the view that any deviation from CDM's 'gold standard of optimisation' to be a departure from rationality (Klein, 2001).

The notion of control in decision behaviour is also an ideal for which antitheticality is incomplete. As Beach and Lipshitz (1993) and Klein (2007) propose, the analysis of a decision is an argument by analogy between what the decision maker must do to decide (NDM), and what a gambler must do to bet on a game of chance (CDM). NDM and CDM are viewed as dichotomous on the basis that control is an integral part of human decisions not permitted by the gambler. It is possible however, for decisions to exist that adopt both forms. Take for instance, the decision-making of investment professionals. Here, decision-making is often conceptualised in layman terms as a gamble on the direction of market movements, of which investment professionals have little formal control. However, investment professionals by means of their investment are influencing the behaviour of the market.

This leads to the rejection of a final premise, namely that 'real-world' decision-making consists of tasks quite distinct from the gambling tasks of CDM. Whilst, it can be argued that 'real-world' decisions do in the main evade this typology of task, there are instances within which gambling tasks and NDM coincide. For example, investment professionals' decision-making is marked by the derivation of statistical models of financial markets and direct assessments of the likelihood of market price-action, alongside more intuitive judgements that are rooted in expertise as a basis for action.

The arguments presented cast doubt on a strict form of antithetical positioning for NDM and CDM perspectives. In view of this, this section ends with consideration of the implications of defining NDM a paradigm shift.

2.3.6 Examination of the appropriateness of terming NDM a paradigm shift

The final issue reviewed, pertains to the question of whether NDM represents a paradigm shift within the decision-making literature? Characterising NDM as a paradigm shift has implications for the problems of both antitheticality and in a broader sense, NDM definition. Kuhn's (1970) seminal *The Structure of Scientific Revolutions* and his notion of paradigms are briefly described as a backdrop for discussion.
At the centre of Kuhn’s rebuttal is the widely held assumption that science is a cumulative process that incrementally progresses towards an ultimate truth. What Kuhn suggests is that science adopts an unsystematic form of progress that is interrupted episodically by violent revolutions that produces lateral as opposed to incremental progress (Kuhn, 1970). Kuhn suggests that periods of ‘normal science’ i.e. the phases of scientific endeavour not characterised by violent revolutions, to be guided by ideological frameworks called paradigms. Paradigms have a prescriptive role in orientating scientific communities towards the types of questions asked, methodologies adopted, the subject of investigation and even forms of acceptable answers (Cannon-Bowers, Salas and Pruitt, 1996; Pruitt, Cannon-Bowers and Salas, 1997). Scientific revolutions arise with the discovery of anomalies that cannot be conquered within current paradigms, ultimately leading to crisis and the emergence of a new paradigm.

The question that follows is whether NDM represents the kind of revolution in science that Kuhn’s paradigm shift suggests? The general consensus amongst the NDM community is that a paradigm shift in decision-making research has occurred (Cannon-Bowers, Salas and Pruitt, 1996). To characterise NDM as a paradigm shift in Kuhnian terms is to suggest it to be a reactive response to CDM (Flin et al., 1997; Pruitt, Cannon-Bowers and Salas, 1997). Proponents of this view suggest the NDM belief system to offer a different perspective of (i) the decision situation i.e. as evolving temporally and not static as CDM suggests, (ii) cognitive power, in emphasising the impact of cognitive limitations in decision-making as opposed to infinite resources, (iii) the emphasis upon decision-making competence rather than dysfunction and (iv) the belief that action and perception are central parts of cognition (Klein and Woods, 1993).

Early definitions pitching NDM counter to CDM substantiate this view (Endsley et al., 1995), as does the belief that NDM has impacted how decision-making research might advance (Cannon-Bowers, Salas, and Pruitt, 1996). There are a number of other beliefs such as methodological transformation and the conversion of theoretical prescriptivity to descriptivity that are addressed in the remaining sections of this chapter and may also be used to inform this argument.

The question of whether NDM represents a true shift in ideology and thus a scientific revolution for science (Gore et al., 2006; Pruitt, Cannon-Bowers and Salas, 1997) is one however, that has been evaded in the main. On the issue of ideological change, it is also possible to construct a conceptual argument that suggests differences in ideology to stem
from the qualitative difference in the types of decision problems approached by NDM and CDM (Yates, 2001). Indeed, during a recent panel discussion at the 8th International Conference on NDM (2007), Professor Robert Hoffman was quoted as saying that it is useful to “preserve the distinction because it gives you power.” The use of the category ‘decision-making’ for NDM research has therefore been criticised as existing only as a strategy of rhetoric in creating a platform for contrast with CDM (Gonzalez, 2001).

Alternative conceptualisations of NDM could have included the equally permissible label ‘complex problem solving.’ Conceptual overlap is evidenced in the following beliefs: (i) that the notion of problem spaces and production rules can be readily mapped onto NDM concepts, (ii) that situation awareness is analogous to the establishment of a problem space, (iii) that recognition-primed decisions are typical of production rules and (iv) the mutual importance attributed to the principles of bounded rationality and satisficing. Here however, NDM would have adopted an equivocal role to ‘complex problem solving’ research, discounting NDM’s declaration of a paradigm shift (Payne, 1982; Yates, 2001).

Problem solving is not the only discipline with parallels to NDM. Equally as pertinent candidates can be drawn from research in expertise (Ericsson and Charness, 1994; Salas and Klein, 2001a, 2001b; Schanteau, 1992), situation awareness (Endsley, 2000; Sarter and Woods, 1991), situated cognition (Suchman, 1987), new organizational theory (Connolly and Koput, 1997; Gore et al., 2006) and managerial cognition (Hodgkinson and Healey, 2008). (See Chapters Three and Four for a depiction of the NDM - managerial cognition interface). The false assumption that NDM represents a paradigm shift, when NDM overlaps heavily with other fields in cognitive science is therefore to date, somewhat ill-justified.

If as the NDM community suggests a change in ideology has occurred, how can the presence of a paradigm shift be measured? The statement of newly developed principles although important is not enough to invoke paradigm change, or paradigm shifts would be a frequent occurrence in science. There is also the additional issue of how long a ‘new’ paradigm should be established for before it constitutes a paradigm shift? NDM has been established formally for just over two decades now, but to date there is no evidence to suggest that it has been viewed as a paradigm shift outside the NDM community.

A final related issue exists regarding the issue of publications within journals, an activity in which NDM has experienced some difficulty in establishing itself. Note that the special issues on NDM in the *Journal of Behavioral Decision Making* in 2001 and *Organization
Studies in 2006 are the first of its kind devoted exclusively to NDM. Work does however, exist within domain specific publications such as Human Factors, Ergonomics and the Journal of Cognitive Engineering and Decision Making (first published in Spring 2007), which uses ‘cognition in context’ as one of three main tracks. The choice of NDM theorists and practitioners not to disseminate their work via the traditional academic route may simply be due to the ‘applied’ nature of their research investigations. Permeation of the fields’ most influential publications would however, provide an indicative measure of the substance of NDM’s claims and pave the way for paradigm change. The forthcoming chapter in Hodgkinson and Starbuck’s (2008a) edited volume The Oxford Handbook of Organizational Decision-Making by Rosen et al. that considers the interface of expertise and NDM in organisations meets this to some degree. However, failure to consistently locate NDM articles in leading publications, prompts the question as to whether NDM really represents a scientific revolution?

Whilst Kuhn suggests that truth does not exist in the absence of a paradigm, this thesis proposes that NDM does not represent a paradigm shift. In conjunction with the limits of antitheticality, the difficulty in defining the ontological source of the NDM paradigm makes it unlikely that a significant shift has occurred to warrant ‘paradigm’ status. That NDM is fraught with conceptual difficulties across ideological and epistemological levels is testament to this stance. Rather, it is perhaps more appropriate to characterise NDM as a “movement – one founded on a revolutionary philosophy that turned out perhaps not so revolutionary” (Howell, 1997, p.40) but that has “…something of a promissory note, understandable given the newness of the approach and the untouched problems and challenges” (Hoffman, 1997: p.xi-xii).

2.4 NDM Models – Specific Representation

The next section of this chapter illustrates the theoretical value of the NDM movement as a descriptive as opposed to prescriptive decision-making perspective. NDM has been framed as “… a loose grouping of non-standard models of individual decision making” (Connolly and Koput, 1997: p.285). As such, a number of models exist depicting decision-making in NDM environments, such as image theory (Beach, 1990), Noble’s (1989) model of situation assessment, Pennington and Hastie’s (1993) theory of explanation-based decisions and Montgomery’s (1983,1989) dominance search model. By far the most comprehensive model is Klein, Calderwood and Clinton-Cirocco’s (1986) recognition-primed decision-making (RPD) model. The RPD model is commonly regarded as the epitome of NDM, and will therefore be used to illustrate the type of descriptive representations developed by the NDM
community. Whilst, this section is largely descriptive, it serves as a demonstration of NDM’s achievements and sets the scene for discussion of the methodological challenges facing the NDM community in the final section of this chapter.

2.4.1 Recognition-primed decision-making (RPD) model: An illustrative example

Genesis of RPD model

The origins of the RPD model are set in command-and-control performance (Klein, 1993). It is useful to consider this in order to assist situating the theoretical depiction of the RPD model in the proceeding section.

Essentially, the earliest work focussed upon observing and obtaining protocols from urban fire-ground commanders about emergency events they had handled (Klein, Calderwood and Clinton-Cirocco, 1986). The protocols suggested that archetypal decisions were: (i) whether to instruct search and rescue, (ii) whether to commence offensive attack or undertake defensive precautions and finally, (iii) where to allocate resources. The fire-ground commanders’ protocols did not appear to be congruent with the decision-tree depictions of CDM. In fact, observations and protocols revealed that fire-ground commanders did not make explicit choices or contemplate alternatives in an exhaustive fashion, nor did they assess the probability of success of particular actions. Rather, it was suggested that fire-ground commanders used experience as a means for their actions. These protocols exposed a process of generating, monitoring and modifying plans in an attempt to meet the demands of particular situations.

What was fundamentally important about Klein, Calderwood and Clinton-Cirocco’s (1986) findings for the NDM perspective was that there was no evidence of extensive option generation. Further still, it enforced the importance of situating decision-making processes within naturalistic environments - as in the case above, a search for optimal choice (as proposed by CDM) would stall the fire-ground commanders, giving rise to a loss of operational control.

The rationale for Klein, Calderwood and Clinton-Cirocco’s belief that fire-ground commanders were not contrasting options is three-fold. First, it is highly improbable that experts have the cognitive capacity to apply complex analytical strategies in time demanding situations (Zakay and Wooler, 1984). Second, fire-ground commanders’ protocols explicitly stated that they did not contrast options. Third, the emergence of an alternative experience-
driven strategy through the fire-ground commanders' protocols was deemed a more intuitively feasible explanation of their decision-making process.

This alternative strategy suggested that clear 'decision-points' were encountered during emergency events. Moreover, the fire-ground commanders suggested that they could describe alternative courses of action that were possible, but that they did not explicitly consider their associated advantages or disadvantages. Rather, they relied upon their past experience to classify the situation, which then dictated the appropriate course of action to be implemented. Lastly, the fire-ground commanders would evaluate an options' feasibility by imagining how it would be implemented. If the potential for failure was high then the option would be modified, or rejected and an alternative generated from their experience base.

RPD model: Description

The basic strategy as described above, was formalised into the RPD model as a depiction of how experience informs decision-making (Klein, 1989). Given the analysis of fire-ground commanders' protocols, Klein (1989) suggested a recognitional strategy to be the most appropriate. There are three versions of the RPD model that represent the increasing complexity of decision-making: (i) routine situations - the simplest form of RPD execution, (ii) decision-making involving the development of a course of action and finally (iii) a complex RPD strategy that deals with the possibility of non-immediate situation recognition. Figure 2.1 overleaf, outlines the complex RPD strategy.

**Routine situations**

In routine situations the expert immediately recognises a scenario as typical. Typicality has four components associated with it: firstly, increasing the relevance of cues that are important within that situation, forming expectations which can serve as a check on the accuracy of situation assessment, understanding plausible goals that can be accomplished within the situation and fourthly, identifying plausible courses of action to implement. Once the situation is recognised as familiar, a single course of action is obvious and simply implemented.

**Developing a course of action**

In the event that a single course of action is not obvious, the expert will conduct a mental simulation of the action and a subsequent assessment of its potential. Here if time allows, imagery is used to uncover potential problems prior to action implementation. If there are no envisioned difficulties then the action is implemented. If problems exist, then if possible, the action will be modified and then implemented.
Experience the situation in a changing context

Seek more information

Re-assess situation

Is the situation familiar?

Yes

Recognition has four aspects:

Plausible goals

Relevant cues

Expectancies

Actions 1...n

Mental simulation of action (n)

Yes, but...

Will it work?

Modify

Yes

Implement

No

Are expectancies violated?

Yes

No

Figure 2.1: Recognition-Primed Decision-Making Model - Complex Strategy (Klein, 1993)
**Complex RPD strategy**

In the event that the situation is not immediately recognised, then the expert actively seeks information to find cues and features that may reveal the nature of the scenario. In other cases the situation type may initially be recognised, but incorrectly. As events pan out, expectancies of future events are violated and the expert seeks clarification of the situation through a diagnostic process. With regard to the use of mental imagery in developing a course of action, a number of possibilities exist: (i) if no problems exist then the course of action is simply executed, (ii) if problems arise then the course of action is modified prior to execution and (iii) if a course of action cannot be modified, then it will be rejected and another option considered. In the event of inadequate time, the RPD model suggests experts to implement the course of action experience has identified as the most likely to be successful.

**Prevalence of recognition-primed decisions**

The empirical knowledge base of the RPD model is limited beyond anecdotal citings and speculative introspection derived from interview protocols. The mainstay of evidence substantiating RPD has been derived from studies quantifying the prevalence of recognition-primed strategies as opposed to the concurrent deliberation of options (as proposed by CDM) for non-routine decisions (Klein, 1993). Data drawn from five independent studies have formed the basis of RPD validation by Klein (1993). These are described as follows:

The first study under Klein’s (1993) consideration involved urban fire-ground commanders’ (FGC-1) consideration of non-routine decisions, suggesting recognitional decisions to comprise 80% of their decision points. The second study involved expert FGC-2 and showed 58% of decision points to be characterised by RPD, which was comparably higher than the RPD usage found in novices (46%). This was taken to suggest that the prevalence of recognition-primed decisions is experience-driven. Study three considered functional decisions about fighting forest fires, indicating 56% of the decisions to be recognitional in nature. Comparatively, organisational decisions required a higher comparison of options yielding a lower use of RPD (38%), suggesting the type of decision to lend itself towards different strategies. For tank platoon leaders in their first 10 days of training, a comparatively lower percentage of recognition-primed decisions prevailed (42%), in study four. This was fitting with the experience-based findings of study two. In the final study, expert design engineers were shown to use RPD for 60% of their decision points, even in the case of minimal time constraints.
Other studies have also provided evidence for the concept of RPD including Randel et al. (1994) in their study of electronic warfare technicians, which suggested 93% of the decisions to involve serial (non-comparative) deliberations in accord with the RPD model. The prevalence of RPD has also been supported by Mosier (1991) in the study of pilots, Kaempf et al. (1992) in operational navy anti-air warfare incidents involving AEGIS cruisers and Driskell, Salas and Hall (1994) in their study of experienced navy officers.

Explanatory value of RPD model

Prior to the development of the RPD model it had been speculated that under certain task conditions decision-makers would not use a rational choice strategy, but no coherent conceptualisation had emerged of what a reasonable alternative might be (Klein, 1997). The RPD model has provided a firm counter example to rational choice, depicting how experts can make decisions without exhaustive analysis of the strengths and weaknesses of alternative courses of action.

Taken together the studies above show growing empirical support for the RPD model as a descriptive account of the way experienced people make decisions. The true strength of the RPD model is that it does not prescribe how decisions ought to be made, but how they are actually made (Lipshitz, 1993), and as such is regarded as a more accurate depiction of 'real-world' decision-making (Klein, 1993). The RPD model provides explanatory value in:

(i) Underscoring the importance of domain-specific knowledge or experience in a situation, focusing upon critical factors and the identification of causal cues that reduce information overload and the sense of confusion that paralyse novice decision-makers.

(ii) Identifying a reasonably good option as the first one considered, as opposed to treating option generation as a random process and as such, relying upon satisficing (Simon, 1955) (i.e. finding the first decision that works) as opposed to optimising (i.e. a comprehensive search for the 'best' option).

(iii) The serial evaluation of options focuses upon the 'moment of choice' and bypasses the requirement for concurrent deliberation between options.

(iv) Enabling decision-makers to be continually prepared to initiate action by committing to the option being evaluated. Formal strategies by contrast require the decision-maker to wait until the analyses are complete before establishing the most appropriate option.
(v) Describing how experts use feature matching (as denoted by availability and representativeness heuristics) and story-building processes to recognise atypical situations.

(vi) Depicting experts' use of the simulation heuristic for explaining events and evaluating courses of action.

There are however, two central limitations: (i) the existence of recognition-primed decisions generally, does not validate the theoretical propositions that comprise the RPD model and (ii) the prevalence of recognition-primed decisions does not negate the existence of analytical strategies.

The first point raised pertains to the lack of explicit validation of the RPD model beyond introspective speculation. Whilst the data discussed provide support for the model, as Klein (1997: p.288) acknowledges himself: “these findings are not a critical test of the model.” The RPD model also neglects to specify exactly how pattern matching or the judgement of typicality occurs during situation assessment beyond story-building or feature matching. More centrally, the RPD model does not take into account the generation of new courses of action, it lacks the ability to distinguish between good and poor decisions or to identify errors and neglects to address cognitive processes such as meta-cognition.

The second point holds implications that operate contra to the NDM community’s case for paradigmatic independence from CDM. Whilst the literature has pitched NDM antithetically to CDM and by implication condoned the use of analytical strategies in ‘real-world’ decision-making, it has (somewhat incongruously) been stressed that the RPD model does not propose recognition-primed decisions to be the best decisions, but that both recognitional and analytical approaches have their own specific functions (Klein, 1993). The consensus within the literature has to date suggested the crucial factor in determining recognitional vs. analytical strategies to lie in problem presentation i.e. the use of recognitional strategies when decisions have a significant perceptual component and are not presented as choice alternatives (Lipshitz and Pras, 2005; Orasanu and Connolly, 1993). However, even in the event of the adoption of a complex strategy, the RPD model also refrains of specifying what happens when decision-makers do compare courses of action.

Consideration of the empirical findings also casts doubt on the antitheticality of classical and naturalistic perspectives, on the basis that during naturalistic study a small proportion of experts employed analytical strategies. The issue of NDM – CDM antitheticality is queried
further on the grounds of conceptual overlap with NDM's use of BDM's 'availability' and 'representativeness' heuristics. Whilst, it is a key strength of the RPD model that these heuristics as employed within the BDM perspective, extend to 'real-world' decision-making, their mutual usage casts doubt on the paradigmatic exclusiveness of these perspectives.

The first three sections of this chapter have both acknowledged the utility of a naturalistic perspective, but also fashioned an argument that exists contra to NDM's proposition of antitheticality on philosophical, theoretical and empirical grounds. The forthcoming section reviews a number of methodological tools used by the NDM community and in considering the challenges associated with their methods, asks whether the issue (exemplified by the paradigmatic positioning of the field) might be one of methodological choice.

2.5 Methodological Contributions and NDM

The final section of this chapter, reviews a selection of methods both adopted and developed within the NDM research community. This overview sets the stage for examination of the shortcomings of NDM's methods, providing a rationale for methodological cross-fertilisation with the field of managerial cognition. The section concludes with a summary of some of the key challenges facing NDM methods. Particular attention is paid to the implications of NDM's tendency to conceptualise the field as antithetical to CDM, for methodological rigour.

2.5.1 Overview of methods

Methodological choice in NDM is driven by the prerequisite for methods that will at once provide insight into domain specific knowledge, perceptual and cognitive processes and illuminate situation, task and information management strategies (Lipshitz et al., 2001). This multi-faceted requirement stems from the conceptualisation of NDM as an interaction between task, expertise and complex environments in which cognition is situated.

As can be seen in Table 2.2 (overleaf), a plethora of methods are employed by the NDM community to meet this end. This review uses the taxonomy provided by www.mentalmodels.mitre.org, that clusters methods according to the mechanism of knowledge elicitation. It is important to note that a variety of classifications exist that are equally as fruitful for organising the wealth of methods available to the NDM researcher. As can be viewed from the methods contained in Table 2.2, work within the field has been guided by a largely descriptive approach, justified by the NDM community as permitting the exploration of phenomena in natural contexts without the constraints of formal hypotheses.
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<tr>
<td>Applied cognitive task analysis</td>
<td>Field observations / ethnographic methods</td>
<td>Activity sampling</td>
<td>Cluster analysis</td>
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<tr>
<td>Critical decision method</td>
<td>Group interview</td>
<td>Cloze experimental technique</td>
<td>Conceptual graph construction</td>
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<td>Cognitive function model</td>
<td>Questionnaires</td>
<td>Critical incident technique</td>
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<td>Cognitive-orientated task analysis</td>
<td>Step-listing</td>
<td>Critiquing</td>
<td>Diagramming</td>
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<td>Decompose, network and assess method</td>
<td>Structured interviews</td>
<td>Crystal ball / stumbling block</td>
<td>Hierarchical sort</td>
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<tr>
<td>Goal-directed task analysis</td>
<td>Teach-back</td>
<td>Discourse / conversation / interaction analysis</td>
<td>Influence diagram construction</td>
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<td>Hierarchical task analysis</td>
<td>Twenty questions</td>
<td>Exploratory sequential data analysis</td>
<td>Laddering</td>
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<td>Interacting cognitive subsystems</td>
<td>Unstructured interviews</td>
<td>Interruption analysis</td>
<td>Likert scale elicitation</td>
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<td>Knowledge analysis and documentation</td>
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<td>Minimal scenario technique</td>
<td>Magnitude estimation</td>
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<td>systems</td>
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<td>Retrospective / aided recall</td>
<td>Multidimensional scaling</td>
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<td>Precursor, action, result, interpretation</td>
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<td>Shadowing another</td>
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<td>Skill-based CTA framework</td>
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<td>Think aloud problem solving / protocol</td>
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<td>Wizard of oz technique</td>
<td>Structural analysis techniques</td>
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Each knowledge elicitation category is discussed in turn, using a selected method as a point for illustration.

Cognitive task analysis (CTA) methods
As can be seen in Table 2.2, a variety of methods have been developed that “… capture the knowledge processing used by experts in performing their jobs” (Gordon and Gill, 1997: p.131). As Crandall, Klein and Hoffman (2006) summarise, there are five aims of cognitive task analysis (CTA) methods that are to:

(i) Capture what experts are thinking about during a task
(ii) Understand the elements experts pay attention to
(iii) Understand the strategies experts employ during problem detection and decision-making
(iv) Establish what experts are trying to accomplish
(v) Document experts understanding of how particular processes work

One means of achieving these aims is through use of applied cognitive task analysis (ACTA) (Militello, Hutton and Miller, 1997), a method grounded in the literature on expert-novice differences. The ACTA techniques were developed within the NDM community with a view to making the conventional CTA method more appropriate for practitioners in field settings. The ACTA techniques use a series of knowledge elicitation, analysis and representation techniques known as: ‘stage 1: task diagram interview,’ ‘stage 2: knowledge audit’ and ‘stage 3: simulation scenario.’ Data is merged across all three stages and compiled into a ‘cognitive demands’ table. One of the benefits of this approach is its highly structured and systematic approach to the representation and elicitation of expertise. This process is outlined in more detail in Chapter Four.

Despite the alleged value of the ACTA techniques, there has been limited research conducted in NDM environments, attributable in the main to its recent development. One application has used the ACTA techniques as a tool to explore recruitment and selection processes in Human Resource Managers (Gore and Riley, 2005). However, whilst the authors note its substantial face validity and the technique’s inherent practicability, they admit that the “subjective evaluation reported here is limited” (p.349), proposing the study to “provide a real-world task from which more rigorous evaluations of ACTA may be completed” (p.349). Thus, one of the inherent difficulties of ACTA and CTA methods more generally, is that there are no established metrics to evaluate the reliability and validity of its methods (Hoffman, Crandall and Shadbolt, 1998; Militello and Hutton, 1998).
Much of the ACTA techniques validation lies in applied efforts following the interviews. The problem is that the success of these are rarely documented other than as a promissory activity for the future. Demonstration of this problem may be seen in Hutchins, Pirolli and Card’s (2004) work of intelligence analysts and Gore’s (2004) examination of human error in UK civil aviation pilots.

A closing point for discussion of the ACTA techniques concerns the credence placed upon the maintenance of rapport over researcher neutrality. Klein and Militello (2004, p.338) suggest it to be “… more important to maintain rapport and follow up on curiosity than to maximise objectivity.” This presents particular ramifications for the maintenance of validity and reliability as discussed later in this chapter. A final weakness raised by Klein and Militello in reference to the ‘knowledge audit’ is that although they are facets of expertise, the different probes are unconnected which can produce an inherently disjointed interview.

**Knowledge elicitation: Interview / observation**

Field observation offers unique opportunities, providing insights not afforded by any other method. Whilst, it can often be difficult to secure organisational access, it provides an opportunity to explore what the actual work demands are, the types of strategies skilled workers have developed for coping, how work flows across the environment, the nature of the team and communication and co-ordination issues (Roth, 2002). This approach can be useful for understanding work patterns both at the social level (information sharing) and at the individual level (cognitive activities).

The advantage of observational methods is that they can be incredibly effective if the researcher is trained in the phenomenon that is the focus of study. Moreover, they require little structure for data collection, procedures often simply employing pre-determined formats for sampling activities. One structured approach outlined by Crandall, Klein and Hoffman (2006) is an in situ requirements analysis. This is essentially an observation and interview about work patterns resulting in an ‘action requirements table’ (ART). An ART is an identification and codification of the important activities that are involved in performing a particular task. ART specifies:

(i) The action sequence involved in the task
(ii) Equipment, tools and forms used to conduct the task
(iii) Specification of information needed to conduct the task
For each task / goal / activity the participant is asked to describe the action sequence, support and tools and information needs. The observation record focuses upon issues of usefulness and usability. The resultant table is therefore able to capture the dynamic flow of activity and notes ways in which support makes the task unnecessarily difficult or awkward or requires the creation of 'workarounds.'

There are however, a number of limitations associated with this methodological approach. First, without observational checklists or other predetermined formats, the researcher may have to establish coding categories following the period of observation. This may lead to uneven coverage in data, as during the observation period the researcher may have been unaware of the significance of particular observations. Conversely, advance structuring can render the observer less sensitive to events (especially if it is contra to expectations), thereby potentially missing rich opportunities.

The most central disadvantage associated with observation surrounds feasibility. The types of environments that comprise the study of NDM make it likely that observation would present an unacceptable risk to observers, as they may impede the abilities of personnel. The reality of observation is that it is obtrusive and interferes with the goal of capturing behaviour in its natural form (that has not been influenced by the presence of the researcher) (Woods, 1993). The observation of authentic behaviour is only likely if the researcher has been accepted into the culture of the organisation, which may take considerable time. It is also important that analyses be conducted in the workplace, since artefacts in the environment may serve as contextual cues to both the participant and the researcher.

There is also the risk with this method that the events observed are not typical. Therefore it is necessary for the researcher to have acquired a substantial amount of domain knowledge prior to the field observation. Crandall, Klein and Hoffman (2006) suggest a coupling of observation with other methods in order to find out how participants view events i.e. through interview, in order to counteract the risk of cognitively shallow accounts. Similarly, Kaempf, Klinger and Wolf (1994) have combined observations with questioning in a study of baggage screeners' expertise, whilst Crandall et al. (1996) used a combination of observation and questioning in order to understand the expertise used in civil legal cases by attorneys and former judges. These combinatorial approaches have been integral in providing more rounded accounts of expertise.
Knowledge elicitation: Process-tracing methods

Process-tracing methods or ‘think-aloud’ techniques have their origins in the classic psychology literature on problem solving (Claparède, 1917; Duncker, 1945). Essentially, the expert is instructed to ‘think-aloud’ during a decision-making activity, from which a protocol is generated and analysed for prepositional content (Ericsson and Simon, 1993). Participants are encouraged to verbalise their thoughts as they work on problems. Process-tracing techniques may also be complemented with probe questions, in a procedure of retrospection. This combination of thinking aloud with protocol data analysis procedures has been used successfully in studies of problem solving (Newell and Simon, 1972).

Hoffman et al. (1995) outline three forms of materials that can be used for process-tracing. The first employs hypothetical problems called test cases. These can be generated from archive data or by other experts, and are employed on the principal that experts generally reason in line with their memories of past experiences. The second employs, tough and atypical cases. This is grounded in the understanding that tough cases can be more revealing than observing experts solving common or routine problems (Klein and Hoffman, 1993). It is also rooted in the suggestion that experts will experience problems accessing the tacit knowledge that underlies performance in instances where skills have become ‘automatic’ (Anderson, 1982). The final approach asks the expert to recall interesting or tough cases from their own past experience (Klein, Calderwood and MacGregor, 1989).

As such, process-tracing methods have been used extensively in the charting of reasoning sequences (Bailey and Kay, 1986; Claparède, 1934; Duncker, 1945; Ericsson and Simon, 1993; Johnson, Zualkernan and Garber, 1987; Voss, Tyler and Yengo, 1983), in the study of expert-novice differences (Chi, Feltovich and Glaser, 1981), in studies of expertise in medical diagnosis (Chi, Glaser and Farr, 1988), computer programming (Jefferies et al., 1981) and process control (Bainbridge, 1979).

Critique associated with this method concerns the issue of whether the task of thinking aloud interferes with reasoning or performance. Introspection or attempting to exert explicit conscious control over performance has been shown to reduce motor performance (Masters, 1992). Hoffman et al. (1995) note that psychological research suggests that the process of verbalisation does not typically cause dramatic interference and therefore does not significantly affect the normal course of cognitive processes. There is also concern associated with the role of individual differences in participants’ expressiveness (Burton et al., 1990; Ericsson and Simon, 1993).
Knowledge elicitation: Conceptual methods

The final method for discussion is concept maps. Concept maps are a representation of a domain or problem in terms of the relationships (links) between domain elements (concept / nodes). The expert and elicitor work together to construct a graphical representation of the domain (Adelman, 1989; Shadbolt and Burton, 1990). These are rooted in the understanding that meaningful learning takes place through the assimilation of new concepts and propositions into existing concepts and frameworks (Crandall, Klein and Hoffman, 2006). There are three core processes by which this occurs: (i) subsumption (understanding how something new relates to something already known), (ii) differentiation (understanding how something new is distinct from something already known) and (iii) reconciliation (understanding how something that appeared at first to contradict something already known has common elements).

Concept maps have been used in a number of studies on expertise. This method has been shown to support the formation of consensus among experts (Gordon, Schmierer and Gill, 1993) and has demonstrated the differences between experts and novices in map detail and organisation (Glaser, 1987). Within NDM it is viewed as a useful tool for building a representation of a domain of knowledge.

However, there are a number of limitations associated with concept mapping methods. First, although useful in documenting the prepositional content of a domain, the utility of concept maps in relation to understanding decision-making is more uncertain. Indeed, concept maps can at a broad level inform understanding of decision-making. However, precisely how the elements elicited and represented within maps of this type inform theoretical concepts and models in NDM is open to subjective interpretation. Second, the process of elicitation and representation has both been termed a constructive and collaborative process and one in which care should be taken to express the domain knowledge in terms preferred by the expert (Crandall, Klein and Hoffman, 2006). Precisely how much the researcher should shape the elicitation and representation of the map should be borne in mind.

Recent developments: Narrative methods

Recent developments to emerge from the field of NDM that are excluded by Crandall, Klein and Hoffman’s (2006) typology, are narrative methods. This movement that emerged within the 8th International Conference on NDM has seen multiple researchers employing story-based methods as a tool for understanding decision-making. Fiore et al. (2007) for example, have focused on the development of narrative theory as a means of understanding the use of
story in complex problem solving environments. In a similar vein, Cohen et al. (2007) have employed a collaborative story-based decision analysis system that merges naturalistic and analytic decision support. Coupled with recent developments in sense-making theory, (Klein, Moon and Hoffman, 2006a, 2006b; Klein et al., 2006) the application of narrative methods to the study of decision-making is an approach at the forefront of NDM investigation.

2.5.2 Methodological debates
This examination opens by considering the mainstay of methodological critique that has been pitched against NDM's methods. Debate is loosely centred on the issue of rigour, given the common criticism that the methods employed are 'soft' (Yates, 2001). This section considers these challenges in line with the ongoing debate of NDM's paradigmatic independence and the associated reification of the qualitative - quantitative divide.

Challenge 1: Differential access hypothesis
There is a general belief among philosophers and psychologists that different knowledge elicitation techniques may elicit different types of knowledge i.e. declarative vs. procedural, explicit vs. tacit and verbal vs. perceptual (Berry and Broadbent, 1988; Dreyfus and Dreyfus, 1986; Hoffman et al., 1995; Olson and Reuter, 1987). Not only can the type of knowledge elicited vary, but it has also been suggested that they can produce different kinds of strategies i.e. top-down vs. bottom-up reasoning and convergent vs. divergent thinking.

The consensus within the NDM literature has been to embrace the variability in knowledge elicited and acknowledge that some methods are simply more suited to particular tasks than others. Indeed, Gammack and Young (1985) have suggested domain concepts to be best elicited by documentation analysis, domain concept interactions to be best elicited by sorting and scaling tasks and that procedural rules and heuristics to best be elicited by think-aloud problem solving, task analysis and interviews based on memory probe questions.

Whilst, it is of concern that methods in use within the NDM community might differentially mould cognitive processes (Orasanu and Connolly, 1993), the ultimate question is how might the cognition elicited be both valid and reliable in light of such methodological variation? Moreover, by employing a particular method to elicit a certain type of knowledge, other knowledge may consequently be lost. One means for overcoming this issue is to employ mixed-methods research designs (as employed in this thesis) in order that a more holistic understanding of the nature of cognition can be achieved through the convergence of findings.
Challenge 2: Rigour - reliability and validity of verbal protocols

A second challenge presenting itself to the NDM community pertains to the issues of reliability and validity in verbal protocols. On the issue of rigour, concern has been expressed over the systematic bias and variation in information content generated by different CTA methods (as outlined above) (Gordon and Gill, 1997). As such, the validity of verbal reports as a representation of cognitive processing has been the focus of much attention. This issue of representativeness has also been queried with the suggestion that thinking aloud may produce cognitive distortions during verbal tasks (Ericsson and Simon, 1993) and doubt as to whether experts have the ability to introspect about their own cognitive processes.

On the front of reliability, doubt has also been raised concerning the consistency of experts’ reporting over time and the uniformity in coding by independent analysts. Caverni (2001) proposes validity to be the central concern for NDM’s methodological debates on the understanding that to be consistent is neither reliable nor valid. However, the assessment of validity is one that is intrinsically hard to judge through the field’s use of naturalistic methods. (This is an issue addressed in the following sections that considers the utility of traditional standards to the domain of NDM and the appropriateness of the concepts of credibility and transferability).

Moreover, using knowledge elicitation and representation methods that produce systematic bias and that are rooted in experts’ verbal reports, as a point of validation for NDM’s models is one of concern. This makes assessment of NDM’s theoretical concepts and representations a largely subjective endeavour, and does little to enhance the validity of NDM’s research status. The view within the NDM community that the traditional standards used within the decision sciences generally, are inappropriate is discussed next.

Challenge 3: Utility of traditional standards

As Caverni (2001) outlines, the standard criteria follow that science is about reality, of which the aim is to describe and explain, through reliable and valid methods. In the ‘Popperian’ sense, this has the objective of refuting, as opposed to confirming hypotheses and theories. The ability to refute is one of NDM’s central weaknesses. This is a concern echoed by Jungermann (2001) who states that often in NDM studies, models are validated according to whether experts’ verbalisations are congruent with the terms of the model and not according to whether decision behaviour can be explained or predicted by it.
The rejection of standards appropriate for laboratory-based methods by researchers within the NDM community has been an endemic part of the fields antithetical positioning against CDM. However, the perceived inappropriateness of CDM and their associated laboratory methods, does not mean one can “… conclude that his or her methods is right because another method is wrong” (Caverni, 2001: p. 358).

In re-defining the standards, Jungermann proposes the validity of NDM’s theoretical propositions to be contingent upon prediction and explanation of decision behaviour and not whether people talk or ask questions in terms of those theories. A central challenge for NDM is the development of methodological frameworks that permit the acceptance or rejection of NDM’s theoretical propositions.

**Challenge 4: Re-defining standards - credibility and transferability**

> “Just as the methods must be suited to the research questions, the criteria for judging the quality of the studies must be appropriate for the methods used.”

(Lipshitz et al., 2001: p.345)

One response to this issue has been to develop alternative criteria upon which to assess the rigour of NDM studies. The criteria of ‘credibility’ and ‘transferability’ (Mischler, 1990) are one such example. ‘Credibility’ is defined as the extent to which a study’s findings and conclusions are warranted. This is rooted in beliefs regarding the suitability of methods to the research questions and research settings, the plausibility of the answers and the reasonableness of the assumptions underlying the choice of methods and interpretation of the data. However, ‘credibility’ assessment lies in the hands of researcher judgement.

The second criteria, ‘transferability’ is concerned with the extent to which a study’s findings and conclusions hold in other settings. Note that this is not in the traditional sense of extending a sample to the population, but on what is described as a ‘case-to-case translation’ based upon the similarity of their significant features (Firestone, 1993). This operates in stark contrast to the path of the NDM community that has emphasised contextually rich understanding to the detriment of generalisability.

Klayman (2001) suggests however, that NDM does not have to choose between field studies and rigour. Put simply, a rigorous study does not have to be a laboratory study and that NDM can draw upon related fields for standards of rigour e.g. ethnomethodology or verbal
protocol analysis in cognitive science. Critique has been premised in the view that the use of criteria such as ‘credibility’ and ‘transferability’ will impede the ability to take NDM seriously (Klayman, 2001).

Challenge 5: Is NDM distinct in methodological challenges?
As Klayman suggests above, the challenges faced by the field of NDM, reflect those of other fields that adopt strictly qualitative approaches within the social sciences. The discussion generated within the NDM community is really therefore no different from those in other disciplines. Indeed, Mann (2001) proposes that fieldwork, interviews and observations can be fully rigorous if standard protocols, appropriate checks, replications and proper sampling are put into place. Furthermore, Roelofsma (2001) suggests the quantitative-qualitative schism to be reductionistic, proposing that the researcher always makes assumptions about the representativeness of research variables, subjects and settings regardless of qualitative or quantitative affiliation.

Therefore, for a true integration to occur there is a need to cease creating distinctions between paradigms in the decision sciences (Cooksey, 2001). Rather effort should be focused upon the creation of a more unified decision science that values both traditional theoretical and methodological approaches and those such as NDM that reveal different types of contextual dynamics. This is a perspective echoed by others within the NDM community such as Todd and Gigerenzer (2001) who argue for an acknowledgement of the importance of context alongside the recognition that individual and organisational learning is possible using a variety of quantitative and qualitative models.

From a methodological perspective, the term ‘naturalistic’ only refers to the research setting (Roelofsma, 2001). As such, NDM researchers need not chose between formal modelling and descriptively valid and task-specific (rather than abstract) processes. In summary, Lipshitz et al. (2001) propose that the focus for future research should be...

“… to develop NDM to be a better science simultaneously focused on solving real-world problems and developing theory built on sound findings, tools and principles. To this end NDM needs more empirical studies applying appropriately rigorous methodology.”

(Lipshitz et al., 2001: p.346)
2.6 Concluding Remarks

As outlined previously, the objective of this thesis is to examine the potential for cross-fertilising methods across the fields of NDM and managerial cognition. In order to set the stage for collaboration, this chapter has presented a selective review of the NDM literature. Particular attention has been drawn to the issue of antitheticality between NDM and CDM / BDM perspectives. This not only justifies the author’s choice in investment professionals as the context for naturalistic investigation, but also sets the stage for collaboration with managerial cognition in Chapter Three, where the shortcomings of the BDM approach are addressed further.

This chapter has also drawn attention to a number of broader methodological debates within the NDM community, which comprise the cornerstone of this thesis. Three in particular are addressed:

(i) The issue of differential access and systematic bias in NDM's methods
(ii) The challenge of developing methodological tools that permit the ability to refute NDM's theoretical and conceptual propositions, and
(iii) The inappropriateness of the quantitative-qualitative divide for NDM research

Suggestions for resolution of the above are addressed in Chapter Four.
CHAPTER THREE

Managerial Cognition
Accomplishments To Date

3.1 Introduction

The purpose of this chapter is to review current advances in the field of managerial cognition. In conjunction with the review of NDM in Chapter Two, this examination will set a platform for methodological collaboration within this thesis. Chapter Two drew to a close with the proposition that a naturalistic approach to the study of decision-making was more appropriate than that offered by CDM and BDM perspectives. As summarised in Chapter One, this is a view also echoed within this thesis in relation to the study of managerial cognition. The previous chapter also drew attention to a number of methodological debates facing the NDM community. In a similar way, this chapter reviews the methodological developments and the associated challenges confronting the field of managerial cognition that makes collaboration fruitful. Chapter Four draws these issues together offering a means for useful rapprochement.

This chapter is organised as follows. First, it opens with a ‘contextualisation of cognition and management’ serving to orientate the reader to the origins of the field. Second, emerging collaborations between managerial cognition and BDM are considered as a ‘juncture of incommensurability.’ The third section of this review summarises the central theoretical and methodological issues facing proponents of this discipline. This leads to a final section that examines a number of knowledge elicitation and representation techniques adopted within this field. In preparation for Chapter Four, this chapter concludes with a summary of the key challenges facing this field that are to be addressed within this thesis.

3.2 Contextualisation of Cognition and Management

The field of managerial cognition has been described as “… one of the more promising and exciting fields of inquiry in the organizational sciences” (Zmud, 1995: p.280). Accordingly, this examination discusses three inter-related aspects of managerial cognition, which the author suggests to best demarcate the field: the origins of managerial cognition, the question of its existence as a distinctive field and finally, the issue of the field’s utility.
3.2.1 The origins of managerial cognition

The emergence of the study of managerial cognition has been against a backdrop of both sociological and economic philosophy and cognitive and social psychology. The respective contributions of these disciplines in defining the field of managerial cognition are considered in turn.

**Sociological and economic philosophy**

During the 1980's sociological and economic thinking started to question the ability of individual managers to contribute to firm value. Pre-1980, the contributions of managers at the individual level of analysis had been largely neglected, with the consensus that managers operated as a source of 'error variation' (Walsh, 1995). Conceptualisations of this assumption included them as a source of error in firm performance equations and as the ultimate source of firm failure. Re-framing the contributions of managers in a positive light (i.e. how they may increase a firms' value) provided one of the pre-requisites that coupled with developments in cognitive and social psychology, led to the emergence of the managerial cognition perspective.

**Cognitive and social psychology**

Whilst sociological and economic thinking provided the impetus for considering the positive contributions of managers to firm value, theoretical conceptualisation of this process surfaced against a backdrop of existing theory in cognitive and social psychology. In particular, it was couched against the theoretical status quo in information processing and decision-making theorem.

In effect, managerial cognition emerged in response to the 'top-down' or 'theory-driven' information processing approach. The central premise of the 'top-down' approach is that past experiences serve to guide current information processing. That is, the cognitive structures generated from experience, shape individuals' capacities to attend to, encode and make inferences about new information. Whilst, the psychological perspective established the utility in adopting 'top-down' information processing strategies and invoked the concept of the knowledge structure to lie at the heart of its formulation, it left a number of theoretical and processual questions unanswered. For example, it never established fully how knowledge structures are used during information processing and decision-making, or how they are navigated and created from experience. It was these very assumptions that cognitive psychology held that the field of managerial cognition sought to answer.
Social psychology’s contribution surfaced later than that of cognitive psychology and was to provide the epistemological and theoretical assumptions that would establish an account of the more processual aspects of cognitive structures. Social psychology offered the foundations for developing an understanding of the nature of social cognition and how this impacted cognitive structures (Eden and Spender, 1998). For example, given the assumption that experience lies at the core of knowledge structure creation, it has been presumed that (i) all individual cognition is grounded in interaction with the social and that (ii) the social provides preconscious modes of cognising (Doise, 1986; Eden and Spender, 1998). However, this has led to the upsurge of debate within the field of managerial cognition, with another stream of thought also arguing that cognition belongs to the individual only and that when considering other levels of analysis, the notions of group or organisational cognition do not address thinking per se, but focus on the role and influence of symbols in organisational life. These theoretical debates are addressed in more detail in the final section of this chapter.

3.2.2 Is managerial cognition a distinctive field?

Given that the field of managerial cognition emanated from discontentment in both sociological and economic philosophy and cognitive and social psychology, its distinctiveness is an important part of its contextualisation. The general consensus within the literature has been to endorse managerial cognition as a distinct discipline (Eden and Spender, 1998). This review casts doubt on this assumption and suggests that whilst the field is important, its distinctiveness may be only in its definition of the manager and in its promissory nuances.

The mainstay of managerial cognition’s pro-distinctiveness agenda stems from the observation that the “... growth of interest and of scholarly activity has been explosive” (Eden and Spender, 1998: p.1). Indeed, some of the most prominent publications to emerge include: Managerial and Organizational Cognition (Eden and Spender, 1998), Images of Competitive Space: A Study in Managerial and Organizational Strategic Cognition (Hodgkinson, 2005), The Competent Organization: A Psychological Analysis of the Strategic Management Process (Hodgkinson and Sparrow, 2002), Mapping Strategic Thought (Huff, 1990), Mapping Strategic Knowledge (Huff and Jenkins, 2002) and Cognition Within and Between Organizations (Meindl, Stubbart and Porac, 1996). This ‘explosion’ of activity has also been represented in the US Academy of Management’s establishment of an interest group in managerial and organizational cognition in 1991 and in the JAI series Advances in Managerial Cognition and Organizational Information Processing. A number of special
issues have also appeared in the Journal of Management Studies (1989, 1992, 1997), Journal of Occupational and Organizational Psychology (2003) and Organization Science (1994). Whilst this influx has been important in establishing the study of managerial cognition as a field, it perhaps has been wrongly implicated as a measure of the field’s distinctiveness.

Of course, the field of managerial cognition draws parallels with many others and has been employed as a point for collaboration with both strategic management (Eden and Spender, 1998; Huff and Jenkins, 2002) and BDM (Hodgkinson and Sparrow, 2002). The cognitive and social psychological foundations of the field make managerial cognition an appropriate tool for expanding existing information processing and decision-making theorem to the level of cognitive structure. In this respect, the field of managerial cognition may also be viewed as an appropriate point for collaboration with NDM – a proposition qualified in Chapter Four.

Whilst the distinctiveness of managerial cognition is open to debate, there are two arguments for viewing it as a worthwhile venture for study. The first is that in a similar vein to NDM, it defines the manager as a key actor, who creates a bounded field of decision possibilities that is then navigated in the process of choice as opposed to a decision-making device that simply computes risks. Secondly, it provides a potential research avenue for exploring information processing and decision-making processes at a more finite level of analysis than afforded by any other field.

3.2.3 Managerial cognition: The utility issue

Whilst the distinctiveness of managerial cognition’s boundaries remains unclear, the utility of this field (be it as a distinct discipline or multi-disciplinary effort) is clear. The contributions of managerial cognition research are well established within the literature (See: Walsh (1995) for an extensive review of the contributions of managerial and organisational cognition to organisational thinking and Hodgkinson and Healey’s (2008) forthcoming examination of ‘cognition in organizations’ in the Annual Review of Psychology).

The field of managerial cognition has made two central theoretical contributions to date. The first pertains to the field’s conceptualisation of cognition and its use of cognitive mapping methods in relation to organisational learning and knowledge management. The second is that it provides a means for conceptualising the linkage between cognition, behaviour and organisational outcomes. Whilst theoretically valuable, the true promise of managerial
cognition research lies in its application. One such area therefore necessitating discussion is its use in the study of strategic management.

The strategic management literature operates as one particular forum for the application of managerial cognition research. A particular point for collaboration has been between managerial cognition and strategic decision-making (Eden and Spender, 1998; Jenkins and Johnson, 1992) using a lens of the resource-based view of the firm (Conner and Prahalad, 1996; Grant, 1991). The basic premise of this view is that competitive advantage comes from resources that are difficult to imitate (Barney, 1991; Lipman and Rumelt, 1982). Whilst, most resources are replicable, there remains one strong inimitable asset to the organisation: knowledge and cognition.

One of the emerging conversations in strategic management therefore concerns the question of how knowledge is generated and managed in organisations (Huff and Jenkins, 2002). In particular, its focus is upon understanding how informal, social mechanisms affect knowledge development and its use. For instance, it has provided insights into how ‘communities of practice’ as defined by Brown and Duguid (1991) provide a social context that shelters knowledge development.

Current work at the interface of strategic management and managerial cognition is centred upon the relationship between tacit and explicit knowledge (Nonaka, 1994; Nonaka and Takeuchi, 1995; Polanyi, 1966). For competitive value to be achieved, knowledge assets need to be identified and managed. However, there is the danger that if informal tacit knowing cannot be united with more explicit formal understanding, then the development of new capabilities will be hindered. The field of managerial cognition provides a fruitful methodological avenue to explore the informal and less articulated aspects of knowledge and cognition.

Whilst the rationale for studying managerial cognition to understand strategic behaviour is a strong one (Jenkins and Johnson, 1992), progress has been rather more promissory. Indeed, whilst Johnson and Hoopes (2003) have suggested socially constructed shared beliefs to determine industry structure in addition to technology-based economic factors, there has been a rise in debate regarding cognitive heterogeneity vs. homogeneity at the levels of the individual and group. The application of managerial cognition’s methods to the field of strategic decision-making has so far provided mixed evidence regarding cognitive
homogeneity (Porac and Thomas, 1990) and heterogeneity of competitive models (Daniels, Johnson and de Chernatony, 1994).

3.3 Behavioural Decision-Making (BDM): A Juncture of Incommensurability?

The second section of this chapter builds upon managerial cognition’s collaborations with strategic management, by tracing the contributions of BDM. A number of researchers have adopted a BDM approach to understanding managerial cognition within the context of the strategic management process (Fischhoff, 1975; Fischhoff, Bostrom and Quadrel, 1997; Hodgkinson et al., 1999; Hodgkinson and Sparrow, 2002; Kahneman, Slovic and Tversky, 1982; Tversky and Kahneman, 1974) and in the cognitive analysis of organisational decisions (Highhouse, 2001; Neale et al., 2006).

Whilst this has made a number of important contributions to debates on rationality, such as advancing understanding of bounded rationality through the deployment of heuristics (Simon, 1957), framing effects (Hodgkinson et al., 2002; Kuvaas and Selart, 2004; Wright and Goodwin, 2002) and providing insights into actors’ non-rational escalation of commitment to failing courses of action (Bragger et al., 2003; Staw, 1981, 1997), it is argued that BDM is limited by its ideological, theoretical and methodological assumptions. The incommensurability of managerial cognition and behavioural decision research is developed on the convictions of (i) BDM’s operationalisation of rationality, (ii) BDM’s lack of insight into decision processes and (iii) the incompatible logic of BDM and ecological validity. These claims suggest that although fruitful, the inter-disciplinary collaboration of managerial cognition and BDM might be better approached from a naturalistic perspective.

3.3.1 BDM’s operationalisation of rationality

It has recently been suggested that the strategic management literature has placed “... too much emphasis on the largely unquestioned assumption that the strategy process is an inherently rational phenomenon ...” (Hodgkinson and Sparrow, 2002: p.8). One of the platforms upon which arguments for the utility of BDM in the study of managerial cognition and strategy-making has evolved, lies in BDM’s contribution to understanding rationality.

As outlined in Chapter Two, BDM uses the prescription of economic rationality as a backdrop for descriptions of actual decisions, where optimality is defined in terms of the behaviour of rational actors. Using this prescriptive backdrop, the heuristics and biases approach has been used to understand the way actors deviate from optimality and thus, rationality. The view held within the field is that research on “... managerial cognition is
important because it helps strategy researchers incorporate bounded rationality into otherwise hyper-rational theories" (Johnson and Hoopes, 2003: p.1).

However, BDM's operationalisation of bounded rationality is somewhat incomplete. As Todd and Gigerenzer (2001) outline, Herbert Simon's original portrayal of bounded rationality occurred at the intersection of the cognitive heuristics used by decision-makers and the structure of the environments in which they operate. The BDM perspective is essentially silent on the role of decision environments, beyond laboratory-contrived tasks. The issue of BDM and ecological validity is a concern addressed later in this section.

A number of arguments have also started to emerge that question the value of BDM and its purist operationalisations of rationality as a backdrop for its prescriptions (Medin and Bazerman, 1999; Vidaillët, 2001). Whilst, counter-claims suggest there to have been a "misunderstanding about the role rationality plays among its advocates" (Markóczy, 2006: p.154) (i.e. suggesting that pure forms of rationality were only ever operationalised as 'ideals'), this author expresses discontent with the value of BDM. The BDM paradigm has also been critiqued on the grounds of overstating the magnitude of deviations from rationality (Gigerenzer and Hoffrage, 1995) and has seen questioning as to whether the existence of deviations from rationality are simply a function of BDM's methodologies (Gigerenzer, 1991)? Even as an idealist form, BDM's characterisation of decision behaviour as deviations from the optimal leaves a large proportion of decision behaviour unaccounted for.

3.3.2 BDM: Insight into decision process?
A second line of reasoning upon which the case of incommensurability is defended, builds upon the final point of critique outlined above i.e. the limited insights BDM has provided into decision processes. As stated earlier, the central concern of the BDM approach has been to give precedence to the analysis of omissions in decision processing through the examination of heuristics and biases. Exploring errors in decision-making (as marked against BDM's prescriptions) is only a small component of decision behaviour.

Some of the most recent critique to emerge has criticised BDM for its inability to provide an effective framework that incorporates the multiple goals that often define decision contexts. BDM approaches operate with the belief that the goal is known and thus separate decision action from problem identification (Medin and Bazerman, 1999). It can therefore be argued
that BDM's heuristics and bias focus can offer (at most) a fragmented and narrowed approach to the study of strategic decision-making and managerial cognition.

3.3.3 Ecological validity and BDM
A final challenge to the claim that BDM is an appropriate approach to understanding managerial cognition and the micro processes of strategic decision-making, is based upon the conviction that the normative models of BDM lend little to 'real-world' decision environments. This builds upon the earlier suggestion that the study of biases and heuristics as denoted by the concept of bounded rationality ought to occur at the intersection of both cognitive heuristics and decision environments.

It is noteworthy that a large proportion of the work conducted within the BDM framework has been done in the context of laboratory conditions employing abstract judgment and probabilistic reasoning tasks (Gigerenzer, 1991; Gigerenzer and Goldstein, 1996). The effect of this concern has been a fundamental questioning of the appropriateness of BDM as a means for understanding managerial decision processes (Eden and Spender, 1998; Gigerenzer, Todd and ABC Research Group, 1999). Whilst, it is acknowledged that both rigour and relevance are a necessity for high quality research, the value of rigor to ecologically invalid BDM research is at best debatable.

This section has defended the notion of ideological incommensurability between BDM and managerial cognition. Arguably, what is required is a holistic approach to the study of managerial cognition that by moving away from normative models coins decision behaviour positively by focusing upon decision-makers' accomplishments as opposed to their failures (Medin and Bazerman, 1999) and re-locates the study of cognition to the field as opposed to the laboratory. It is on these conditions that this thesis proposes the study of managerial cognition to be more ably complemented by a NDM perspective.

3.4 Theoretical Challenges in Managerial Cognition
This third section examines some of the broader debates facing the managerial cognition literature. Concomitant with the rise in research activity within this field, is an intensifying debate that confronts the most fundamental philosophical assumptions of its methods. This section takes stock of the theoretical and epistemological challenges currently facing researchers in managerial cognition. It is envisaged that by reviewing these challenges, an agenda for future research may be accurately gauged.
The theoretical discussion focuses upon (i) the relationship between cognitive content / structure and process, (ii) examination of level of analysis issues in managerial cognition research, (iii) initiating dialogue on an appropriate epistemological approach, (iv) discussion of the conceptual issue involved in inferring cognition from words, and finally (v) the risk of anthropomorphism in asking the question ‘can organisations think?’

3.4.1 Challenge 1: What is the relationship between cognitive content / structure and process?

The mainstay of literature to date has explored content / structure and process as distinct entities within cognitive mapping methods. Process has been approached as the study of how information and beliefs are combined and used in forming judgements and making decisions (Corner Kinicki and Keats, 1994; Harris, 1994), whilst content / structure has been operationalised as the description of knowledge and its inherent organisation (Laukkanen, 1994; Phillips, 1994).

What is problematic is that by studying each aspect independently, the structure of thought is de-emphasised during the study of process and vice versa. As a by-product of our approach to the study of managerial cognition, the illusion has been created that structure and process are mutually exclusive. By implication, no comprehensive theoretical or methodological framework exists to explicate the links between structure and process. As Meindl, Stubbart and Porac outlined in the 1994 special issue in Organization Science:

“We believe that content-process integration is an important element for any future research agenda.”

(Meindl, Stubbart and Porac, 1994: p.291)

The limits of this theoretically fragmented approach to the understanding of managerial cognition has been moving to the forefront of current research, but still presents significant challenges. Melone (1994) has successfully achieved integration of content and process in a study of decision-making in corporate development executives. Verbal protocols were used to examine the effect of expertise on reasoning processes in relation to business issues. Promise for integration also exists in the work of Gioia et al. (1994) in their adoption of an ethnographic approach to the study of sense-making during strategic change and Fiol’s (1994) work concerning the development of group beliefs over time at multiple levels of analysis. However, even recent studies have continued to differentiate between task-specific knowledge and team process knowledge (Lim and Klein, 2006; Mathieu et al., 2000).
What is evident from the literature surveyed is that whilst progress regarding the integration of content and process has occurred through the development of sophisticated methodological designs, integration has not been matched theoretically. As evident from the work of Gioia et al. (1994) and Fiol (1994), there is no uniform theoretical base to unite their empirical interpretations. Work using causal mapping applications such as Clarkson and Hodgkinson’s (2007) study of frontline call centre employees using the causal mapping tool ‘cognizer’ has been met with similar criticism. A central challenge for the managerial cognition community is therefore the matching of theory with methodological advances in order that content / structure and process may be better modelled.

3.4.2 Challenge 2: Level of analysis issues

An important question that is currently being grappled with within the managerial cognition research community is whether collective cognition forms the aggregate of individual-level cognition (Langfield-Smith, 1992; Meindl, Stubbart and Porac, 1994)? Several questions emanate:

(i) Is it appropriate to conceptualise aggregated forms of cognition (i.e. at the levels of the group, organisation or industry levels) as a derivation of cognitive processes at the level of the individual?

(ii) Is it accurate to conceptualise cognition at the level of individuals as a reflection and articulation of collective-level processes?

(iii) Are cognitions held at the supra-individual level greater than the sum of its parts?

(iv) What assumptions are made regarding the homogeneity / heterogeneity of cognition at individual, group, organisational and industry levels?

What is increasingly perplexing is that researchers have studied managerial cognition in a manner of ways, which has made it increasingly difficult to draw a consensus. For example, Laukkanen (1994) has utilised a micro-to-macro perspective by mapping individual managerial belief structures. Using these belief structures, collective beliefs at the industry level of analysis were operationalised as belief-agreement among individual managers. Definition of collective level cognition (i.e. inter-manager agreement) was drawn empirically from analysis at the individual level. As Meindl, Stubbart and Porac (1994) remark, “such consensuality may be a sufficient condition for assuming the existence of collective cognition, but it is hardly a necessary condition” (p.290). Is it sufficient to assume that collective beliefs are both the aggregate of individual beliefs and as such, are simply denoted by cognitive homogeneity?
An alternative approach has to be too study cognition at a collective level of analysis. Phillips (1994) has suggested that industries are characterised by cultural systems of belief that create ‘mindsets’ shaping the worldviews of industry members. Precisely how collective belief systems influence cognition at the individual level is however, under-specified. The links between cognition at the levels of the individual, collective and organisation are not well documented. Meindl, Stubbart and Porac (1994) have suggested that it is tempting to conclude that this is an “intractable philosophical problem rather than an empirical question” (p.291). Whilst this may be an attractive conclusion, it is suggested that it may be more appropriate to re-conceptualise the level of analysis question.

An interesting development on this front has been a movement towards bridging process with structure (Challenge 1) in a way that also accounts for the concurrent development of cognition across multiple levels of analysis. Re-framing the level of analysis question as an issue of ‘temporal dynamics’ involving the interplay of individual and group level cognitive processes may be a more appropriate way for the field to progress (Corner, Kinicki and Keats, 1994; Fiol, 1994; Garud and Rappa, 1994). This is a movement that has also been echoed within other similar fields such as strategy-as-practice (Jarzabkowski and Matthiesen, 2007; Whittington, 2006).

What is novel in this approach is that it also helps to re-conceptualise cognition. The literature thus far has tended to approach cognition as either homogeneous (Gripsrud and Grønhaug, 1985; Porac and Thomas, 1990; Reger, 1990; Reger and Huff, 1993) or heterogeneous (Daniels, Johnson and de Chernatony, 1994; Hoopes, Madsen and Walker, 2003). These two streams of literature, one emphasizing consensus the other diversity, are increasingly being unified both conceptually (See: Fiol, 2002; Lant, 2002; Porac and Thomas, 2006; Porac, Ventresca and Mishina, 2002) and empirically (See: Daniels, Johnson and de Chernatony, 2002; Sutcliffe and Huber, 1998) as a by-product of this re-conceptualisation. For instance, the use of a temporally dynamic approach has shown promise in understanding the interaction of consensus with diversity in the shaping of collective decision environments (Fiol, 1994). A number of other similar concepts such as ‘enactment’ have been suggested as fruitful tools for explicating the process by which belief systems develop over time where the strength of beliefs increase and decrease as a function of groups striving for ‘interpretative dominance’ (Garud and Rappa, 1994).

The concepts of ‘temporal dynamics,’ ‘interpretative dominance’ and ‘enactment’ represent promising avenues for unravelling the puzzle of cognition across multiple levels of analysis.
and have also been used extensively in work on managerial mental models of competition (Levenhagen, Porac and Thomas, 1993; Porac and Thomas, 1990; Porac, Thomas and Baden-Fuller, 1989). The growing consensus is that they bring an element of human agency into the managerial cognition literature. That is, belief systems are no longer conceptualised as static or imposed systems, but are defined as active forums for beliefs to be developed and disseminated. This idea is also exemplified by the recent work of Burke et al. (2006) who developed a multi-level conceptual model that brings together individual cognition (e.g. knowledge, cognitive ability and team orientation) and group cognition (e.g. team situation awareness and shared mental models) underpinning team adaptation. Although profitable, if the validity of these concepts is to be investigated with an acceptable degree of rigor, then the challenge lies in matching theoretical progress with method (Hodgkinson, 1997).

Numerous articles have appeared that propose new methods that go beyond static snapshots at a given level. For instance, work by Johnson and Hoopes’ (2003) has involved mathematical simulations in an attempt to understand the complexity of the cognitive heterogeneity – homogeneity relationship within a unified framework, by modelling the relationships between managerial cognition, industry economics and industry structure. The results suggested a bi-directional relationship whereby managerial cognition not only influences industry structure, but that the underlying economics of an industry can force industry members to accept a reality they might not have enacted on their own. Hodgkinson’s (2005) recently published longitudinal study has also tested out the relative merits of these views by modelling individual and collective cognition concurrently using a method called PINDIS. This work is discussed in more detail from a methodological perspective later in this chapter.

3.4.3 Challenge 3: What is an appropriate epistemological approach?
Following March and Simon’s (1958) suggestion that organisations are information processing systems that consist of embedded routines through which information is stored and enacted, two epistemologically distinct approaches emerged in the managerial cognition literature. The first is the computational (positivist) approach and the second the interpretive (social constructionist) approach, each offering a different set of philosophical assumptions, theories and method. The question of which is the more appropriate has provided a forum of debate in recent years (Hodgkinson and Healey, 2008; Lant and Shapira, 2001).
The computational approach

The computational approach has taken March and Simon’s (1958) proposition to mean that organisations are systems that process and code information in a computational mode. This perspective suggests the problem facing organisations is related to the search and processing of relevant information under conditions where search is costly and decision-makers are boundedly rational. This class of research examines the processes by which managers and organisations process information and make decisions.

Essentially, this perspective uses the metaphor of the computer as a model for human information processing. The mainstay of recent work in the field has been concerned with how humans process information and how information processing guides behaviour (Fiske and Taylor, 1984; Lord and Maher, 1991a,b). What has emerged is the view that information processing involves a categorisation process in which information is filtered by existing knowledge i.e. in the form of cognitive maps (Jenkins and Johnson, 1992). It is these maps that have been shown to impact both how individuals interpret information and make decisions.

The interpretive approach

An alternative construal of March and Simon’s proposal is that organisations are fundamentally social entities that enact their world (Garud and Porac, 1999). This stream of research is concerned with exploring how meaning is created around information in a social context. Whilst the roots of the computational approach have emerged from psychology, this interpretive perspective has emanated from sociology. It draws upon the sociology of knowledge using Berger and Luckmann’s (1966) exposition on the social construction of reality. In contrast to the computational perspective, the interpretive approach advocates that “information is indifferent with regard to meaning” (Bruner, 1990: p.4). That is, without the meaning attached to information, information is rendered worthless.

The question of how the collective processes and stores information through the concept of cognitive maps proved problematic (Walsh, 1995). The notion of the ‘collective mind’ therefore followed (Sandelands and Stablein, 1987) arguing that human thought, cognition and knowledge is situated within a cultural system, which is itself made up of prior thoughts and knowledge. Knowledge embedded within these systems both enables and constrains subsequent thoughts (Wundt, 1921). What is problematic for the term is the theoretical process by which the collective mind comes into being. The notion of the collective mind has also produced difficulties regarding measurement. Whilst appearing a fruitful concept
with explanatory potential (at least theoretically), the concept has been described as invoking “a state of mystical confusion” Allport (1924: p.4).

Which is the more appropriate: Computation or interpretation?

One of the central issues to appear in the recent literature (Hodgkinson and Healey, 2008; Lant and Shapira, 2001) is whether the computational and interpretive approaches may be united or whether they make assumptions about human cognition that cannot be reconciled?

The rationale for irreconcilable perspectives is premised in pure forms of epistemological thought and reasoning regarding the manner in which reality is conceived. The interpretative perspective as denoted by Weick’s (1995) seminal contribution on sense-making suggests that patterns of meaning are extracted from environmental cues in order to socially construct a sense of reality. Purist forms of the interpretative perspective suggest that if reality is socially constructed, then one true reality does not exist. This would suggest there to be no real criteria against which human cognition can be compared. Attempts to gauge the accuracy of decisions or to assess the reliability and / or validity within this type of research are therefore likely to prove problematic.

For researchers adopting an epistemologically pure computational stance, the view is endorsed that cognition research should focus solely on the processing structures of the brain and symbolic representations of the mind. Work of this type is exemplified by the application of BDM to the study of mental representations (Hodgkinson and Healey, 2008) that emphasises the information processing limitations of decision-makers and the strategies they employ in order to overcome them. For the interpretive researcher, computational research on error and accuracy would be inconsequential for the social construction of cognition.

It has also been argued that common ground exists between these two epistemological approaches (Lant and Shapira, 2001) and that both perspectives are required in order to develop adequate theoretical accounts (Hodgkinson and Sparrow, 2002). Lant and Shapira have proposed that both information processing and meaning making are simultaneous, ongoing process in organisations. This less extreme position suggests that all human thought and behaviour including even the most complex social interactions, can be represented in symbolic models. For instance, Vidaillet (2001) explicitly uses concepts from both perspectives in tandem to analyse a catastrophic decision at a chemical plant. The challenge of reconciling computational and interpretive accounts of cognition has also been addressed
in the work of Porac and Thomas (1990), and Porac, Thomas and Baden-Fuller (1989) in their work on mental models combining computational notions (e.g. Rosch’s (1978) work on categorisation theory and March and Simon’s (1958) notion of bounded rationality) with interpretive concepts such as enactment and sense-making, citing both Weick (1995) and Berger and Luckmann (1966).

The challenge of integration is already advancing, with the potential reconcilability or otherwise of computational and interpretive perspectives on managerial cognition being raised by a number of contributors in the Journal of Management Studies (1989, 1992, 1997) and Journal of Occupational and Organizational Psychology (2003) special issues in addition to Narayanan and Armstrong’s (2005) edited volume. This is a view echoed by Hodgkinson and Healey (2008) who suggest computational and interpretative processes to coexist in a ‘dynamic interplay.’ The precise nature of this temporally evolving interplay has not yet been uncovered, however Hodgkinson and Healey propose a number of fruitful interdisciplinary avenues to exist within the social and management sciences (including NDM). What is likely to emerge in future research is a set of boundary conditions whereby one process is more prevalent than the other, and will reveal instances whereby they complement one another.

3.4.4 Challenge 4: Are words a window to the mind?

One of the most fundamental assumptions of this review is that words proffer a window from which cognition may be understood (Winterscheid, 1994). Language is the dominant form of managerial cognition’s descriptions (Eden, 1990; Gioia and Chittipeddi, 1991), whereby words are used to convey meaning through the concepts they represent. The language-cognition relationship is denoted by the following assumptions: (i) that each word contains a conceptual core that is an organised representation of beliefs, (ii) that individuals use words to label their experience and (iii) the frequency of word use reflects cognitive salience.

The question of whether or not words are a sufficient window to the mind is far from new and intimately bound up with debates on introspection. Managerial cognition researchers have debated this issue at some length, as reflected in discussions of tacit vs. explicit knowledge, the role of intuition and dual process models of decision-making and attitude change (See: Hodgkinson and Sparrow (2002) for a review). Despite continued concern regarding the adequacy of language as a reflection of cognition, the lack of other feasible alternatives available to the managerial cognition researcher has led to widespread use of a linguistic approach. Managerial cognition researchers have therefore been careful to
distinguish between ‘cognitive maps’ and ‘revealed cognitive maps’ (Narayanan and Armstrong, 2005).

There exist however, a number of unresolved questions, which have been circumvented by the research community. Some of these questions have been raised by Winterscheid (1994) and include whether language when used in the same way adopts the same meaning and whether individuals share patterns of word usage? What is important to highlight, is that language is only one part of the picture of cognition. By using methodology that is linked to the cognition of individuals, the social and behavioural aspects of communication and meaning are omitted from study. This is especially pertinent in research where the perspective is adopted that meaning and cognition are created through a temporally dynamic process.

3.4.5 Challenge 5: Can organisations think?

Given the complex system of interacting individuals and groups and the rise of the notion of collective cognition, a final area of contemplation for the managerial cognition community is whether it is possible to conceptualise the organisation as one that is able to think (Ocasio, 2001)? Or whether through the ascription of human characteristics to the organisation, we are at risk of anthropomorphism (Walsh and Ungson, 1991)?

One literal response is that organisations cannot think. Rather it is the individuals within them that have the explicit ability to cognise. That is, thinking is an activity of individuals not organisations. An alternative response has been to explore how organisations shape the symbolic representations and knowledge structures used by individuals (Walsh, 1995). Whilst this adopts the view that thinking is an individual level activity, it concomitantly acknowledges that schemas and knowledge structures that shape cognition at the individual level come from social groups within organisations. In sum, there are two variants in the managerial cognition literature (i) the shared cognition perspective and (ii) the top management perspective, the premises of which are described below:

Shared cognition perspective

Proponents of this perspective believe that organisations think in terms of their shared assumptions and beliefs and their common organisational culture and identity (Schein, 1985). This view however, does not take into account the de-centralised nature of thinking or information processing that takes place in organisations (Radner, 1997). The perspective is
also unable to explain the formation of commonalities in thinking across different organisations.

Top management perspective
An alternative perspective focuses upon the thinking of top managers (Fligstein, 1990; Hambrick and Mason, 1984). This approach builds upon themes of political coalition, theories of information processing and top management perspectives. It highlights the power and control of the top management team in shaping cognition. The problem with this approach is that it is unable to account for the diversity of interacting groups and individuals in organisations, the organisational division of labour or the lack of consensus with top management beliefs.

What does it mean to talk about organisational cognition given these limitations? To what extent can one argue that organisational cognition is more than shared cognition or different from the cognition of its individuals or groups, particularly its top managers? Ocasio (2001) has suggested as a response to these questions that it is valuable to talk about an organisation thinking in ways that cannot be reduced to individual level cognition. To understand how organisations think, is to understand not only how individuals think, but how thinking is situated in organisations, how situations are structured by organisations and how thinking and situations are embedded in broader social, economic, political and cultural environments. Thinking therefore ought to be viewed as a cross-level process and as such, it is erroneous to conceptualise the shared cognition and top management perspectives as distinct.

A number of writers have challenged the top management view of Hambrick and Mason (1984) and responded to the challenge of understanding cross-level processes with new models of strategising from the middle (Balogun and Johnson, 2004; Floyd and Lane, 2000; Floyd and Wooldridge, 1992, 1994, 1997, 2000; Maitlis, 2005). Other conceptions such as Weick and Roberts’ (1993) notion of ‘heedful inter-relating’ are also contributing towards understanding of the collective mind, as is the extensive work on team mental models (Ensley and Pearce, 2001; Gibson, 2001; Mohammed and Brad, 2001).

3.5 Scratching the Surface of Cognition: Knowledge Elicitation Techniques
This section of the review examines the call within managerial cognition to expand the catalogue of research tools currently available to researchers (Hodgkinson and Sparrow, 2002). As early as 1990, Huff and Fletcher suggested the fundamental challenge facing
managerial cognition researchers to be that of devising and applying methods that would capture actors’ mental representations. Indeed, Hodgkinson (2005) suggests that still, “...methodological and empirical advances have not kept pace with the scale of theoretical progress that has been achieved over the ensuing years” (p.xxii).

In demonstrating the challenges associated with existing techniques, a number of applications within managerial cognition are discussed, including rating techniques, the Markóczy-Goldberg approach, hierarchical cluster analysis (HCA), multi-dimensional scaling (MDS), procrustean individual differences scaling model (PINDIS), 3-way scaling and modelling using Dempster-Shafer’s theory of belief functions. Concurring with Hodgkinson and Sparrow (2002) a number of arguments are presented that suggest current knowledge elicitation techniques are only scratching the surface of cognition and that issues of validity and reliability pose significant challenges to methodological progress.

3.5.1 Cause maps

One of the most common techniques used to study managerial cognition uses causal mapping methods. Causal mapping techniques are a set of methods designed to reveal the “influence, causality and system dynamics” of actors’ mental models in decision-making and strategy-making (Huff, 1990: p.16). Cognition is represented in the form of a directed network in which concepts are depicted as nodes and interconnecting arcs indicate causal assertions. Some methods permit the differential weighting of relationships on the basis of belief strength or certainty / uncertainty (as denoted by arcs), whilst other methods attribute values to nodes depending upon its relationship with other nodes (Langfield-Smith and Wirth, 1992). Whilst these methods are marked by diversity in application and are manifest by questions of accuracy and representativeness, they undoubtedly remain one of the more robust methods of managerial cognition’s toolkit. This section defends the proposition that the ultimate challenge for mapping techniques lies in the development of methods that match the field’s theoretical advances.

3.5.2 Rating techniques

This review of techniques would not be complete without making reference to early work in this field based on rating techniques. A number of rating techniques have been invoked as tools for comparing the structure and content of causal maps (and what is also termed cognitive maps) between individuals (See Table 3.1 overleaf). Comparative analyses of this type make a number of fundamental assumptions regarding cognition, including the belief that higher levels of map complexity are representative of higher levels of individual’s
<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-degrees (Axelrod, 1976)</td>
<td>Number of links to a given node.</td>
<td>To illustrate the extent to which the construct in question is influenced directly by other constructs in the causal belief system.</td>
</tr>
<tr>
<td>Out-degrees (Axelrod, 1976)</td>
<td>Number of links stemming from a given node.</td>
<td>To illustrate the extent to which the construct exerts a direct causal influence on other constructs within the causal belief system.</td>
</tr>
<tr>
<td>Comprehensiveness (Carley and Palmquist, 1992)</td>
<td>Total number of concepts in a map.</td>
<td>To illustrate map complexity. It resides in the assumption that the more complex the map the more complex the cognition.</td>
</tr>
<tr>
<td>Reachability (Harary, Norman and Cartwright, 1965)</td>
<td>The sum of all direct and indirect influences of a given node on the overall system of causal relations.</td>
<td>To indicate the direct and indirect impact of a construct within a causal belief system.</td>
</tr>
<tr>
<td>Link-to-node ratio (Eden, Ackermann and Cropper, 1992)</td>
<td>Proportion of links to nodes + variables within a given map. Higher scores denote greater structural complexity.</td>
<td>Evidence of cognitive complexity, on the basis that more inter-connected maps represent greater understanding of the relations impacting an issue.</td>
</tr>
<tr>
<td>Map density (Hart, 1976)</td>
<td>The number of observed links ÷ total number of links theoretically possible. Higher scores denote greater structural complexity.</td>
<td>As above.</td>
</tr>
<tr>
<td>Average chain length (Jenkins and Johnson, 1997a,b)</td>
<td>Calculating the mean length of all complete chains within a given map provides the measure of average chain length.</td>
<td>Evidence of cognitive complexity: the greater the average chain length, the greater the elaboration of patterns of events or actions depicted in the map.</td>
</tr>
<tr>
<td>Centrality (Knake and Kuklinski, 1982)</td>
<td>The ratio of the aggregate of linkages involving the construct divided by the total number of linkages in the matrix.</td>
<td>It is a measure of how central the construct of concern is to the map thus reflecting the degree of hierarchy characterising the map.</td>
</tr>
</tbody>
</table>
cognition and that the centrality of a concept may be calculated from the ratio of linkages involving the construct divided by the total number of linkages in the map (Armstrong, 2005; Salancik and Porac, 1986; Swan and Newell, 1998; Weick and Bougon, 1986).

These techniques are both awkward and ungainly on the basis that: (i) the nature of analyses assumes causality to be constant regardless of the strength of causal relations, (ii) the piecemeal approach to the analysis of cause maps separates content and process and (iii) the utility and meaningfulness of these measures are questionable without recourse to external variables. The nature of these methods also makes it difficult to achieve comparability between participants without recourse to some degree of researcher judgement. It is therefore somewhat surprising to find Narayanan and Armstrong’s (2005) recent publication on the application of causal mapping techniques to information technology contexts giving so much precedence to these techniques (Armstrong, 2005; Hodgkinson and Clarkson, 2005).

3.5.3 Distance formula 12
In response to these limitations, Langfield-Smith and Wirth (1992) proposed a series of distance measures for the quantitative comparison of cause map content. The objective of this formula was to unveil the extent to which individuals vary in terms of the concepts included within their causal maps (depicted as nodes), and how these are perceived to interrelate by capturing differences and similarities in the complexity of maps. They developed ‘distance formula 12’ representing the most complete formulation of inter-subjective belief (dis)similarity. The formula seeks to summarise on a node-by-node and arc-by-arc basis all the differences between a given pair of maps. Scores range between 0-1, whereby larger numbers reflect greater dissimilarity. The essential drawback of this method is that no software has been developed to conduct computations.

3.5.4 Markóczy-Goldberg approach
One approach that has been proposed that builds upon the contribution of Langfield-Smith and Wirth (1992) is the Markóczy-Goldberg (1995) approach. This is a systematic method for eliciting and comparing causal maps. It is comprised of five stages:

(i) Development of a pool of constructs from interviews and literature review
(ii) Each participant selects a fixed number of constructs from the pool available
(iii) The causal map is constructed through a consideration of the relationships between the selected constructs
(iv) Distance ratios are calculated between causal maps using a generalised version of Langfield-Smith’s (1992) formula
Statistical tests are performed on the distance ratios to identify those characteristics that account for similarities in thinking.

Whilst, the ‘distrat / askmap’ suite of programmes employed by Markóczy and Goldberg (1995) for causal belief map analysis have been described as a “significant methodological breakthrough” (Hodgkinson and Sparrow, 2002: p.264), doubt is cast over the value of their method. First, the author expresses discontent with the construction of causal maps from a pre-selected pool of constructs. It has been suggested that a trade-off exists between capturing data that is meaningful to participants and ensuring that data is elicited in a manner that is conducive to comparison (Jenkins, 1998; Hodgkinson, 2002). Whilst this method eases the process of comparative analysis considerably, the view is adopted that ‘ease of analysis’ is a poor substitute for cognitive accuracy, and that in so doing the inherent complexity of cognition is lost. This point is particularly ironic given Markóczy’s (2006) recent criticism that distillations during cluster analysis and multi-dimensional scaling (MDS) have the effect of multivariate analysis techniques losing statistical power (See later discussion on cluster analysis and MDS).

The second point upon which the Markóczy-Goldberg approach is grounded which gives concern, is the use of statistical tests to identify characteristics of causal maps which account for similarity in thinking. What this review would like to question is the utility of knowing the similarity of dyadic constructs? To this author at least, this contributes little to our understanding of the underlying nature of cognition.

3.5.5 Hierarchical cluster analysis and multi-dimensional scaling

Indeed, it is questionable of the extent to which the Markóczy-Goldberg approach circumvents the problems commonly associated with hierarchical cluster analysis (HCA) and multi-dimensional scaling (MDS) and their analysis of proximities matrices.

For MDS the goal is to reduce the data in the proximities matrix to as few dimensions as possible without undue distortion, in order to permit its spatial representation (Kruskal and Wish, 1978). It also aims to preserve the relative distances between stimuli, so that their proximal relations are analogous to the cognitive representations elicited. Similarly, HCA uses proximities matrices to derive a pictorial representation in the form of a hierarchical tree diagram. Whilst the relative distance is not detained, concepts are grouped together on the basis of similarity.
What is perturbing for the development of managerial cognition research is that these represent some of the most developed methods in use. Yet, both MDS and HCA both lose a great deal of relevant information in performing their distillations, thus dramatically reducing the sensitivity of subsequent statistical tests. Furthermore, they are unable to account for the concurrent homogeneity and heterogeneity of cognition i.e. the existence of individual differences in cognition within a shared set of cognitive dimensions. Not only is accounting for cognitive homogeneity and heterogeneity an issue, but they are also unable to model cognition across multiple levels of analysis.

3.5.6 Procrustean individual differences scaling model (PINDIS)
One method proposed to circumvent the problem of cognitive heterogeneity and homogeneity has been to root analyses in procrustean individual differences scaling model (PINDIS) and its associated algorithm (Borg and Lingoes, 1978, 1987; Lingoes and Borg, 1976, 1978). Hodgkinson (2005) has used PINDIS to determine the extent to which individual’s cognitive configurations are comparable or differ from one another. Participants’ configurations are compared to a centroid configuration that represents the cognitive structure of the average participant. Although methodologically progressive, this relies upon the assumption that collective cognition is a manifestation of the average of individual cognitions - an assumption that is highly questionable.

3.5.7 3-way scaling / weighted multi-dimensional scaling (WMDS)
Despite the aforementioned loss of information associated with MDS distillations, another development that has gained impetus on this front is 3-way scaling (Arabie, Carroll and DeSarbo, 1987) or weighted multi-dimensional scaling (WMDS) (Schiffman, Reynolds and Young, 1981). A variety of computer programmes are available such as individual differences scaling (INDSCAK) (Carroll and Chang, 1970), ALSCAL (Takane, Young and DeLeeuw, 1977) and MULTISCALE (Ramsay, 1978).

What is advantageous with a 3-way / WMDS approach is the simultaneous representation of individual and collective cognition. 2-way scaling procedures (Reger, 1990; Walton, 1986) are only capable of representing cognition at the individual or collective level, not both. The underlying assumption is that a group of actors share a common set of underlying dimensions in their mental models of a particular domain. However, at the individual level, they differ in terms of the extent to which a given dimension is of relevance in their ‘private cognitions’ including the possibility of zero relevance. 3-way scaling yields an aggregate perceptual map coined the ‘group space’ and a series of weights reflecting sources of
variation in cognition at the individual level, represented as the proximities between stimuli. The extent to which the group space adequately represents their judgments is captured by two goodness-of-fit indices: stress and RSQ (Hodgkinson, 2005).

The shortcoming of this method is that it is underpinned by an Euclidean distances model and as such you do not get a cardinal measure of where a particular cognitive map is, simply its proximity and or similarity / dissimilarity to others (Markóczy, 2006).

3.5.8 Modelling with Dempster-Shafer's theory of belief functions
Addressing the earlier difficulty of integrating the strength of causal relations into analyses, Srivastava, Buche and Roberts (2005) have utilised Dempster-Shafer's 'theory of belief functions' in conjunction with explorations of managerial cognition. The theory of belief functions is a generalisation of the Bayesian theory of subjective probability. Whereas Bayesian theory requires probabilities for each question of interest, belief functions allow the degrees of belief for one question to be based on the probabilities for a related question. Specifically, what Srivastava Buche and Roberts' termed 'evidential diagrams' were analysed using a belief functions technique. Belief functions (derived from survey data) were used to represent uncertainties, personal intuition and confidence based on direct experience.

Whilst this approach is advantageous in its provision of a dynamic model of decision problems there are a number of wider issues of concern. First, unlike PINDIS and 3-way scaling methods, the theoretical concerns of cognitive heterogeneity and homogeneity are underplayed. In this study 83 responses were converted into one aggregate map. This ultimately dismisses from analyses any degree of cognitive heterogeneity between individuals. Secondly, the nature of this theoretical approach uses a basic probability assignment function to represent the strength of evidence, which is somewhat prescriptive resting incongruently with the concepts of cognitive heterogeneity and the use of experience in decision-making.

3.5.9 Software developments
Research has also been focused upon the development of software tools to aid the elicitation and analysis of causal maps. A number of these are critically reviewed including, CMAP2, 'decision explorer,' the 'distrat / askmap' suite of tools and 'cognizer.'
The first to be summarised is CMAP2, which has been developed as a method for eliciting and analysing maps in the form of their natural language (Laukkanen, 1994, 1998). This makes the CMAP2 software particularly suited to the comparative analysis of cause maps derived from interview transcripts. This software also supports data collection and the distillation of cause maps from interview notes, audio recordings and secondary documents.

One of the shortcomings of CMAP2 centres upon the requirement for the transformation of data into standardised constructs. With this comes an element of researcher subjectivity and a process of coding that is particularly cumbersome. The merits of standardising the content of constructs from which cause maps are drawn is a process also called into question (See earlier critique of Markóczy-Goldberg approach). The software also permits a number of calculations such as measures of the distances between maps of individual participants or clusters of participants. One of the limitations of the software is that it does not permit the exportation of outputs to other software packages. It has also been criticised on the grounds that it does not allow links within the map to be formally weighted and that it does not support concurrent visualisation. Finally, the CMAP2 software has been viewed as labour intensive, limited in its provision of feedback to participants and lacking in primary-level standardisation (Clarkson and Hodgkinson, 2005).

'Decision explorer'

'Decision explorer' is another type of software to have emerged in recent years to enable cause map elicitation and construction (Eden, Ackerman and Cropper, 1992). This software adopts an unstructured approach to elicitation, enabling the adoption of an ideographic approach to causal mapping. The consequence of which is that although the maps produced provide more accurate and comprehensive representations, the variation in complexity can also make systematic comparison difficult.

'Decision explorer' also enables the graphical representation of maps, whereby participants can not only view and validate their maps, but construct them within the software environment. Whilst this capability has been viewed positively, it has also been criticised as providing a forum for researcher bias (Clarkson and Hodgkinson, 2005). 'Decision explorer' is also limited in that it does not allow the formal incorporation of weights to the links between nodes. However, this software does permit the calculation of a variety of quantitative indices of a structural nature and the completion of a cluster analysis (and also hierarchical clusters) based upon link similarities between constructs.
‘Distrat / askmap’ suite of tools

This suite of tools has been developed as a supporting technique to the Markóczy-Goldberg causal mapping approach. Whilst not exhaustive, Goldberg (1996) developed the ‘distrat / askmap’ suite of programmes to perform several of the tasks associated with the Markóczy-Goldberg approach. As such, the ‘distrat / askmap’ suite of tools do not support cause map elicitation and construction.

The central limitation of this suite of tools is that although Markóczy and Goldberg (1995) have described a number of statistical procedures there is no complete accompanying software. Further still, the algorithms are not in a form that facilitates the transfer of data to and from other systems for analysis (Clarkson and Hodgkinson, 2005).

‘Cognizer’

The latest software to be developed within the managerial cognition community, builds upon the work of Langfield-Smith and Wirth (1992) and Markóczy and Goldberg (1995). This software was designed to meet the requirements of researchers looking to elicit and compare large numbers of maps on a longitudinal or cross-sectional basis. ‘Cognizer’ combines the Markóczy-Goldberg approach to cause map elicitation and construction with a range of measures of cognitive content and structure (Clarkson and Hodgkinson, 2005). It is proposed that this combination aids hypothetico-deduction by isolating the determinants of the structure and content of collective belief systems allowing the testing of a priori hypotheses.

Cause maps can also be elicited and constructed using nomothetic, ideographic or hybrid approaches such as the Markóczy-Goldberg approach outlined earlier. Following the latter, participants are required to select a set of salient constructs from a pre-determined pool. This Clarkson and Hodgkinson (2005) propose to meet the conditions of meaningfulness of the research task and data comparability. They further state that:

“Crucially this procedure totally obviates the need for researcher subjective judgement in making cause map comparisons albeit within the boundaries of a researcher-designed framework.”

(Clarkson and Hodgkinson, 2005: p.322)

The process of cause map elicitation is then denoted by the questions of whether: (i) a particular construct exerts a causal influence upon another construct belonging to subset selected, (ii) if it does whether it does so positively or negatively and (iii) whether the
relationship is slight (+1) or (-1), moderate (+2) or (-2) or strong (+3) or (-3). This process is exhaustive, considering all pair-wise combinations. It is proposed that this systematic approach should not only significantly diminish the possibility that any important effects are omitted (Hodgkinson, Maule and Brown, 2004), but also aid a reduction in coding errors due to the difficulties associated with the inference of cause and effect. Finally, ‘cognizer’ enables the cause map to be depicted graphically in a manner similar to ‘decision explorer,’ with the addition of ‘cognizer’ permitting the incorporation of formal weights into the graph. The software also enables the elicitation of cause maps directly from participants and enables their validation and modification in real time, in order to minimise the effect of changes in maps (Huff and Fletcher, 1990).

‘Cognizer’ also provides a number of analytical functions based upon the cause maps. These include measures of map content of the type contained in Table 3.1 (i.e. direct and indirect in-degree and out-degree values) and measures of map structure (i.e. link to node ratios and map density). These structural measures are taken to reflect varying degrees of complexity among maps, providing a base upon which to test the validity of hypotheses concerning cross-sectional differences and developmental changes in belief systems. Distance ratios (calculated as a reflection of the degree of overall dissimilarity between pairs of cause maps) can also be used to explore patterns of similarity and difference among subgroups of participants. As Clarkson and Hodgkinson (2005) demonstrate, a variety of further calculations can be completed through the exportation of data into programmes such as SPSS for statistical analysis such as cluster analysis or logistic regression.

The analysis of aggregated cause maps for the analysis of group tendencies is also permitted using the ‘cognizer’ software. The study of which is premised in the suggestion that managerial cognition is a multi-level phenomenon embracing collective patterns of individual cognition (Sitkin, 2001). The study of collective cognition is enabled through summation, mean calculation or standard deviation calculations of weightings. Langfield-Smith and Wirth’s (1992) distance formula 12 may also be used, whereby distance ratios reflect content differences between pairs of individual maps. For instance, in a study of call centre employees Clarkson and Hodgkinson (2005, 2007) produced a composite map of each participating organisation based upon individual’s maps, revealing the constructs to be related in different ways across different organisations.

The main point of critique for this method concerns Clarkson and Hodgkinson’s (2005) claim that ‘cognizer’ will aid hypothetico-deduction and the testing of a priori hypotheses on
“well-developed extant theoretical formulations” (p.318). The theoretical basis upon which these objectives are rooted is sparse at best. The study of managerial cognition could benefit from more theoretically robust methods. A second point concerns the use of the term ‘collective belief systems.’ As Clarkson and Hodgkinson conclude, although insightful in revealing overall group tendencies, aggregated maps cannot be viewed as representative of individual cognition. The validity and utility of using a composite of individual maps as a basis of inter-organisational comparison, is one of concern.

Connectionist architectures
A small literature base has started to emerge that use connectionist architectures to model human thought. Connectionist architectures use the human brain as a metaphor of how cognitive processes might operate, characterising it as a flow of excitation and inhibition between networks of neurons (Lord and Maher, 1991b). Architectures of this type have been informative in shaping the work of a small number of researchers within the managerial cognition community. For instance, they have been proposed as fruitful tools for measuring the differences between causal maps (Wang, 1996), and as such, offer a means for bridging content, structure and process.

Fiol (2002) has also suggested that the intersection of computational-interpretative thinking might be captured through what is termed ‘mixed-architectures’ i.e. through the adoption of top-down schema-based theories alongside connectionist approaches. For example, Weick (1995) in his account of belief-driven sense-making processes focuses not only on sense-making and pattern matching processes, but also on the role of top-down symbol-driven choice processes in shaping cognition. This approach has also been echoed work in similar work by Czarniawska-Joerges (1997), Eden and Spender (1998) and Meindl, Stubbart and Porac (1996). Whilst researchers within this field are beginning to define managers as actors who proactively make sense of decision environments (as opposed to simple processing devices), the connectionist metaphor has remained a simple analogy:

“The connectionist metaphor that emerges is a view of people as neurons and organization as a brain.”

(Fiol, 2002: p.125)

This thesis proposes that connectionist architectures offer a useful means for modelling cognition that extends beyond the simple role of a metaphor. These methods are valuable not only in the psychological plausibility they afford, but also in reconciling computational-
interpretative debates. Whilst speculation regarding the potential of cognitive modelling applications to the study of managerial cognition has surfaced, there have been limited developments within this arena.

3.6 Methodological Debates

There are two broader challenges worthy of note in relation to managerial cognition’s methods that shape this final section. These centre upon the issues of validity and reliability in cognitive mapping research and are discussed in turn below.

3.6.1 Challenge 1: Managerial cognition and issues of validity

The issue of establishing validity represents one of the central difficulties facing managerial cognition researchers. Whilst the question “are we measuring what we think we are measuring?” (Kerlinger, 1987) would seem one to which the response should be yes, it is only by making the fundamental assumption that words are a window to the mind (see earlier discussion) that one can have confidence in the validity of their research. This question in a nutshell, is difficult to answer with certainty. Cognition at the individual level is enigmatic. At best, one can only endeavour to capture its representation in a relatively incomplete fashion.

Deconstructing Kerlinger’s question reveals a positivist view of validity, in its assumption that there exists a reality, which can be established and measured in some way. Is this an appropriate view of validity given our earlier discussion regarding the suitability of a range of epistemological assumptions? Perhaps it would be more appropriate to adopt a phenomenological perspective of validity where the question is asked “has the researcher gained full access to the knowledge and meaning of informants?” (Easterby-Smith, Thorpe and Lowe, 1991). Or does this merely offer a way of evading the heart of the validity issue?

On the notion of validity, there is also the issue of appropriate use of a priori variables. Do a priori variables capture respondents’ views of the world? Or do they force respondents to work within a set of variables that is not central to their cognition of a situation? There is a real danger that their use may: (i) reduce the ability to detect new aspects of managerial thought not documented in the established literature and (ii) mould individual’s cognition into an artificially pre-ordained from. The use of a priori variables also brings concerns regarding saliency vs. comparability as discussed earlier in relation to the Markóczy-Goldberg approach.
Finally, building upon the issue of comparing cognitive maps, Jenkins (1998) raises the question of ‘what are we actually comparing?’ Although consensus on this issue would seem an appropriate foundation of validity, agreement has been difficult to achieve. This in part, has been due to the many aims of managerial cognition research including, the comparison of cognitive maps between individuals and the comparison of cognitive maps to the actual cognition of the individual.

The issue of validity in managerial cognition research is one fraught with difficulty, with questioning of some of the fields most fundamental assumptions. Besides Hodgkinson and Clarkson (2005), Jenkins (1998) and Narayanan and Armstrong (2005), discussion of these challenges has in the main been evaded and as such, consensus has been difficult to establish.

3.6.2 Challenge 2: Managerial cognition and issues of reliability

This second challenge is premised in the assumption that reliability is concerned with replicability (Easterby-Smith, Thorpe and Lowe, 1991; Gummesson, 1991). This is an assumption associated with most positivistic paradigms within the social sciences. As outlined during consideration of the theoretical challenges facing this field a number of epistemological approaches exist through which managerial cognition may be studied i.e. computational and interpretative. It has been proposed that whilst the concept of reliability is appropriate for computational accounts of cognition, from a purely qualitative perspective this concept is considered inappropriate (Taylor and Bogdan, 1984).

The perspective held throughout this thesis is that a concern for replicability (whilst secondary to that of validity) should be central to both quantitative and qualitative research. One approach that has been used in cognitive mapping research spanning the quantitative-qualitative divide has been post hoc coding. However, this has not been a formalised practice with many researchers refraining from citing levels of inter-rater agreement (Bonham and Shapiro, 1976; Hart, 1977; Levi and Tetlock, 1980; Stubbart and Ramaprasad, 1988), or simply not citing the coding process (Cosette and Audet, 1992; Hall, 1984; Roos and Hall, 1980). Despite advances in specialist coding procedures (Huff, Narapareddy and Fletcher, 1990; Wrightson, 1976) and techniques to enhance inter-coder reliability (Calori, Johnson and Sarnin, 1992; Jenkins and Johnson, 1997a, 1997b) fundamental questions remain regarding coding procedures (Hodgkinson, 2001; Jenkins, 1998). For instance, whilst these methods are useful for determining reliability at one particular instance in time, the degree to
which one can expect replicability over an extended timescale is largely dependent upon the
dynamic nature of the environment within which cognition is situated.

A number of recent methodological developments in causal mapping such as PINDIS
(Hodgkinson, 2005) are informative in that they enable the exploration of longitudinal
stability and change and sub-group differences without recourse to cumbersome coding
procedures of questionable reliability and validity. As outlined previously however, methods
of this type are not without drawbacks.

Reliability is of particular concern for studies making comparisons across multiple
individuals and organisations. In these situations any form of systematic bias could have an
acute effect on the map produced. This is especially likely in instances where the mapping
process involves high levels of interviewer input and may be determined by the amount of
structure given to the interview. A second approach to reliability has therefore been to
remain mindful during analysis of the distinction between the cognition of the researcher and
those of the respondent.

3.7 Concluding Remarks

The aim of this thesis is to explore the potential for methodological collaboration between
the fields of NDM and managerial cognition. Complementing the examination of NDM in
Chapter Two, this chapter has selectively reviewed some of the epistemological, theoretical
and methodological challenges confronting the managerial cognition research community. A
thread uniting these literatures concerns the inadequacy of the BDM approach to the study of
decision-making and cognition. This forms a platform for the application of NDM to the
study of managerial cognition, as is discussed in more detail in Chapter Four.

Review of methods employed within the field of managerial cognition also identified a
multitude of shortcomings, of which four principal challenges are to shape this thesis:

(i) The problem of representing and comparing causal maps without recourse to
proximal similarity / dissimilarity relations
(ii) The challenge of incorporating the strength of causal beliefs into analyses
(iii) The difficulty of providing structured approaches to the elicitation and
representation of cognition, that also permit cognitive heterogeneity, and
(iv) The provision of an adequate theoretical basis to causal mapping methods
The above challenges represent the basis for the methodological contribution of this thesis. The precise means, through which these issues are addressed in conjunction with those facing NDM as raised in Chapter Two, are outlined in the next chapter.
CHAPTER FOUR

Methodology
Research Rationale, Epistemology and Design

4.1 Introduction

This chapter outlines the methodology underpinning this thesis. As such, it addresses three interrelated aspects: (i) research rationale, (ii) epistemological approach and (iii) research design. This chapter defends the adoption of a mixed-methods approach that draws across the fields of NDM and managerial cognition. The epistemological appropriateness of adopting both quantitative and qualitative methodologies is also discussed.

The first section ‘research rationale’ draws attention to the convergence of thought that exists between the fields of NDM and managerial cognition that makes cross-fertilisation feasible. Locating this thesis at the interface of epistemological - methodological debates, the value of a mixed-methods approach is outlined. Attention is drawn to how mixed-methods might facilitate epistemological and methodological rapprochement within NDM and managerial cognition. These arguments are used as a platform from which discussion of the epistemological approach and design of this thesis follow.

The second section ‘epistemological approach,’ opens by locating the relevant methodological debates of NDM and managerial cognition within a broader discussion of paradigmatic divides that are prevalent throughout the social sciences. This is used as a basis for considering the promise of philosophical convergence and the author’s preference for mixed-methods as an appropriate epistemological choice for this research.

Making reference to the methodological challenges raised in Chapters Two and Three, the final section ‘research design’ outlines the three studies comprising this thesis. The methods employed i.e. applied cognitive task analysis (ACTA), ‘convince me’ and interpretative phenomenological analysis (IPA) are reviewed. This chapter closes with a general consideration of the challenges associated with mixed-methods research.
4.2 Research Rationale

As stated previously, the overarching objective of this thesis is to examine the potential of methodological exchange between the fields of NDM and managerial cognition. In light of this aim, this section opens with a summary of the points at which these fields (as reviewed in Chapters Two and Three) converge that makes collaboration feasible. Consideration of the intersection of NDM and managerial cognition on epistemological, conceptual and methodological grounds, fortifies the rationale for cross-fertilisation. Drawing these propositions together, the value of a mixed-methods approach as a mechanism for methodological conversation is outlined.

4.2.1 Convergence of thought: NDM and managerial cognition

A number of threads exist that unite the fields of NDM and managerial cognition, as reviewed in Chapters Two and Three. The first thread to be drawn concerns a mutual dissatisfaction with the field of BDM for the study of cognition. As maintained by NDM, BDM appears fundamentally inappropriate on the grounds of its normative conceptualisation of rationality and may be considered somewhat incomplete through its underplaying of the cognition - environment interaction and solitary use of laboratory-based methods. Whilst forming an established basis for NDM research, this discontentment with BDM sets the ground for the application of a naturalistic perspective to the study of managerial cognition. The perspective is defended that by taking the study of managerial cognition to the field without the constraints of BDM’s normative prescriptions, the intersection of cognition and environment may be better understood.

A second thread uniting these fields and forming an integral component for the cross-fertilisation of these perspectives is reflected in the common use of the notions of schemas and mental representations. Hodgkinson and Healey (2008) in their discussion of cognition in organisations, state:

“Schema theory and related notions of mental representations, for example, have emerged in a variety of guises as a basic mechanism for explaining cognitive bias and inertia at the individual, group, organizational, and interorganizational levels of analysis, from work groups and teams to leadership and organizational change and development.”

(Hodgkinson and Healey, 2008: p.18)

For the field of managerial cognition, the concept of mental representations and the use of specialised schemas for action have formed the cornerstone of the field’s theoretical and
methodological contributions. The crux of this work has suggested that categories of structured knowledge exist that can be brought forth by situational cues to facilitate understanding and action (Gioia, 1986). Reasoning as a schematically-driven process has also emerged in NDM in response to decision-making under conditions of uncertainty. For instance, the activation of schema-based structures has been represented theoretically in both Beach’s (1990) image theory and within Klein’s (1993) RPD model as a process integral to pattern recognition.

The third strand of thought uniting these fields concerns the concept of ‘sense-making.’ In managerial cognition this has been most strongly reflected in the work of Weick (1988, 1993, 1995) and Weick, Sutcliffe and Obstfeld (2005) who describe the process as an ongoing accomplishment in the creation of reality that occurs when people make retrospective sense of uncertain situations as a basis for future-orientated thought. The concept of sense-making has also underpinned much of the work within NDM, particularly in relation to situation awareness (Endsley, 2000). Most recently, Klein, Moon and Hoffman (2006a, 2006b) have presented a theory of sense-making as a set of processes invoked in response to an insufficient understanding of events. For Klein et al. (2006), sense-making is conceptualised as a two-way process that involves fitting data into a mental model and using the evoked mental model to connect data. The overlap between NDM and sense-making is such that the recently coined term “naturalising sense-making” was used during the 8th International Conference on Naturalistic Decision-Making (Klein, Snowdon and Lock Pin, 2007; Snowdon, 2007).

The epistemological debates that have marked both NDM (i.e. surrounding the incongruence of quantitative methods and the contextually-rich study of expertise) and managerial cognition (i.e. the appropriateness of computational vs. interpretative perspectives for the study of cognition) reflect a final thread of convergence. The convergence exists in a movement that is gaining ground regarding the inappropriateness of such divides. The fallacy of paradigmatic exclusivity is an issue addressed more generally in section 4.3 of this chapter.

Indeed, Hodgkinson and Healey (2008) have suggested the processes of computation and interpretation to coexist in a ‘dynamic interplay,’ a proposition reflected in the successful marriage of these accounts in recent years (Lant and Shapira, 2001; Porac and Thomas, 1990; Vidaillet, 2001). Fiol’s (2002) suggestion that the intersection of computational-interpretative thinking might be captured through connectionist architectures, is a view
endorsed within NDM in relation to the field’s own quantitative-qualitative debates. As Todd and Gigerenzer (2001) propose, NDM’s methods need not exclude quantitative methodologies and as such might draw value from formal modelling applications. The use of formal modelling tools in the study of NDM has however, been met with limited response (although see: McAndrew, Banks and Gore, 2008). This sets the groundwork for the study of NDM and managerial cognition in a way that complements connectionist architectures with the contextual richness of qualitative methods.

4.2.2 Value of a mixed-methods approach

The first part of this section sought to establish an appropriate rationale for the convergence of thought across the fields of NDM and managerial cognition. Whilst these provide a variety of avenues for cross-fertilisation, the focus of this thesis is intrinsically methodological. (Although as evident throughout the remainder of this thesis, these broad points of convergence are linked and interject into the discussion when necessary). Accordingly, the remainder of this section locates discussion at the interface of epistemological – methodological debates. In doing so, attention is drawn to how a mixed-methods approach might be used to facilitate epistemological and methodological rapprochement within NDM and managerial cognition.

NDM and mixed-methods

The rationale for the adoption of a mixed-methods approach to the study of NDM is situated in relation to the notion of paradigmatic independence between the NDM community and CDM theorem. As outlined in Chapter Two, NDM has become equated with qualitatively rich methodologies that are in strict contrast to the experimentally driven quantitative methods of CDM. Whilst in some respects this has been advantageous in aiding the development of highly structured qualitative methods for the elicitation and representation of expertise such as ACTA, it has at once dismissed the utility of quantitative methods.

The nature of the methodological limitations outlined in Chapter Two, are testament to and operate as a function of this paradigmatic exclusivity. As debated, the assumption of a pure form of antitheticality is limited and consequently a sole preference for qualitative methods inappropriate. Indeed, one of the central challenges facing the NDM community is the development of methodological tools through which theories can be subjected to empirical testing. As outlined in the preceding section, one such proposition has been the use of formal modelling procedures in NDM (Todd and Gigerenzer, 2001). Adopting an approach in which NDM’s grounded methods are complemented with quantitatively rigorous tools (stimulated
by academic thought within managerial cognition), may aid new insights and provide NDM with a basis for theoretical refutation.

**Managerial cognition and mixed-methods**

This rationale for the complementing of formal modelling applications and qualitative study within NDM also sets the scene for methodological reconciliation of managerial cognition’s interpretative and computational perspectives. In recent years this polarisation has begun to wane with the suggestion that all human thought including social interactions, can be represented symbolically. The proposition that both computation and interpretation exist in a dynamic interplay has set a new theoretical and methodological agenda for the study of managerial cognition of which progress has been limited. It is proposed that by drawing upon connectionist architectures from within cognitive psychology that permit the combinatorial use of interpretative and computational assumptions, greater insight into cognitive process will be obtained.

The perspective is also advocated that there exists utility in complementing connectionist architectures with qualitatively rich methods of the type NDM advocates. It is proposed that by borrowing from NDM, the study of managerial cognition might draw value from an understanding of the environment in which decision-making is located and its interaction with cognition.

By reviewing the rationale for a mixed-methods approach, this section paves the way for a research agenda grounded in methodological interchange between the fields of NDM and managerial cognition. The precise means by which methodological exchange occurs is outlined in the final section of this chapter entitled ‘research design.’ The next section addresses the epistemological framing of this thesis.

**4.3 Epistemological Approach**

The philosophical basis of mixed-methods approaches to research has been the focus of much debate (Coyle, 2007; Creswell et al., 2003; Ormerod and Ball, 2008). In light of this ongoing discussion, this chapter seeks to outline the philosophical foundation of this thesis. This section opens by locating the debate at a broad level within the paradigmatic divides that exist within the social sciences, paying particular attention to purist stances adopted within the field of cognitive psychology. In justifying the adoption of a mixed-methods approach, this chapter then draws attention to the threads of convergence that exist across these paradigms that makes paradigmatic rapprochement possible. The stance adopted is one
of methodological plurality on the conviction that it is only through the adoption of mixed-methods that one can come close to capturing the real nature of cognitive phenomena. Concluding this section, a case is then made for the adoption of a pragmatic approach to mixed-methods research as a basis for this thesis.

4.3.1 Paradigmatic divides within the social sciences
In order to set the stage for the philosophical basis of this thesis, it is first necessary to outline the purist instantiations of the quantitative and qualitative paradigms. The beliefs that follow demark the relentless focus on the differences between the two epistemological perspectives and as such, form the foundation of the widely disseminated notion of paradigmatic antitheticality.

Quantitative purists
The beliefs held by quantitative purists centre around a number of assumptions consistent with positivist philosophy. In a way analogous to the philosophical assumptions of the physical sciences, proponents of this paradigm assert that enquiry within the social sciences should be met with objectivity (Johnson and Onwuegbuzie, 2004). As such, quantitative purists consider the attainment of time and context-free generalisations to be an attainable gold standard. The notions of reliability, validity and emotional detachment from the object of study reflect the rhetorical neutrality that is associated with research within this paradigm (Tashakkori and Teddlie, 1998).

For cognitive psychologists operating within this camp, the accuracy of self-reports as a reflection of cognitive processing is held with reservation. As outlined in Chapter Three, the possible incompleteness and inaccuracy (i.e. the potential for post hoc rationalisations and the construction of causal theories) of this type of method is used as a call for experimental approaches to the study of cognitive phenomena (Ormerod and Ball, 2008). The consequence of objective, independent, controlled and measurable approaches is the use of quantitative methods from which cognitive processes are theoretically inferred.

Qualitative purists
By way of contrast, qualitative traditionalists operate with the view that multiple constructed realities exist. Purist conceptualisations of this tradition therefore propose that detachment from the object of study cannot be attained, as the subjective being is the only source of reality. The desire for and value of research devoid of the contextual richness in which it inhabits is queried. Contrary to the proposals of quantitative purists, the qualitative paradigm
suggests the differentiation of cause and effect to be unobtainable and advocate an inductive approach to the generation of explanations that are presented in an empathic form (Johnson and Onwueggbuzie, 2004).

One of the essential advantages of the qualitative approach is that unlike experimental approaches that necessitate theoretically-driven propositions, qualitative investigations are well-suited to areas of research that are ill-defined and exploratory. This is particularly pertinent for researchers within the field of cognitive psychology, where laboratory-based methods are inappropriate for the study of cognitive activity as it occurs in naturalistic environments. Ormerod and Ball (2008) suggest this difficulty to lie in the fact that such activities are (i) inherently situated with respect to organisational constraints, social structures and interactions and because (ii) cognitive activity is distributed, emerging as a complex interaction between members of teams and external artefacts.

This antithetical pitching of one paradigm against the other has ultimately led to a view of incompatibility (Howe, 1988), and has resulted in an inappropriate consolidation of paradigm with method. Whilst this view continues to exist within the social sciences, the potential for philosophical convergence is discussed below.

4.3.2 Philosophical convergence

The conviction that "... the often believed quantitative-qualitative research divide is false, misplaced and misleading" (Ratnesar, 2005: p.1) is one that is gaining ground within the social sciences. Rising interest in the implications associated with the attribution of mutually exclusive epistemological and methodological positions for progressiveness has been cause for concern (Niglas, 2000). As Ratnesar states:

"There is no methodological or other justification in continuing to maintain the paradigm of the quantitative-qualitative divide if it is research progress that is desired."

(Ratnesar, 2005: p.10).

Whilst notions of paradigmatic antitheticality have prevailed, thought has started to underline the commonalities that exist between these perspectives. Though challenging to reconcile epistemologically, threads of philosophical consensus have emerged as follows:
(i) **Light of Reason:** The relativity of what appears reasonable is variable across researchers.

(ii) **Theory-Laden Perception:** What is noticed and observed is framed by background knowledge, theories and experiences.

(iii) **Under-Determination of Theory:** It is feasible that more than one theory might explain a single set of data.

(iv) **Auxiliary Assumptions:** Hypotheses are embedded in a network of beliefs therefore: (i) testing cannot occur in isolation and (ii) alternative explanations will continue to exist.

(v) **Problem of Induction:** Empirical research provides only probabilistic evidence not proof, which is perplexed by the fact that the future may not reflect the past.

(vi) **Social Nature:** Research is inherently situated within communities of researchers and their associated attitudes, values and beliefs.

(vii) **Value-Ladenness Inquiry:** This is rooted in the belief that humans can never be entirely value-free. As such, the choice of investigation and the interpretation of data is an interpretative endeavour.

(Johnson and Onwuegbuzie, 2004)

The above points of convergence are by no means exhaustive, with Johnson and Onwuegbuzie (2004) proposing research across the social sciences to be marked by a unanimous effort to create assertions about actors and the social worlds in which they inhabit. Convergence of thought has also been developed on the conviction that both quantitative and qualitative paradigms use empirical observations to construct explanatory arguments from which research outcomes are interpreted. As has the proposition that each paradigm employs methods of assuring biases are minimised that may detriment the validity of the research. At the level of ontology, convergence is also deemed attainable with the claim that:

"There is room in ontology for mental and social reality as well as the more micro and more clearly material reality."

(Johnson and Onwuegbuzie, 2004: p.15)

Close inspection reveals that far from being diverse, an intrinsic coherence exists between methods and paradigms along the lines of objective, scope and nature of inquiry. This is also
reflective of the emerging concern regarding the synonymous treatment of epistemology and method, whereby often the logic of justification is confused with method (Bryman, 1984; Howe, 1992; Onwuegbuzie and Teddlie, 2003). As Johnson and Onwuegbuzie (2004) state, the logic of justification does not dictate specific methods for collecting and analysing data.Known as the issue of ‘paradigm-method-fit,’ this challenge has been integral in the materialisation of paradigmatic convergence.

4.3.3 Pragmatism as an epistemological choice
The legitimating of mixed-methods research within the disciplines of psychology and management has been marked by a number of recent publications (See: Ball and Ormerod, 2000a, 2000b; Bryman, 2006a; Coyle, 2007; Ormerod and Ball, 2008; Tashakkori and Teddlie, 2003). The discussion of how qualitative and quantitative methods might be combined in practice and the tensions between them managed is a topic of ongoing discussion (Brannen, 1992; Bryman, 2006a, 2006b, 2007; Schreier and Fielding, 2001; Todd et al., 2004).

A typology of mixed-methods
The starting point for discussion considers Greene, Caracelli and Graham’s (1989) typology for combining data collection methods that extend above and beyond the notion of triangulation. Their classification is composed of four objectives:

(i) **Complementarity** i.e. qualitative and quantitative methods may be used to elaborate results obtained using alternative method
(ii) **Development** i.e. the results from one method may be used to develop the other method
(iii) **Initiation** i.e. the results from one method may be recast to question the results from another method, and
(iv) **Expansion** i.e. extend the range of inquiry by using different methods for different inquiry components

The notion of ‘expansion’ is the most common within the literature, with Coyle (2007) proposing that the meaningful combination of relatively discrete qualitative and quantitative methods each hold potential for contributing something different to the research question. For instance, qualitative methods might benefit from greater generalisability, whilst quantitative methods might benefit from increased proximity to research participants (Coyle, 2007; Mayring, 2001). The decision to use mixed-methods should be goal-orientated and therefore determined by how best to answer the research question (Coyle, 2007; Moran-Ellis
et al. 2006; Saunders, Lewis and Thornhill, 2007). This is a view also echoed by Ball and Ormerod (2000a, 2000b) who suggest that it is legitimate to adopt a variety of theoretical stances to the study of cognitive processes depending upon one’s research agenda i.e. whether the research is orientated towards the level of the individual or organisation.

Building upon the above, it has also been suggested that a full understanding of cognitive phenomena is achievable only through rigorous mixed-methods research designs that capitalise upon the strengths of qualitative and quantitative approaches (Ormerod and Ball, 2008). Whilst mixed-methods approaches are inherently more time consuming than their single method counterparts, it is argued that the study of cognition becomes far more meaningful. The study of cognitive phenomena from multiple methodological perspectives is imperative if the real nature of cognitive activities is to be understood (Ormerod and Ball, 2008). Research by Dunbar and Blanchette (2001) that triangulates naturalistic and laboratory methods in what they term a ‘in vivo/in vitro’ approach, is testament to this proposition.

In line with the objective of methodological cross-fertilisation between the fields of NDM and managerial cognition and in addressing the epistemological-methodological debates these fields face, this thesis is rooted in the exchange of philosophically diverse methods. Accordingly, pragmatism is viewed as an appropriate epistemological lens for this thesis. In accordance with earlier arguments in favour of paradigmatic and philosophical convergence, this perspective unites insights and procedures from multiple approaches to produce a superior level of understanding. A strong form of this philosophy is adopted where it is deemed feasible to combine multiple epistemological perspectives within one study in an effort to elaborate the results obtained and extend the range of inquiry. The choice in a pragmatic, mixed-methods approach that adopts a complementary and expansive form is justified through specification of the research design in section 4.4 of this chapter.

4.4 Research Design

The final section of this chapter outlines the research design that shapes this thesis, formulated in line with the aforementioned research rationale and epistemological approach. What follows, is an explicit statement of the research objective and overview of the three studies. The mixed-methods employed (i.e. ACTA, ‘convince me’ and IPA) are also described. This section concludes with consideration of some of the challenges associated with this research, paying particular attention to those affiliated with mixed-methods as drawn from the author’s experience.
4.4.1 Research objective

The over-arching objective of the thesis was to examine the potential of methodological cross-fertilisation between the fields of NDM and managerial cognition. Application of methods drawn from these fields to the study of investment professionals' decision-making provides a backdrop to this work. Drawing together the reviews of Chapters Two and Three, this chapter has identified four broad areas of convergence that makes collaboration between NDM and managerial cognition feasible:

(i) Inappropriateness of BDM to the study of NDM and managerial cognition
(ii) Common use of the concepts of schemas and mental representations
(iii) Centrality of sense-making processes to theorising
(iv) The existence of epistemological-methodological debates

Although drawing across these four points of convergence, the research design is principally framed in response to the inappropriateness of BDM and epistemological-methodological debates that have prevailed within NDM and managerial cognition. The inappropriateness of BDM is addressed through the adoption of a naturalistic mode of decision enquiry throughout this thesis generally, whilst the guiding notions of schemas, mental representations and sense-making processes form the foundation of the methodological contributions. Accordingly, in meeting the objective of methodological cross-fertilisation, the research rationale was composed of two parts. First, assessment of the value of methods drawn from NDM and managerial cognition in order to understand investment professionals' decision-making. Second, consideration of the practical utility of methodological interchange, in addition to the epistemological and theoretical conjectures outlined earlier.

The research questions to be addressed in meeting the objective of methodological cross-fertilisation are outlined below.

Question 1: To what degree do connectionist architectures exhibit methodological and practical value in the study of NDM and managerial cognition?

Question 2: How, if at all do qualitative methods (including those drawn from NDM's qualitative toolbox) assist understanding of the contextual components i.e. task and social environment, within which cognition is situated?

These questions are justified on account of the challenges facing the NDM and managerial cognition research communities as outlined in Chapters Two and Three.
4.4.2 Mixed-methods design

The process for determining an appropriate mixed-methods design was informed by the work of Hanson et al. (2005). The broad process they propose is documented in Figure 4.1 overleaf. The process of determining (i) an appropriate theoretical lens, (ii) data implementation and prioritisation and (iii) data analysis and integration, was a useful means of structuring the author’s choice in research design.

As the author adopted a pragmatic approach to this research, the three studies varied according to the type of mixed-methods design invoked. As can be seen in Figure 4.2 (see page 81) the Preliminary Study utilised a concurrent triangulated design (where both quantitative and qualitative methods were used to inform the results equally), whilst Studies II and III adopted concurrent nested designs. Consequently, it is appropriate to discuss the author’s choices as framed by this model in relation to each study.

An overview of the three studies comprising this thesis is provided below. The structure of this thesis, sought to progressively understand the nature and boundaries of methodological rapprochement between NDM and managerial cognition. An overview of this development in understanding is also sketched.

4.4.3 Preliminary Study

This first study was exploratory in nature and was concerned with piloting the ACTA and ‘convince me’ methods. In-depth interviews were conducted with two Portfolio Managers, drawn from within the UK investment industry. This had the purpose of determining the practical potential of the methods in preparation for Studies II and III.

Accordingly, the choice of a pragmatic approach for this research (i.e. one that selects methods in order to best understand actual practice as defined by Gore et al., 2006), justified the combinatorial use of methods derived from both fields for this study. This acknowledged both the computational and interpretative connotations associated with the study of managerial cognition and addressed the challenge regarding the use of quantitative methods as a basis of theoretical refutation. It also drew attention to the importance of naturalistic enquiry and the cognition-environment intersection as encouraged by NDM. Given the preliminary stage of the research, it was deemed appropriate to give each method equal priority. A concurrent triangulated design was used to meet this means, as illustrated in Figure 4.2 (page 81). Data integration occurred through comparative review during discussion of the data.

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This first stage refers to the philosophical basis or paradigm that underlies the study and subsequent methodological choices. This is used to inform the researcher’s choice in methodology.

This second stage is concerned with how data collection is implemented and prioritised. Implementation relates to the order in which quantitative and qualitative data are collected. Prioritisation refers to the weighting attributed to each type of data.

The final stage refers to the decision regarding the point at which data analysis and integration will occur. It is feasible that data analysis may be conducted separately and then integrated at a later stage.

Figure 4.1: Process for Determining Mixed-Methods Research Designs
(Adapted from: Hanson et al., 2005)
Research Stage

*Preliminary Study*
2 Portfolio Managers
ACTA and 'convince me'

→

*Study II*
11 Fund Managers
'Convince me' and IPA

→

*Study III*
8 Day Traders
ACTA and IPA

Mixed-Methods Design*

\[\text{QUAN} + \text{QUAL} \]

Results

Key:
QUAN = quantitative data prioritised; QUAL = qualitative data prioritised; quan = lower priority given to quantitative data; qual = lower priority given to qualitative data.

*Adapted from Tashakkori and Teddlie (2003): Preliminary Study adopts a concurrent triangulated design (equal priority is given to quantitative and qualitative data); Study II adopts a concurrent nested design (qualitative data is nested within quantitative data); Study III adopts a concurrent nested design (qualitative data is nested within qualitative data).

*Figure 4.2: Research Design*
The ACTA techniques necessitated a task-focused approach that permitted flexibility in participant’s focus. The variety of probes made it possible for the researcher to obtain at once a broad overview of the types of decision tasks encountered and some of intricacies associated with these decision tasks. The ‘knowledge audit’ derived from stage 2 was used as a basis for the analysis. By way of contrast, the ‘convince me’ method focused upon one decision generated by each participant that was mapped in detail. The thematic analysis derived from ACTA was used as a basis for reconciling data drawn from the ‘convince me’ method through a process of concurrent triangulation.

This Preliminary Study was completed with multiple objectives borne in mind. First, it provided an opportunity to refine methodological procedures to ensure clarity and precision in advance of Studies II and III. Secondly, it also served as a point of reference for reviewing the suitability of the approach to data analysis. It also offered an opportunity to develop the researchers’ interviewing skills and to build upon theoretical understanding of the domain by becoming acquainted with the reality of Portfolio Managers’ practices. Finally, this study served as a point to determine the potential utility of examining investment professionals’ decision-making through the fields of NDM and managerial cognition. This study is examined in detail in Chapter Five.

4.4.4 Study II

This second study examined the method ‘convince me’ in more detail and is outlined more comprehensively in Chapter Six. Interviews with a sample of eleven Fund Managers formed the basis of this research. The Fund Managers were recruited from seven of the UK’s leading investment houses. The participating organisations were all authorised and regulated by the Financial Services Authority (FSA).

The objective of this work was to build upon the Preliminary Study, with particular reference to the mixed correlations that had been derived from the ‘convince me’ models. By exploring in more detail the methodological utility of ‘convince me,’ the question of the degree to which connectionist architectures exhibit methodological and practical value in the study of NDM and managerial cognition may be addressed. As such, it was the aim of this study to examine the boundaries of cross-fertilisation in more detail.

In line with the procedure outlined for the Preliminary Study, participants were asked to focus upon one decision that they had recently made charting it in the form of a causal belief map. At a second point in time (following the researcher’s construction of the models using
the ‘convince me’ software), participants completed a ratings task based upon the hypotheses and statements of evidence comprising their causal belief maps from which decision coherence was computed.

As in the Preliminary Study, Study II was marked by a pragmatic approach to data collection. The initial design was to focus upon the ‘convince me’ method in isolation. However, in addition to the data necessary for the construction of the ‘convince me’ models, the interviews also provided significant insights into the way Fund Managers’ conceptualise their decision environments and the highly situated nature of their practices. This data was used to complement the ‘convince me’ models and therefore extend understanding of Fund Managers’ decision-making, through the completion of an interpretative phenomenological analysis (IPA) (See: Appendix One for an overview of the process of conducting an IPA). IPA’s are completed with the purpose of gaining an ‘insider’s perspective’ of the topic under investigation (Smith, Jarman and Osborn, 1999). The approach is both ‘phenomenological’ in that it is concerned with participants’ personal accounts and ‘interpretative’ in that it uses the perspective of the researcher to make sense of their personal world. This study therefore used IPA and the ‘interpretative order’ it produces as a means of structuring the insights from the Fund Managers’ interviews.

As such, the research design was marked by a concurrent nested design as can be viewed in Figure 4.2 (page 81). Here weight was given to the quantitative findings of ‘convince me,’ which were supplemented by the IPA at the point of discussion. This had the benefit of providing a deeper insight into the world Fund Managers inhabit, thereby acknowledging the more situated aspects of their expertise. The success of the concurrent nested design formed the basis of the design for Study III.

4.4.5. Study III

Study III sought to examine the ACTA techniques in more detail building upon the findings derived from the Preliminary Study (further detail - see Chapter Seven). This study was based upon in-depth interviews with eight Day Traders recruited from four trading firms. As in Study II, all participating firms were authorised and regulated by the FSA.

The objective of this study was to examine in more detail the utility of the ACTA techniques. The Preliminary Study had highlighted the potential of the method, but also the need to conduct it with more participants in order to achieve a deeper insight into the decision-making processes of investment professionals. By consequence of this deeper exploration,
the question of whether qualitative methods drawn from NDM might assist understanding of investment professionals' decision-making was explored.

In line with the earlier studies, this study also adopted a mixed-methods approach. In contrast to Study II whereby quantitative and qualitative methods were reconciled, this study advocated the use of two qualitatively based methods. As such, Study III also adopted a concurrent nested design, where the situated approach of IPA was used to complement the task-focus study of expertise using ACTA. Akin to Study II, the author’s choice in IPA resided in the fact that it offered a means for organising the insights derived from Day Traders’ interviews in a way that (i) gives precedence to individuals’ personal accounts whilst (ii) acknowledging it is an inherently interpretative activity shaped by the researcher’s own conceptions.

Completion of the ACTA interviews adopted the same procedure as in the Preliminary Study. The in-depth nature of the ACTA interviews generated a wealth of data, which used alone would have led to the exclusion of important contextual information. It was from this excess that the IPA drew its thematic analysis. This had the benefit of providing a more holistic understanding of investment professionals’ decision-making expertise at the level of task and the social environment in which it is situated.

4.4.6 Analytical tools and methods
This next section provides an overview of the methods employed within the above three studies. Particular attention is paid to how these methods might address the challenges faced by the fields of NDM and managerial cognition and consequently, inform the research questions of this thesis. Each method concludes with a summary of its principal benefits and shortcomings.

Applied cognitive task analysis (ACTA)
The NDM community have been at the forefront of research developing ‘applied’ methodologies to enable the operative study of decision-making in naturalistic environments (See: Crandall, Klein and Hoffman (2006) for an overview). In Chapter Two, the ACTA techniques (as developed by Klein Associates) were reviewed with the vision that conventional cognitive task analysis technique should be attainable to practitioners (Militello, Hutton and Miller, 1997). To reiterate, the ultimate aim of the techniques is to aid the identification of the key cognitive components used to perform a specific task through a series of knowledge elicitation and representation procedures described below:
Stage 1: The ‘task diagram’ interview, aims to provide a broad overview of the task, identifying areas requiring complex cognitive skills.

Stage 2: The ‘knowledge audit,’ focuses on a cognitive sub-task from Stage 1 identifying elements that may present difficulties for inexperienced individuals.

Stage 3: The ‘simulation scenario’ provides a contextual element to the task, aiding the identification of the cues used in assessment, the strategies implemented and the errors novices make.

(A ‘cognitive demands’ table merges data across the 3 stages)

The systematic approach to eliciting task-specific, high quality knowledge makes it particularly appropriate for gaining an in-depth understanding of the decision-making process (Gore, 2003a, 2003b; 2004; Gore and Riley, 2005). In particular, it aids the identification of cues, strategies and aspects difficult for those with less experience, which otherwise would be difficult to access. One of the true strengths of the techniques is the reconciliation of a broad overview of the decision-making process using stage 1 and the use of stages 2 and 3 to represent in detail the different aspects of expertise comprising the most cognitively perplex component.

With reference to understanding the decision processes of investment professionals, ACTA benefits from a structured approach for progressively eliciting and representing knowledge that contrasts with the methods typically utilised by CDM in the laboratory i.e. abstract judgment and probabilistic reasoning tasks. On the contrary, it is argued that the ACTA techniques are able to focus on cognitive functions such as decision-making that emerge in natural settings and take forms not easily replicated in the laboratory such as the multiple goals that often define decision environments. The nature of ACTA makes it suited to the study of decision-making in naturalistic environments by consideration of actual decisions encountered making it a method higher in ecological validity than its comparative neighbours.

By implication, the ACTA techniques might assist understanding of the environment in which decision-making is located and its interaction with cognition. In this way (and as examined in the Preliminary Study and Study II), cross-fertilisation of NDM’s methods with the study of managerial cognition might be informative.
In terms of the logistics of the method, ACTA is also advantageous in that it adopts a free recall environment, circumventing the difficulties associated with the generation of pools of constructs in cognitive mapping research. The ACTA techniques therefore have the potential to address the methodological problem currently facing the field of managerial cognition associated with providing structured approaches to the elicitation and representation of cognition whilst allowing cognitive heterogeneity.

Some of the weaknesses associated with the ACTA method include reductionism due to the construction of ‘knowledge audit’ and ‘cognitive demands’ tables that represent only the key elements of data elicited. The practical difficulty of data reduction and aggregation was attenuated by the importance of context to investment professionals’ decision-making. For example, subtle differences in market conditions or market sentiment would often have the effect of generating different courses of action or strategies. A second weakness concerns stages 1 and 2, which are open to post-hoc rationalisation. Whilst, stage 3 circumvents this issue, the access restrictions of this research did not permit completion of this time-intensive stage. This method therefore resides in the assumption that investment professionals’ descriptions are an accurate representation of their thought and action in practice.

‘Convince me’

‘Convince me’ (Schank, Ranney and Hoadley, 1996) is a computational architecture rooted within the wider cognitive psychology literature. It attempts to account for the process by which the plausibility of beliefs characterising causal belief models are determined. ‘Convince me’ is comprised of two components: the theory of explanatory coherence (TEC) and its computational counterpart: ECHO. Essentially, participants elicit a causal belief map specifying hypotheses and statements of evidence relevant to a particular decision. Hypotheses and statements of evidence are then rated according to their believability and reliability. The causal belief map is then mapped using the ‘convince me’ software from which participants’ ratings are correlated against those generated by ‘convince me’ i.e. ECHO. The resultant correlation is reflective of the overall coherence of the participants’ argument.

‘Convince me’ is an appropriate methodological choice for use in this thesis on two grounds. First it addresses the call for connectionist models that might bridge managerial cognition’s computational-interpretative divide and NDM’s quantitative-qualitative dichotomy. Second, ‘convince me’ is underpinned by TEC, which is a theoretical account of the process by which actors establish the plausibility of beliefs asserted in an explanation or argument.
‘Convince me’ is of value to the NDM and managerial cognition research communities through its account of the sense-making process.

TEC is rooted in three fundamental assumptions of reasoning: Firstly, that the believability of an idea increases with simplicity, on the conviction that the generation of lots of assumptions may in fact be counterproductive. Secondly, statements of belief yield higher credibility when there is more evidence to support them. Finally, TEC is rooted in the assumption that actors are increasingly likely to believe statements that do not dispute other strongly held beliefs. Whilst, these demark the broad assumptions of reasoning that underpin TEC, more specific principles that determine the mechanism by which explanatory coherence is determined are outlined below:

**Symmetry:** Coherence and incoherence are symmetric relations, which means that if one belief explains (or conflicts with) another, the beliefs send activation back and forth to one another.

**Explanation:** A hypothesis coheres with what it explains. Hypotheses that together explain some other proposition cohere with one another. The more hypotheses it takes to explain something the lower the degree of coherence.

**Simplicity:** The plausibility of a proposition is inversely related to the number of explaining statements needed to explain it. The simpler the explanation, the more likely it will be believed.

**Data Priority:** Propositions that describe the results of observations have a higher degree of acceptability. Thus, acknowledged facts, memories, and observations carry more weight than hypotheses.

**Contradiction:** Contradictory hypotheses that in-cohere with one another send ‘negative activation’ to each other.

**Competition:** Competing beliefs that explain the same evidence or hypotheses, but are not related are said to in-cohere. Highly independent explainers of the same proposition conflict with each other, and thus send ‘negative activation’ to each other.

**Acceptability:** The acceptability of a proposition increases as it coheres more with other acceptable propositions, and in-coheres more with unacceptable propositions.
Analogy: Similar hypotheses that explain similar pieces of evidence cohere.

Coherence: The overall coherence of a network of propositions depends on the local pair-wise cohering of its propositions. The goodness of a whole system of beliefs is determined by the believability of its relationships.

(Adapted from: Thagard, 2004)

It is envisaged that ‘convince me’ has potential for addressing additional limitations of methods currently used in the field of managerial cognition. First, the cardinal measure afforded by ‘convince me’ is more informative about the overall coherence and logic of beliefs than measures of proximal similarity / dissimilarity relations that have permeated managerial cognition to date i.e. Clarkson and Hodgkinson’s (2005, 2007) ‘cognizer.’ Second, ‘convince me’ offers a means by which the strength of causal beliefs may be integrated into the analysis of cause maps without using Bayesian probabilities (Srivastava, Buche and Roberts, 2005), which has been problematic both in its prescriptive use of probability functions to represent the strength of evidence and its lack of psychological realism.

Despite the above strengths, there are a number of shortcomings associated with the practical utility of this method. The first, relates to the time-consuming nature as a methodological process. The process of eliciting a causal belief map and ratings, developing a representation within the ‘convince me’ software and running the simulations was time intensive. The inherent complexity of investment professionals’ decision-making also added to the difficulty of this process.

Communication with the designers of this software (Michael Ranney, University of California, Berkeley and Patricia Schank, Center for Technology in Learning, California) have suggested that the causal belief maps typically used within ‘convince me’ to be much simpler. This brings the question as to the appropriateness of using a method to map managerial cognition that was originally developed to help students with formal and informal reasoning. Specifically, it was developed as a tool to aid the process of structuring, restructuring and assessment of knowledge about controversial situations. The author believes there to be value in the theoretical basis of ‘convince me’ i.e. on the view that TEC is conceptually appropriate as a process of establishing coherence between propositions and therefore in its account of sense-making for understanding investment professionals’ decision-making.
There is also weakness in the ‘convince me’ method from a developmental perspective. To illustrate, the developers of the software provide no justification for their choice in believability and reliability ratings, or for the scales underpinning their choices. Like ACTA, this method is also met with difficulties regarding the post-hoc rationalisation of decisions and the degree to which causal belief maps represent the actuality of investment professionals’ thoughts and actions. Whilst not exclusive to ‘convince me,’ the validity of verbal protocols as a representation of cognition is also open to debate. Testing the capability of the software and its ability to model complex decision-making sets an agenda for this thesis.

However, despite these concerns, the author’s choice in ‘convince me’ was rooted in its relative aptness, in comparison to other cognitive architectures that are available. One such example is based upon Heuer’s (1999) analysis of competing hypotheses (ACH) developed in collaboration with the Palo Alto Research Center (PARC). Here, the analysis of hypotheses and evidence adopts the form of a matrix, and as such does not possess the procedural ease of causal belief maps that ‘convince me’ holds. By comparison the use of causal belief maps in ‘convince me’ makes a more direct contribution to the managerial cognition literature. A final point of comparison pertains to ACH’s output. The software makes calculations based upon the likelihood of each hypothesis, which is simply based upon inconsistency scores for each hypothesis. As such, the process of determining decision outcomes lacks psychological plausibility and presumes a deliberate and analytically driven approach. There is no overall calculation of coherence as afforded by ‘convince me.’ Even the more complex instantiations of ACH are problematic in their use of Bayesian belief networks (driven by probabilistic reasoning) that lack psychological fidelity.

**Interpretative phenomenological analysis (IPA)**

This third and final method was employed in response to the data generated during Studies II and III that (despite providing significant insights) could not feasibly be integrated into the ‘convince me’ and ACTA analyses. This data highlighted the importance of understanding the contextual foundations of investment professionals’ decision-making and as such, formed the author’s choice in interpretative phenomenological analysis (IPA) (Smith and Eatough, 2007) as a nested approach to data analysis in Studies II and III. As outlined in Chapter Two, the application of narrative methods in order to understand sense-making processes is a trend moving to the forefront of NDM investigation. This choice therefore operates in line with some of the recent qualitative approaches to the study of cognition emerging within the field of NDM.
In brief, IPA is a qualitative method that permits insight into how individuals construe and perceive their world. Typically, qualitative data is derived from interviews or focus groups. In this thesis, the IPA’s in Studies II and III were conducted using the additional data derived from the ‘convince me’ and ACTA interviews respectively. The ‘phenomenological’ component of the analysis gives precedence to the uniqueness of individuals’ thoughts and perceptions of the world as opposed to the creation of objective descriptions. IPA therefore necessitates the researchers’ immersion in the world of each participant as a phenomenological insider, whilst also making ‘interpretative’ sense of participants’ experience in order to address the question of focus.

This thesis adopted an iterative process to the interpretation of the data in order to ensure both precision and representativeness. The cyclic process between transcript and the extraction and generation of themes is documented in more detail within Studies II and III and in Appendix One. The appropriateness of IPA is that it is a bottom-up, inductive approach generated through interaction with the data.

One of the central advantages of this method of analysis is that it provides insight into the situated and locally embedded components of investment professionals world not permitted by other methods. IPA is also appropriate for describing complex phenomena and is therefore particularly suited to understanding the interaction between thought, action and context. Moreover, it is appropriate for study in naturalistic settings, thus operating in line with the naturalistic lens to enquiry advocated by this thesis. It also enables a progression in understanding of the social basis of this construction at the group level as opposed to that of the individual. The insightful, rich description it provides can be used to understand how participants interpret and construct their decision environments and henceforth be used to complement insights drawn from other methods used throughout this thesis.

There are however, also a number of disadvantages associated with this ‘phenomenological’ approach to analysis. The first pertains to the unintentional tendency for researchers to treat written narrative as truth, failing to attend to accounts as serving rhetorical purposes. This point also relates to the role of the researcher as an audience in shaping the emergent narrative. A second point relates to the inherent subjectivity on what is deemed appropriate for inclusion and exclusion within the thematic structure of the IPA. Finally, the knowledge produced may not generalise beyond the research study.
4.4.7 Challenge of mixed-methods research: General considerations

The final section of this chapter, documents some of the difficulties encountered as a researcher in completing the three studies. First those problems encountered on the front of recruitment and participant commitment are considered, before addressing those specific to the completion of mixed-methods research.

The first point of difficulty related to the recruitment of participants. This was a particularly pertinent issue for the Preliminary Study and Study III. These studies necessitated interviews in the region of 1 1/2 hour to 2 hours. Quite simply, investment professionals do not have the time resources available to assist with research of such an in-depth nature. A number of approaches were used as a means of gaining entry to organisations including approaching London Stock Exchange and the use of their online database of member firms. Whilst, enquiry into assistance from London Stock Exchange was thwarted, the use of online databases was instrumental as a means of familiarising the researcher with firms within the industry thereby assisting the process of recruitment. By far the most effective method adopted a snowball recruitment style, building upon relationships as they were established between industry contacts and the researcher.

A second point of difficulty emerged with respect to Study II and the collection of data over an extended time frame. Despite obtaining agreement for the completion of a causal belief map at Time₁ and the collection of ratings at Time₂, the reality of collecting data at Time₂ was fraught with difficulty. The researcher proposed the ratings task to be completed remotely by email, initially envisaging that this would be the most time-efficient method for participants. Often however, ratings were completed erroneously or with omissions and as such, necessitated informal telephone interviews in order that the task was completed to the researchers satisfaction. The maintenance of relationships throughout the period of research often proved integral in ensuring swift resolution to any difficulties.

Before moving on to address some of the issues associated with the completion of mixed-methods research, one final point remains to be examined, namely the effect of the role of the researcher. Whilst this is not unique to this research alone, the difference in knowledge between the researcher and investment professionals would have shaped to some degree the emergent narrative across the three studies.

The reality of completing mixed-methods research was not without its challenges. The first point, relates to the time-consuming nature of the mixed-methods approach. The use of
multiple methods not only necessitates familiarisation with procedures (i.e. ACTA and ‘convince me’) but also with the concomitant software (i.e. ‘convince me’) and distinct data analysis processes (ACTA, ‘convince me’ and IPA). The ‘convince me’ method was particularly time-consuming and demanded a more realistic timeframe for building models than anticipated by the author. The difficulty of using methods to explore ‘real-world’ enquiry in itself is more time-consuming than approaches adopted by its experimental counterparts.

The integration of data from multiple methods during discussion significantly perplexes the process of data interpretation. This is a time-consuming process, amplified by a lack of guidance within the mixed-methods literature regarding the actual practice of data interpretation. Although providing a richness and depth of analysis afforded only by the adoption of a mixed-methods approach, the wealth of data generated was inherently difficult to handle. One of the criticisms of the mixed-methods literature is that problems of paradigm mixing i.e. how to qualitatively analyse quantitative data and interpret conflicting results, remain to be worked out fully by research methodologists and as such is a point reiterated by this thesis.

4.5 Concluding Remarks

This chapter has outlined the methodology underpinning this thesis addressing, the research rationale, epistemological approach and research design. The adoption of a mixed-methods approach as an appropriate philosophical base has also been justified on the grounds of convergence and corroboration of findings. The three studies outlined aim to increase understanding of the boundaries through which cross-fertilisation between NDM and managerial cognition and an understanding of investment professionals’ decision-making may be achieved.
CHAPTER FIVE

Preliminary Study: Exploring Portfolio Managers’ Decision-Making

5.1 Introduction

This chapter is positioned in response to a call for an integration of developments in the psychological analysis of cognition in organisations (Hodgkinson and Healey, 2008). In response to this request, this Preliminary Study examines the value of cross-fertilising methods across the fields of NDM and managerial cognition. This chapter opens with a summary of the key issues to be explored and offers a rationale for adopting a NDM perspective for the study of Portfolio Managers. The methodological approach using ACTA and the computational modelling tool ‘convince me’ is then outlined and the results from the piloting of these methods reviewed. The final section of this chapter, discusses the findings in relation to theory and the practical implications for understanding Portfolio Managers’ decision-making. The potential contributions to academic knowledge this research may generate and the implications for future study are discussed.

5.1.1 Key issues explored

The over-arching objective of this thesis is to examine the potential of methodological interchange between NDM and managerial cognition. In addressing this aim, this Preliminary Study seeks to pilot the ACTA techniques and the connectionist architecture ‘convince me’ as a basis for in-depth analysis in Studies II and III.

The key issues to be addressed in this study are as follows:

- To examine the degree to which inter-disciplinary collaboration might address the methodological challenges associated with NDM and managerial cognition
- To understand the benefits of studying Portfolio Managers’ decision-making from a NDM perspective

The methodological choices in ACTA and ‘convince me’ in order to address the above issues, was informed by the existence of a number of challenges facing the NDM and
managerial cognition research communities. These have been extensively illustrated throughout Chapters Two, Three and Four, but are summarised below as a set of criteria for assessing the fulfilment of the above issues. The principal questions facing the NDM community are summarised below:

(i) Can the contextually bound study of NDM draw value from formal modelling applications?
(ii) Are connectionist architectures able to provide NDM with a basis for theoretical refutation?
(iii) Can the quantitative-qualitative divide in NDM research be addressed using connectionist architectures?

From the field of managerial cognition, the questions shaping this chapter are:

(iv) How if at all, can the intersection of computational-interpretative thinking be captured through the use of connectionist architectures?
(v) How if at all, can connectionist architectures (a) integrate the strengths of causal beliefs into maps and (b) represent and compare causal belief maps without proximal measures of similarity / dissimilarity?
(vi) Do structured approaches to the elicitation and representation of cognition drawn from outside of the field of managerial cognition permit cognitive heterogeneity?
(vii) What managerial cognition can draw value from understanding the situated nature of cognition?

Whilst ambitious to answer these questions in an exhaustive manner given the preliminary nature of this work, it was envisaged that this chapter would (at the least) be able to gauge the promise of methodological exchange. Before progressing further, the author’s choice of Portfolio Managers’ decision-making as a context for this work is justified.

5.1.2 Background: NDM and Portfolio Managers

The combinatorial study of NDM and Portfolio Managers is an area which to date, has not been researched simultaneously. Whilst, it has been the norm to apply behaviourally driven decision-making approaches to the investment domain (As outlined in Chapter One), it is argued that the application of a naturalistic approach has the potential to spur new insights. Whilst the theoretical appeal of bridging NDM and the study of experienced investors has been met with interest (Mauboussin and Bartholdson, 2002; Olsen, 2000, 2002), it has not been fully demonstrated in practice. One attempt to address this has been a study of the naturalistic behaviour of Chartered Financial Analysts conducted by Olsen (2002). Whilst,
Olsen's study was broadly situated within a NDM framework, the conclusions drawn are fundamentally undermined by a methodological design that was incongruent with the basic premises of naturalistic enquiry.

5.1.3 Study objective

The principal objective of this study was to begin to understand the practical potential of cross-fertilisation between the fields of NDM and managerial cognition. Through the interdisciplinary exchange of methods this study also sought to address the practicality of adopting a mixed-methods research philosophy and explore the under-researched area of decision-making of Portfolio Managers through a naturalistic lens.

5.2 Method

5.2.1 Domain specific knowledge: Portfolio Managers

See Appendix Two for a summation of the knowledge acquisition process.

5.2.2 Design

This Preliminary Study adopted a mixed-methods approach that integrated both qualitative and quantitative methods to inform understanding of the nature of Portfolio Managers' decision-making. Specifically, this study utilised a 'concurrent triangulation' design (Creswell et al., 2003). The choice in design was marked by: (i) the philosophical appropriateness of 'pragmatic' approaches (Cherryholmes, 1992; Rossman and Wilson, 1985) as the foundation of naturalistic enquiry i.e. the assumption that regardless of circumstance, both objective and subjective methods may be used in a single study (Gore et al., 2006), (ii) the simultaneous collection of data using mixed-methods and (iii) the equal priority of qualitative and quantitative data in informing the analysis.

5.2.3 Participants

In-depth interviews were conducted with two Portfolio Managers (Mean age = 50 years; SD = 4.24 years). This followed Militello, Hutton and Miller's (1997) recommendations that for a full study, three to five subject matter experts exhaust the domain of analysis. Both participants worked as independent consultants for organisations that are trading members of London Stock Exchange and the Association of Private Client Investment Managers and Stock Brokers. Participants had been employed in their current position for an average of 6.6 years (SD = 7.60 years) and worked for an average of 29.5 years (SD = 7.78 years) within the investment industry (Average statistics are based upon mean calculations). The principal
decisional activities of participants were described as portfolio management and discretionary / execution only, stockbroker advice services.

5.2.4 Materials

Applied cognitive task analysis (ACTA)

This method was used to elicit Portfolio Managers’ expertise. Both participants completed Stages 1 and 2 of the ACTA techniques (Militello, Hutton and Miller, 1997), outlined below:

Stage 1: The ‘task diagram’ interview, aims to provide a broad overview of the task, identifying areas requiring complex cognitive skills.

Stage 2: The ‘knowledge audit,’ focuses on a cognitive sub-task from stage 1 identifying elements that may present difficulties for inexperienced individuals.

The instructional format for eliciting and representing knowledge generated from the ACTA techniques was used in the form documented in the multi-media instructional CD and booklet provided by Militello, Hutton and Miller (1997). The instructions used to organise the interviews are outlined in Appendix Three. These were used in order to ensure procedural similarity between interviews. Although the ACTA techniques consist of a series of three stages, these may be combined in a number of different ways, as all three stages are not necessary for this analysis. Due to the time constraints imposed by access restrictions to participants, ‘stage 3: simulation scenario’ was therefore not conducted within this Preliminary Study.

Computational modelling architecture: ‘Convince me’

The ‘convince me’ software (Ranney and Thagard, 1988; Thagard, 1989) was downloaded from: http://www.soe.berkeley.edu/~schank/convinceme/index.html. To date, no instructional guidelines exist for the elicitation of expertise prior to input into ‘convince me.’ Thus, a standardised set of instructions was devised in order to ensure procedural similarity in the elicitation of causal belief maps across interviews. These are provided in Appendix Four.

The ‘convince me’ architecture uses hypotheses, statements of evidence and their associated linkages as the basis of participants’ causal belief maps. Explicit specification of information as either hypotheses or evidence were therefore obtained and classified as at least one of the following: ‘acknowledged fact or statistic,’ ‘observation or memory,’ ‘one possible
inference, opinion or view' or 'some reasonable people might disagree.' ‘Convince me’ also required assessments of the reliability of evidence and judgements of the believability of hypotheses and statements of evidence. The rating scales are shown below:

**Hypotheses:** Judgements of believability as measured on a scale of 1 (Low) – 9 (High)

**Evidence:** Judgements of believability as measured on a scale of 1 (Low) – 9 (High)

Assessments of reliability as measured on a scale of 1 (Low) – 3 (High)

5.2.5 *Procedure*

Data collection for this study occurred at two points in time. The first at Time$_1$ outlines the mainstay of data collection for ACTA and ‘convince me.’ The second at Time$_2$ outlines the process by which ratings were obtained for the developed ‘convince me’ models. The process of data analysis is described for each method below. An illustration of the overall process is documented diagrammatically in Figure 5.1 overleaf.

**Data collection Time$_1$: Applied cognitive task analysis (ACTA) and ‘convince me’**

Information sheets were presented to participants at the start of the interview. The purpose of these was to ensure clarity regarding the purpose of the interview and to explicate the requirement for the completion of the ‘convince me’ rating activity at Time$_2$. The information sheets were also used as a formal method of obtaining permission for subsequent uses of the data and to digitally record the interview, and served as a point of reassurance of participants (and their organisations) anonymity and the confidentiality of any information they might disclose.

The interviews began with a discussion of the current research study, offering participants an opportunity to ask any questions. The establishment of researcher-participant rapport was aided by informal discussion of the types of activities participants typically undertake, which also served to orientate the researcher within the domain. At Time$_1$ participants completed stages 1 and 2 of the ACTA techniques and provided a causal belief map for a second decision task for use in ‘convince me.’ Participants were permitted to select their own decision tasks for the focus of these methods. During stage 1 of the ACTA techniques participants were allowed to freely map an overview of their chosen task. During stage 2, the researcher recorded notes in a ‘knowledge audit’ table as a mechanism for ensuring accuracy with participants’ verbalisations. The researcher adopted a more facilitative role to the participant in providing guidance for the elicitation of their causal belief map for use in
Figure 5.1: Illustrated Data Collection and Analysis for Portfolio Manager (A)
‘convince me.’ Each interview was digitally recorded and lasted between 1 hour 30 minutes to 2 hours.

Data analysis: Applied cognitive task analysis (ACTA)
Following data collection, each interview was transcribed. This process took a total of 35 hours for the transcription of 3½ hours of interview data. The interviews for Portfolio Managers (A) and (B) were 14,570 and 8,361 words respectively. (The average of these interviews was 11,465 words). This resulted in the total analysis of 22,931 words as a basis of this preliminary work. See Appendix Five for an illustrative passage from Portfolio Manager (A)’s transcript.

Following transcription of the interviews, ‘task diagrams’ and ‘knowledge audit’ tables were created for each participant. This was a largely iterative process between the researcher’s notes, participants’ diagrams and the transcripts. The recursive nature of this analysis was to ensure technical accuracy in the representation of participants’ cognition. The construction of the ‘task diagrams’ and ‘knowledge audits’ took approximately 10 hours to complete per participant. The final point of this analysis, involved the content analysis of the data across stages 1 and 2 with the aim of establishing a number of common decision processes, which were then represented thematically. This aspect of the analysis took a further 12 hours to conduct.

Data analysis: ‘Convince me’ modelling
This analysis involved the conversion of the causal belief models generated at Time₁, into a form compatible with the ‘convince me’ cognitive architecture. Specifically, this required the extraction of hypotheses and statements of evidence from each causal belief model. The ‘convince me’ representations were complemented with additional data from the transcripts. This approach although not ideal, was adopted due to the limited time availability of participants. This recursive process of drawing upon participants’ causal belief maps and transcripts was a means of ensuring conceptual accuracy. Each ‘convince me’ model took an average of 24 hours to construct using this procedure.

Data collection Time₁: ‘Convince me’ ratings
Following the construction of the causal belief maps in ‘convince me,’ a ratings table for each participant was created. This typically took 1 hour per participant to construct. This table required the classification of each hypothesis and statement of evidence according to the type of information source and ratings of believability and reliability. Note that ratings of
reliability were only used for statements of evidence. The ratings tasks for each participant were then distributed via e-mail and were completed remotely at Time₂. This typically took 15-20 minutes to complete per participant.

Data analysis: ‘Convince me’ running the simulations
This final stage of data analysis involved feeding the ratings obtained at Time₂ into each ‘convince me’ model. The simulations produced a correlation per participant based upon the coherence of their arguments to ECHO’s activations. The period of data entry, running the simulations and adjusting the parameters typically took 30 minutes per participant.

5.3 Results
The results of this Preliminary Study are divided into two sections. The first documents the findings obtained using ACTA, using illustrative examples drawn from both participants. The second section outlines the results derived from the ‘convince me’ models.

5.3.1 Applied cognitive task analysis (ACTA)
The results derived from Stages 1 and 2 of ACTA are presented both for Portfolio Manager (A) and Portfolio Manager (B). Data obtained from the ‘knowledge audits’ (stage 2) is then synthesised, and presented thematically. Note that, data derived from the ‘knowledge audit’ is usually merged with knowledge elicited from ACTA’s ‘stage 3: simulation scenario.’ Given the access restrictions discussed earlier, stage 3 was not conducted.

Illustrative example 1: Portfolio Manager (A) (Branch Manager, Oxford)

Background demographics
Portfolio Manager (A) is 53 years old and holds 35 years of experience within the investment industry. He has spent twelve years in his current position, working for a leading UK stockbroker. Activities undertaken include stockbroker execution only and with advice activities and portfolio management. Portfolio Manager (A) has not received any training focusing upon decision-making during his time in the industry.

Stage 1: Task diagram
The ‘task diagram’ for Portfolio Manager (A) focuses upon the scenario of devising an investment scheme for a new client who holds cash, but no previous investments. Figure 5.2 (page 101) illustrates the ‘task diagram’ elicited by Portfolio Manager (A). The four broad stages are addressed in turn.
'Know your Client:' Gather Background Information → Construct a Risk Profile → Determine Purpose of Investment → Portfolio Construction

Figure 5.2: Illustrative Example 1: Task Diagram “New Client With Cash and No Previous Investments” (Portfolio Manager A)
The first stage, "know your client: gather background information" is concerned with understanding the financial position of the client. This leads on to a second stage namely, "construct a risk profile," whereby the objective is to establish the degree of risk the client is willing to take. The third stage entitled "determine purpose of investment" pertains to the clients' investment requirements i.e. capital growth, income growth or an intermediary stage (this is largely elicited from the client). The final stage of this 'task diagram' is "portfolio construction." This provides the basic framework from which Portfolio Manager (A) works.

The construction of an investment scheme for the client is guided not only by the amount of capital available for investment, but also the amount to be placed in a secure area, the total income required and consequently the amount remaining for growth. This broad framework then guides his choice in stocks, the format of which was documented as being based upon a simple enthusiasm for a particular set of stocks currently being monitored. In all, Portfolio Manager (A) monitors no more than approximately 100 different stocks. The stocks take the form of long-term monitoring and are summarised on a 'buying list,' whereby those felt to be over priced will be omitted from the list, or those in a stable continuing trend may be included. Populating the portfolio is a question of pulling together this basic knowledge.

The stage of "portfolio construction" is also facilitated by the existence of a number of pre-set portfolios i.e. international, income and growth portfolios are prepared by the in-firm research team and run by a committee. These are also used as a basis of idea generation. Within Portfolio Manager (A)'s firm, proprietary capital is directly invested into those. A final point of informational leverage during this stage comes from peer interaction. This may take the form of discretionary advice, collective investments or investment in individual stocks offered by peers. This has the benefit for Portfolio Manager (A) of drawing upon the knowledge base of peers working in collectives who have significantly closer relationships with Fund Managers than Portfolio Managers.

**Complex cognitive component**

Portfolio Manager (A) highlighted the stage of "portfolio construction" as requiring the most cognitively complex judgement and decisions and formed the basis of discussion during the 'knowledge audit.'

**Stage 2: Knowledge audit**

Table 5.1 (pages 103-104) provides a synopsis of Portfolio Manager (A)'s 'knowledge audit.' This analysis revealed a number of important aspects underpinning Portfolio
<table>
<thead>
<tr>
<th>Aspects of Expertise</th>
<th>Cues and Strategies</th>
<th>Why Difficult?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Past and Future</strong></td>
<td>Ensure existing stocks match current client requirements; assess balance between risk and reward; ensure portfolio diversity through a variety of shares and holdings; composition of portfolio: retain a portion in safe area to ensure there is always something liquid; research unfamiliar stocks.</td>
<td>Portfolio Managers have a limited frame of expertise and do not always have the necessary knowledge to apply to existing portfolios; clients may have shares that the novice is unfamiliar with; 'new' Portfolio Manager means a different angle on the portfolio and substantial changes to match their technical area; process of training client to see it from perspective of Portfolio Manager is difficult; client may be unwilling to sell existing shares upon advice; nature of expertise is difficult to communicate with clients who view investment as gambling; there is a natural completeness to each portfolio that is difficult to express.</td>
</tr>
<tr>
<td><strong>Big Picture</strong></td>
<td>Industry-specific journals; hard tracking of 100 stocks and specialising in 10-15 stocks from which clients investments would be placed; past experience; gauge if any 'holes' in portfolio exist based upon forecasts of performance; buy from overseas markets.</td>
<td>Novices may have a limited familiarity of worldwide markets; assimilation of information is an issue of organising and sifting; knowing what key aspects to take onboard.</td>
</tr>
<tr>
<td><strong>Noticing</strong></td>
<td>Under-performance of portfolio: identifying specific collectives that are problematic; acknowledging the point at which one's tunnel vision prevents portfolio resolution; recognising that a different perspective is required and seeking external expertise when appropriate; speak to internal research department in London; devise switch recommendations that cover the broad area of the failing funds.</td>
<td>Less experienced Portfolio Managers may not know when they have got tunnel vision and thus when to ask for help; older colleagues are more blinkered which makes it difficult to see the bigger picture or even specific pictures; narrowed focus of expertise.</td>
</tr>
<tr>
<td><strong>Tricks of the Trade</strong></td>
<td>Geo-political environment: Identify companies that fit your perception of the world; consider trends in developing world; look at organisations that supply and are going to meet the needs of emerging markets; assess whether there is going to be a demand that cannot be met which will lead to rising prices.</td>
<td>Novices may not have had the experience acquired by reading widely: may not understand that mainstream tabloids have particular axes to grind; limited range of resources available; narrow vision.</td>
</tr>
<tr>
<td>Aspects of Expertise</td>
<td>Cues and Strategies</td>
<td>Why Difficult?</td>
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<td>--------------------------------------</td>
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<tr>
<td><strong>Opportunities / Improvising</strong></td>
<td>Know task requirements e.g. of portfolio management; strategies are to do what comes naturally; cues are based upon what learnt.</td>
<td>Inability to access information; novices may find it difficult to hold vast amounts of general information that has accumulated over some time.</td>
</tr>
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<td>Management of client portfolio ‘at the drop of a hat’ with little preparation.</td>
<td></td>
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<tr>
<td><strong>Self-Monitoring</strong></td>
<td>Bear in mind proximity of deadline; techniques to ensure task completion include prioritisation, passing task onto other Portfolio Managers, seeking outside assistance and alternative methodologies.</td>
<td>Novices may not have knowledge of alternatives i.e. of laying it off against somebody else or against another way of approaching the deadline; client expectations of performance as a service industry.</td>
</tr>
<tr>
<td>Monitoring task deadline.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Anomalies</strong></td>
<td>Cues specific to portfolio include the limited growth of holdings (£ figures); external cues include competition / prospects; judge valuations of shares against others in the market; cues within organisation: what do to change it, advice from peers.</td>
<td>Less experience Portfolio Managers may have a narrow knowledge of markets; expertise may lie in one particular interest.</td>
</tr>
<tr>
<td>Under-performance of a client portfolio held in Trust e.g. under-performance of 3 funds; identifying holdings from general investment model portfolios that have ‘slipped through the net’ e.g. holdings that had not performed for multiple clients.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Equipment Difficulties</strong></td>
<td>Adaptation is important as the process is client-driven; knowledge of global markets e.g. vision of research centre does not extend to overseas markets such as Seven Sisters, US; acknowledge limitations of information sources and their angle e.g. central research base is UK focussed; comparison of relative valuations between two markets e.g. UK to alternative stocks in US; minimise uniformity.</td>
<td>Uniformity of portfolio is difficult to address if the organisational requirement is for stocks to be selected from a pre-determined list; expert systems are too mechanical and do not account for global markets; nature of organisation can constrain composition of portfolio as it is driven from centre vs. bottom up: requirement for a wide spread of knowledge; experience required to ‘go-against’ recommendations.</td>
</tr>
<tr>
<td>Central research base suggested purchase of a stock, whilst Investment Managers thought to be inappropriate advice; methodologies for constructing portfolios; e.g. some firms work with an approved list of stocks, which creates problem of widespread under-performance due to stock uniformity.</td>
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</tbody>
</table>
Managers’ expertise. Two of the most pertinent ones are outlined thus. First, under ‘past and future’ Portfolio Manager (A) drew attention to the sense of natural completeness that occurs within each portfolio following construction, which was described as inherently difficult to express. Probes used within the ‘knowledge audit’ suggested this intuitive expertise to be underscored by an understanding of the overall diversity of holdings within the portfolio and the balance between risk and reward. Second, Portfolio Manager (A) drew attention to the variety of methodologies employed to construct portfolios and the effect this has in constraining Portfolio Managers’ decision-making process. For instance, the use of ‘approved’ lists of stocks and ‘expert systems’ within some firms was deemed problematic in not only constraining Portfolio Managers choice, but producing a uniformity in stocks that could produce widespread under-performance. This can be viewed in more detail under the section ‘equipment difficulties.’

Illustrative example 2: Portfolio Manager (B) (Investment Manager Principal, Oxford)

Background demographics

Portfolio Manager (B) was 47 years old and had worked in the investment industry for 24 years. At the time of interviewing, Portfolio Manager (B) was working as an independent investment consultant, having set up his own investment firm. He had therefore been working in his current job for one and a quarter years. The principal activities undertaken were conveyed as private client portfolio management with a small proportion of trust, charity and small pension funds completed on a bespoke basis. Portfolio Manager (B) had received in-house decision-making training in the past.

Stage 1: Task diagram

The ‘task diagram’ for Portfolio Manager (B) is outlined in Figure 5.3 (page 106). The task of focus was the creation of a portfolio for a new client. Three stages comprise this task and are outlined thus. The first “establish whether client is appropriate for you,” necessitates an assessment of whether or not the services offered are appropriate for the client. Assuming the clients’ needs could be met, the second stage “agree on investment strategy,” would lead to a discussion and the establishment of a suitable investment remit. This will include an agreed strategy in terms of risk profile and the establishment of a benchmark against which the performance of the portfolio will be compared.

The final stage in this process “where go from here? sectors allocation,” concerns the population of the portfolio. Portfolio Manager (B) described how market conditions drove investment strategies, either by investing all of the cash available immediately or investing in
Establish Whether Client is Appropriate For You → Agree on Investment Strategy → Where Go From Here? Sectors Allocation

Figure 5.3: Illustrative Example 2: Task Diagram “Creation of a Portfolio For a New Client” (Portfolio Manager B)
stages in case there is an opportunity to invest at a lower level. With this judgement, comes a risk associated with the assessment of price optimality. The overall shaping of this stage is driven by decisions of sector and asset allocations for the client. This would typically include assessments of sectors that are perceived to be over-valued from which the clients' exposure will be weighted less, and the identification of under-valued sectors from which exposure will be increased. A similar process of over and under-weighting occurs at the stock level. Depending on the investment remit, the emphasis between sector and stock will vary. Finally, Portfolio Manager (B) takes reference from 3rd party research he completes, cues from the news and the market as to the most appropriate action to implement.

Complex cognitive component
Portfolio Manager (B) highlighted two areas as the most cognitively complex: (i) division of an investment strategy and (ii) sectors allocation. The justification for these was that if the macro asset allocation is incorrect at stage two the consequences hold for stage three i.e. if strategy dictates investment in bonds as opposed to equities, then if the equity market rises, no matter what action is taken, the portfolio is likely to under-perform. Alternatively, if the market declines and the portfolio is over-weighted, then that particular asset class would go into decline. Therefore, Portfolio Manager (B) chose the task of ‘asset allocation’ as the point of focus for the ‘knowledge audit.’

Stage 2: Knowledge audit
Table 5.2 (pages 108-109) provides a synopsis of Portfolio Manager (B)’s ‘knowledge audit.’ An overarching theme that emerged from Portfolio Manager (B)’s ‘knowledge audit’ was the importance of being aware of the state of markets and the global economy - this can be seen in the ‘past and future’ and ‘big picture’ aspects of expertise. For instance, understanding the evolution of a portfolio is driven by cues from the global environment such as market conditions. A second aspect of expertise raised by Portfolio Manager (B) related to the identification of stock market phenomenon before other investors. This is documented under the section ‘noticing.’ Broadening one’s viewpoint by reading widely and networking were identified as important processes for the identification of overlooked stocks. Portfolio Manager (B) therefore revealed the dichotomy that exists between experts’ limited frames of expertise and their need for a broad-level awareness of the global economy. The next section reconciles the data provided by the ‘knowledge audits’ using a thematic analysis.
<table>
<thead>
<tr>
<th>Aspects of Expertise</th>
<th>Cues and Strategies</th>
<th>Why Difficult?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Past and Future</strong></td>
<td>Print off evaluations to quickly track the history and identify current performance of new portfolios; understanding of current clients' portfolios is intuitive / driven by gut feeling; cues from global environment such as market conditions help quick recognition e.g. portfolio out-performance in current market conditions due to strong sectoral performance; rate performance relative to appropriate benchmark.</td>
<td>Novices may not know which sectors have performed well / poorly; they may not understand the asset allocations; they may find it difficult to identify appropriate benchmarks; they may lack the knowledge of how stocks and sectors are likely to behave i.e. understanding of stock market cycles and economic cycles; they may have difficulty envisaging cyclic repetition in markets.</td>
</tr>
<tr>
<td><strong>Big Picture</strong></td>
<td>Suitability of portfolio is marked by client agreement re: asset allocation; annual confirmation of strategy; direction of interest rates impacts economy; inflation reports; economic growth forecasts; company forecasts; 3rd party research; daily price sheets; financial news: hard copy and online.</td>
<td>Less experienced Portfolio Managers may not have the understanding of what drives the stock market; the superfluous amount of information available requires extensive sifting; knowing the appropriate resources to draw upon to establish the state of market and global economy; credibility and reliability of information sources is variable; experience is necessary to establish whether client’s requirements are changing.</td>
</tr>
<tr>
<td><strong>Noticing</strong></td>
<td>Reading widely is a window to hitting upon a stock ignored by the market; network and talk to people in order to utilise sources of ideas across multiple sectors to identify overlooked stocks; consider overlooked stock in detail.</td>
<td>Less experienced Portfolio Managers may not know where to read; may not have an established network of industry professionals that are required to provide different insights and ideas.</td>
</tr>
<tr>
<td><strong>Tricks of the Trade</strong></td>
<td>Cues include clients' capital to be invested e.g. in an under-valued small company; input specific parameters and then screen stock outputs e.g. price / earnings ratio &lt;x and a market capitalisation &lt;x; use past experience to identify problematic stocks and understand why they are low / overlooked; use 3rd party research.</td>
<td>Inexperienced Portfolio Managers may not know what parameters to set to screen stocks; interpretation of list of potential stocks calls upon experience; awareness of technical analyses to inform stock selection is required.</td>
</tr>
<tr>
<td>Aspects of Expertise</td>
<td>Cues and Strategies</td>
<td>Why Difficult?</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Opportunities / Improvising</strong></td>
<td>Ongoing process of monitoring stocks, shares and macro assets on a daily basis; systematically screening clients' portfolios are issues of time and interpretation, potential to ease workload with delivery in graphic format; adjust investment model or client portfolio in response to market changes in order to re-align with investment model; enhance performance monitoring with computerisation to monitor daily portfolio performance above or below trend; awareness of aspects that are inefficient / not working; strategies to ensure warning bells ring in advance; deviations from benchmarks.</td>
<td>The volume of work involved in monitoring all portfolios; knowing what financial news to look for and which will have a significant impact upon sectors and consequently portfolios; novices may find it difficult achieve an intricate understanding of the underlying portfolios; difficulty in bespoke portfolio management of making judgements for each portfolio unlike those in the industry who fit portfolios into templates.</td>
</tr>
<tr>
<td><strong>Self-Monitoring</strong></td>
<td>Extra responsibilities relative to available time; deal with workload before deadline approaches; monitor portfolio changes: vet them and change if necessary.</td>
<td>Less experienced Portfolio Managers may not know what workload is reasonable to cope with.</td>
</tr>
<tr>
<td><strong>Anomalies</strong></td>
<td>Substantial divergence in value of the portfolio from an earlier portfolio valuation; expectation for valuations to be similar from one period to the next.</td>
<td>It is difficult for novices because an awareness of wider market changes is required; need to be critical of figures e.g. market movement of 5% and portfolio evaluation movement of 25% - ask why portfolio moved by 25%.</td>
</tr>
<tr>
<td><strong>Equipment Difficulties</strong></td>
<td>Verify factors in relation to company news and investment research; check fundamentals in relation to fund; strategy: dig deeper to establish causality.</td>
<td>It is difficult to know what questions to ask when faced with an anomaly; difficulty of identifying relevant sources to understand cause; experience tells you that the information is not sufficient upon which judgements are based; it is a combination of both experience and knowing what to do.</td>
</tr>
</tbody>
</table>
ACTA: Thematic analysis

Whilst the data derived from the ‘knowledge audits’ (Tables 5.1 and 5.2) provide useful illustrations of task-specific expertise, a number of common elements of expertise used by the Portfolio Managers can be extracted. Note that data derived from the ‘knowledge audit’ is usually merged with knowledge elicited from ACTA’s ‘stage 3: simulation scenario’ from which a ‘cognitive demands’ table is compiled. Given the access and time constraints within this study, stage 3 was not conducted. The relative merits of producing a ‘cognitive demands’ table in addition to the ‘knowledge audits’ was unclear and therefore a thematic approach to data reconciliation was adopted.

**Story-building:** The ability to quickly fashion together cues to create a logical ‘story’ based upon previous experience or future projections upon which to ground a decision e.g. understanding the evolution of a new clients’ portfolio.

**Reconciliation of the global environment with micro-level activity:** Portfolio Managers have the relevant expertise to reconcile activity in the global market, economy and political environment with the micro-level of stocks and shares e.g. cues from market conditions aid recognition of portfolio out-performance due to strong performance in mining sector for example.

**Natural completeness:** There is an emergent natural completeness to portfolios, which is difficult to express to clients e.g. how asset allocation and its associated risk ‘coheres’ across sectors as a whole.

**Expectancies:** Projecting future states based upon past experience and expertise e.g. envisaging cyclic repetition of stock market cycles.

**Price/Earnings (P/E) Ratio:** Valuation ratios such as P/E are used to establish a company’s current share price compared to its per-share earnings. ‘Rules of thumb’ such as these can be used to quickly establish the potential value in a selected stock e.g. estimating projected P/E for a given stock or share in the next year.

**Recognition:** This aspect characterises the ability to quickly identify relevant aspects of a given task e.g. identifying under-performance within a portfolio.

**Analogy:** Portfolio Managers are looking to identify stock market phenomenon before other investors and achieve this by reasoning by analogy e.g. when a cheap stock has been identified in an unfamiliar sector, the situation may be evaluated against a comparable situation in another more familiar sector.
Limited frame of expertise: Portfolio Managers have a limited knowledge of stocks trading on the current market (typically 10-15) and as a consequence do not always have the knowledge to apply to existing portfolios e.g. unfamiliarity of stocks within a new clients’ portfolio.

Relevant cues: The ability to know what constitute relevant cues e.g. identifying weaknesses in expert systems stock projections.

Seeking information: Knowing when to seek additional information and how to assess the reliability and credibility of information sources e.g. reading widely to hit upon a stock ignored by rest of market.

Past experience: The ability to draw upon past experiences to inform current decisions e.g. uniformity in sector allocation runs the risk of overall portfolio under-performance if sector takes a downturn.

5.3.2 ‘Convince me’

Using the computational architecture ‘convince me,’ two models were constructed based upon the causal belief maps of participants, as illustrated below.

Illustrative example 1: Portfolio Manager (A) (Branch Manager, Oxford)

Descriptive overview

Figure 5.4 (page 112) illustrates the causal belief map for Portfolio Manager (A) for the decision task of a stock purchase in the developing world. This decision specifically focused upon the purchase of a ‘Porterage and Lighterage’ stock that was under-valued relative to its intrinsic worth. It was envisaged that by forming a component of a client’s investment portfolio (under construction at the time of interview), the stock would add value in the medium to long-term. Figure 5.5 (page 113) provides an example of the specific hypotheses and statements of evidence used during this decision task and their explanatory and contradictory inter-relations.

The investment rationale is summarised as follows: It was observed during the long-term tracking of the stock over a 20-year period, that the stock had reached an all-time low of 60p. The decreasing value in the share price was attributed to the existence of a seller in the market place. On this conviction, Portfolio Manager (A) employed a number of heuristics to make sense of the existing state of valuation. For instance, explicit reference was made to the seminal work of Benjamin Graham on the conviction that the “net asset value > share price.”
Figure 5.4: Illustrative Example 1: ‘Convince Me’ Diagram “Stock Purchase in the Developing World” (Portfolio Manager A)
<table>
<thead>
<tr>
<th>Label</th>
<th>Hypotheses</th>
<th>You</th>
<th>ECHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Top shares in developing world have good growth prospects</td>
<td>5</td>
<td>7.7</td>
</tr>
<tr>
<td>H2</td>
<td>Growth in developing world may be happening by chance</td>
<td>5</td>
<td>7.2</td>
</tr>
<tr>
<td>H3</td>
<td>Stock will provide capital gains</td>
<td>5</td>
<td>7.2</td>
</tr>
<tr>
<td>H4</td>
<td>Stock will provide income gains</td>
<td>6</td>
<td>8.5</td>
</tr>
<tr>
<td>H5</td>
<td>Growth in Portage and Lighterage stocks is likely</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>H6</td>
<td>Portage and Lighterage stocks are unlikely to substantially drop in value</td>
<td>6</td>
<td>6.6</td>
</tr>
<tr>
<td>H7</td>
<td>Political stability is likely to remain</td>
<td>9</td>
<td>7.0</td>
</tr>
<tr>
<td>H8</td>
<td>Corporate responsibility is want managed</td>
<td>7</td>
<td>7.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Label</th>
<th>Data</th>
<th>You</th>
<th>ECHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>PM equals a yield of 7%</td>
<td>9</td>
<td>7.6</td>
</tr>
<tr>
<td>E2</td>
<td>Corporate responsibility is successfully managed in the UK.</td>
<td>5</td>
<td>7.6</td>
</tr>
<tr>
<td>E3</td>
<td>Net asset value of Portage and Lighterage is greater than share price</td>
<td>9</td>
<td>7.9</td>
</tr>
<tr>
<td>E4</td>
<td>Benjamin Graham principle: if net asset value + share price then buy</td>
<td>7</td>
<td>8.0</td>
</tr>
<tr>
<td>E5</td>
<td>Country is geographically close to U.S.</td>
<td>7</td>
<td>7.8</td>
</tr>
<tr>
<td>E6</td>
<td>Stock reached low (30 days) of 60%</td>
<td>5</td>
<td>7.9</td>
</tr>
<tr>
<td>E7</td>
<td>Stock traded for 20 years</td>
<td>9</td>
<td>7.7</td>
</tr>
<tr>
<td>E8</td>
<td>Performance ahead of other comparable companies</td>
<td>5</td>
<td>7.9</td>
</tr>
<tr>
<td>E9</td>
<td>Stock traded relatively similar to another company</td>
<td>5</td>
<td>7.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Explanations</th>
<th>Hypotheses</th>
<th>You</th>
<th>ECHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>H12 explains H1</td>
<td>H11, H12 explains H12</td>
<td>9</td>
<td>7.6</td>
</tr>
<tr>
<td>H12 explains H17</td>
<td>H12 explains H17</td>
<td>5</td>
<td>7.6</td>
</tr>
<tr>
<td>H1 explains H17</td>
<td>H1 explains H17</td>
<td>5</td>
<td>7.6</td>
</tr>
<tr>
<td>H9 explains H17</td>
<td>H9 explains H17</td>
<td>9</td>
<td>7.9</td>
</tr>
<tr>
<td>E9 explains H8</td>
<td>E9 explains H8</td>
<td>7</td>
<td>7.8</td>
</tr>
<tr>
<td>H16 explains H17</td>
<td>H16 explains H17</td>
<td>5</td>
<td>7.9</td>
</tr>
<tr>
<td>H5 explains H17</td>
<td>H5 explains H17</td>
<td>9</td>
<td>7.7</td>
</tr>
<tr>
<td>E15 explains H17</td>
<td>E15 explains H17</td>
<td>5</td>
<td>7.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contradictions</th>
<th>Hypotheses</th>
<th>You</th>
<th>ECHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2 contradicts H17</td>
<td>H2 contradicts H17</td>
<td>5</td>
<td>7.6</td>
</tr>
<tr>
<td>H1 contradicts H2</td>
<td>H1 contradicts H2</td>
<td>5</td>
<td>7.6</td>
</tr>
<tr>
<td>H1 contradicts H10</td>
<td>H1 contradicts H10</td>
<td>5</td>
<td>7.6</td>
</tr>
<tr>
<td>E13 contradicts H11</td>
<td>E13 contradicts H11</td>
<td>5</td>
<td>7.9</td>
</tr>
<tr>
<td>H5 contradicts H6</td>
<td>H5 contradicts H6</td>
<td>5</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Figure 5.5: Illustrative Example 1: ‘Convince Me’ Text “Stock Purchase in the Developing World” (Portfolio Manager A)
This was complemented by measures of P/E (Prices / Earnings), which suggested a 7% yield and subsequent analyses that suggested the potential for capital and income gains.

Whilst, there is undoubtedly a quantitative undertone to the valuation estimations, Portfolio Manager (A)'s decision-making was also complemented by a number of qualitative beliefs that sought to reconcile the micro view of stock with global-level activities in the developing world. For example, this included beliefs regarding the nature of economic growth, the management of the economy, the amenability of Brazilian demographics to growth and political stability within Brazil. Portfolio Manager (A)'s causal belief map also made reference to past experiences by way of the observed trends in the re-location of large corporations' business within developing countries, and suggested that whilst the share price was about half the price of comparable others within the rest of the market, performance was ahead of its competitors.

Figure 5.5 (page 113) also provides a comparative example of the belief ratings of Portfolio Manager (A) vs. ECHO's activations. The degree of overall correlation is addressed in the final section of this analysis.

Illustrative example 2: Portfolio Manager (B) (Investment Manager Principal, Oxford)

Descriptive overview

Figure 5.6 (page 115) displays Portfolio Manager (B)'s causal belief map for the 'Decision not to invest in equities.' Portfolio Manager (B)'s causal belief map was based upon the decision not to invest a clients' self-invested personal pension in the equity market. This was underpinned by the fundamental assertion that the higher investment returns (of the nature and in the range requested by the client) would not be achieved by simply tracking the equity market. Figure 5.7 (page 116) provides an example of the specific hypotheses and statements of evidence used.

The decision process is summated as follows: The client has £50k to invest into a pension fund (with no further contributions) which he/she wishes to draw in 18 years time at retirement. The client is risk adverse and during retirement is seeking £50k per annum in "today's money." Portfolio Manager (B) calculates that the required compound annual growth required to meet the client's pension needs to be 11%. Given that industry figures support average annual returns from equity portfolios of 8%, in low inflation environments, the required annual growth (11%) is unlikely to be consistently met through equity investments.
Figure 5.6: Illustrative Example 2: 'Convince Me' Diagram “Decision Not to Invest in Equities” (Portfolio Manager B)
Once the feasibility of achieving the clients' objectives within his/her risk remit had been ascertained, a number of expectancies for potential courses of action were generated. It was proposed that the required returns could be achieved through: (i) a change in investment strategy, (ii) a modification of risk behaviour (iii) further contributions to fund over 2-3 years or (iv) the amendment of pension expectancies.

Relative to the decision activities of Portfolio Manager (A), the decision to advise the client against investing in the equity market was formed on the basis of general assumptions regarding market conditions. Such an example is the belief that the equity market will behave as expected i.e. it will generate returns in the region of 8%. Furthermore, Portfolio Manager (B)'s causal belief map was shaped by a number of contrarian beliefs surrounding the nature of inflation i.e. that inflation is higher than the official statistics. Despite predicting that inflation is likely to increase and will approximate 3% for next 18 years, Portfolio Manager (B) uses the statistic of 2% - 2.2% in a strategic bid to over-deliver in projections. These contradictory assertions are denoted in Figure 5.6 (page 115) by dashed red arcs between the nodes.

**ECHO vs. Portfolio Manager's ratings**

The default parameters adopted from 'convince me' were used for both initial runs of the simulations. Default parameters were set as follows: an inhibition (contradiction) weight of 60, an excitation (explanation) weight of 30, a data priority weight of 55 and a scepticism weight of 40. Running the simulation using these parameters revealed a correlation of $r = 0.5$ between Portfolio Manager (A)'s causal belief system and ECHO's activations. The simulation for Portfolio Manager (B) required several iterations and a modification of the parameters in order to achieve the most coherence between ECHO and the causal belief system. The resultant correlation was $r = -0.04$ which was based on a inhibition (contradiction) weight of 30, an excitation (explanation) weight of 60, a data priority weight of 25 and a scepticism weight of 10. The resultant change in parameters had the effect of giving more weight to explanations relative to contradictions. Appendix Six provides an illustrative log of the 'convince me' output for Portfolio Manager (A). Table 5.3 (page 118) summarises the correlations.
Table 5.3: Correlations Between ECHO’s Activations and Portfolio Managers’ Causal Belief Maps

<table>
<thead>
<tr>
<th>Portfolio Manager</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Manager (A)</td>
<td>0.50</td>
</tr>
<tr>
<td>Portfolio Manager (B)</td>
<td>-0.04</td>
</tr>
</tbody>
</table>
5.4 Discussion

The underlying objective of this Preliminary Study was to begin to understand the practical potential of methodological cross-fertilisation between the fields of NDM and managerial cognition. In light of this objective, the discussion is organised accordingly. First, it opens with review of the results derived from ACTA and `convince me' and examines their utility as points for methodological exchange. The value of a mixed-methods approach is also reflected upon, through which the convergence in findings across ACTA and `convince me' are identified. The difficulties encountered accessing expertise are also highlighted, before closing with a series of considerations for future study and a summary of the central contributions to knowledge this Preliminary Study has generated.

5.4.1 Applied cognitive task analysis (ACTA)

The ACTA techniques exhibited a good degree of success across both participants in examining their decision activities. The depth of cognitive data extracted is by virtue of ACTA's systematic and highly structured approach to elicitation. Note that for the purposes of this Preliminary Study it was deemed more important to complete a test of the ACTA method and not ACTA's analysis. Although a 'cognitive demands' table was not completed, the thematic approach to the analysis was informative in furthering understanding of the Portfolio Managers' decision-making and useful for collaborating information across participants.

From this Preliminary Study eleven elements were identified that underpinned the decision-making expertise of the Portfolio Managers under consideration. Interpretation of the ACTA data suggests the elements to be underscored by a common concern for sense-making and the achievement of coherence. The nested form that structures these themes is described below.

Level one: Creating logical stories through coherence
The first level, focuses upon the higher-order level processes of 'story-building,' and 'natural completeness.' This creation of logical 'stories' and the assessment of the natural coherence of arguments serve as an implicit mode for Portfolio Managers to evaluate the plausibility of decision choices.

Level two: Reconciling global environment and micro-level activity
The second level, proposes that these higher-order processes are achieved through the 'reconciliation of the global environment with micro-level activity,' the use of 'analogy' and
finally, the generation of 'expectancies.' The first of these processes is integral to the work of Portfolio Managers in reconciling activity in global markets with the micro-level of stocks. Whilst the use of 'analogy' and 'expectancies' directly feed into level one processes (i.e. story-building, and 'natural completeness'), they are integral in the process of reconciling the global environment with micro-level activity. Thus, whilst these elements cluster thematically, their nested nature represents their interaction across all three levels.

Level three: Micro-level practices and conventions
Finally, level three represents the decision-making expertise of Portfolio Managers at an increasingly finite level of analysis. Here elements are clustered according to the micro practices and conventions that mark Portfolio Managers’ expertise. Examples include the use of the 'price/earnings (P/E) ratio' as a heuristic in order to make sense of the potential value of a particular stock and the 'limited frame of expertise' to ensure in-depth knowledge and long-term tracking of a small proportion of sector-specific stocks. This level also acknowledges a number of processes that operate at a more micro level such as 'seeking information' and 'recognition' in the identification of 'relevant cues.'

On a theoretical note, it is interesting to highlight that many of the elements of the Portfolio Managers’ expertise were analogous to the descriptive representations developed by NDM. For instance, the higher-order level process of 'story-building' echoes the theoretical conjectures of the RPD model (Klein, 1989), Klein, Moon and Hoffman’s (2006b) recent theory of sense-making and the processes underpinning image theory (Beach, 1990). The notion of an emergent 'natural completeness' that characterises the sector allocation of portfolios also draws parallels to Montgomery’s (1983, 1989) dominance search model and the process of dominance-structuring (See Chapter Six). Future study might therefore take stock of these theoretical parallels as a basis for progressing understanding further.

As outlined above, use of the ACTA techniques have afforded considerable insight into the decision-making expertise of Portfolio Managers. The ACTA techniques have also shown potential in addressing the problem of employing structured approaches for the elicitation and representation of cognition that also permit cognitive heterogeneity, as faced by managerial cognition researchers. The systematic approach of Militello, Hutton and Miller (1997) has suggested utility as a guide in eliciting and representing knowledge without the unnecessary constraint of pre-determined constructs. As this Preliminary Study demonstrates, Portfolio Managers may utilise different tasks during the ACTA interview.
whilst not sacrificing the comparability of cognitive processes and strategies between experts.

The second challenge to be addressed pertained to the tendency of research at the interface of BDM and managerial cognition to downplay the role of the environment in which decision-making is situated. By complementing the study of managerial cognition with methods derived from NDM it was envisaged that the situated nature of cognition would be better understood. This objective has been partially fulfilled within this study by providing insight into the task-bound elements of Portfolio Managers' expertise. This task-focus however, neglects the socially situated aspects of Portfolio Managers' decision-making.

5.4.2 'Convince me'

The piloting of the connectionist architecture 'convince me' was met with varied success with the existence of the correlations $r = 0.5$ and $r = -0.04$. The correlation $r = 0.5$ implies a 'moderate degree of coherence,' and was accordingly in the range expected for a method that was being piloted. However, the correlation of $r = -0.04$ produced quite disparate results, suggesting Portfolio Manager (B)'s ratings to be 'mildly opposed' to ECHO's activations. A number of reasons attributed towards the cause of this disparity shape this discussion:

(i) The decision rationale and consequential coherence of beliefs were not represented accurately

(ii) The concept of coherence is an inappropriate framework for representing and modelling Portfolio Managers' decision-making

Through a process of 'trial and error' running altered simulations of this data and iterative referencing back to the original interview transcript, it was found that Portfolio Manager (B)'s ratings were the principal source of the problem. Statements of evidence and hypotheses that had given the appearance during the interview of being strongly believed had since been weighted differentially, providing confirmation of this problem. As such, the rationale and consequential coherence of beliefs underpinning the decision were not represented accurately i.e. the contrarian view (the adoption of contrary positions to the prevailing crowd's view as depicted by his beliefs surrounding inflation) led to a high number of contradictory relations to the 'perceived industry wisdom' and an under-representation of his own beliefs in the causal belief map. Given the relative success of Portfolio Manager (A)'s modelling in 'convince me,' which was founded on principles derived from TEC, the author therefore considered (i) to be the most likely conclusion.
Discussion with both the Portfolio Managers and a number of insights on behalf of the researcher suggested 3 potential causes of this disparity:

(i) Decay in recall: Time frame between elicitation of causal belief map (Time₁) and the ratings task (Time₂)
(ii) Dynamic nature of the investment industry: The character of the causal belief system had changed in the intervening period (Time₁ - Time₂)
(iii) Decision Structure: Ill-structured nature of Portfolio Managers’ decision tasks makes it difficult to express beliefs

The first potential cause relates to the delay in completion of the ratings relative to the elicitation of the causal belief map. Whilst, the elicitation of hypotheses and statements of evidence and ratings had been attempted at Time₁, this had been met with limited success, as when the transcripts were analysed it was noticed that significant omissions had occurred. It was deemed best practice for the researcher to extract the hypotheses and statements of evidence from the transcripts and ask the Portfolio Managers to complete the ratings remotely with the necessary instructions via e-mail. This proved problematic in that because this extra activity had not been formally agreed it did not get completed close to Time₂, typically occurring 4-5 weeks after the interview. Whilst, this had the effect of producing an in-depth model it proved problematic obtaining the ratings remotely. The effect of delay between the activities at Time₁ and Time₂ may have led to decay in recall of the key arguments underpinning the Portfolio Manager (B)’s causal belief model.

The second potential explanation for the disparity between the interview transcript and the ratings at Time₂ relates to the nature of the investment industry. During correspondence Portfolio Manager (A) commented that there had been significant changes in the price of the stock of concern in that period (to the extent that clients had lost 1/3rd of the value of their shares). This appeared to impact quite strongly upon Portfolio Manager (A)’s ability to rate his beliefs, as the foundations and justifications of his arguments had quite clearly changed. The same was true of Portfolio Manager (B). At the time of initial interview (Time₁) the description of the decisions surrounding the client with a self-invested personal pension was described as ‘work in progress’ and therefore key aspects of the underlying causal belief system may have been subject to change.

The final contributing factor to the emergent disparity lies in the ill-structured nature of Portfolio Managers’ decision tasks. This makes it particularly difficult to express beliefs and is accentuated by the unclear boundaries of the task and the variety of impacting variables.
from local (e.g. client) and global environments (e.g. economic markets). This makes it particularly difficult to express beliefs. It therefore, may have been the level of expressiveness that contributed towards a misunderstanding of the causal relations during the interview at Time1. It is likely that it is a complex interaction of all three of the proposed causes that have produced the poor coherence between ECHO and the causal belief system of Portfolio Manager (B).

Despite the aforementioned methodological and procedural difficulties, a number of significant insights were obtained from this method. The first is particularly important for the argument that the study of Portfolio Managers’ decision-making could benefit from a naturalistic approach. The supposition that the nature of the causal belief system had changed in the intervening period is fitting with the characteristics of the NDM perspective i.e. that the decision environment is one that is dynamic and uncertain.

The second point to be made emerged during the interview with Portfolio Manager (A) and was concerned with his retrospective communication of the task. Through verbal protocols Portfolio Manager (A) described the process by which he would select stocks, by first focusing upon the conditions in the global environment and using this to reduce down to an appropriate stock. Following the interview it was explained that in fact in reality, the process would begin with a stock that was being monitored until the global conditions fitted and made it appropriate to purchase. This reconstruction has obvious parallels to the process of story-building that is drawn upon in NDM and demonstrates (i) the obvious parallels that exist between NDM and the decision-making of Portfolio Managers, (ii) the utility of complementing naturalistic approaches with formal modelling procedures and (iii) the inappropriateness of the quantitative-qualitative divide in NDM research. In terms of meeting NDM’s goal for theoretical refutation the value of the ‘convince me’ architecture is inconclusive, and warrants further attention.

This Preliminary Study has also demonstrated how the strength of causal beliefs may be incorporated into models of managerial cognition and has made tentative suggestions of how the problem of representing and comparing causal maps without proximal similarity / dissimilarity relations may be overcome by drawing upon ‘convince me’ and its correlation between theory (i.e. ECHO’s propositions) and the beliefs underpinning decision behaviour (i.e. participants ratings). Whether the intersection of computational-interpretative thinking can be captured through the use of connectionist architectures is at best debatable given the mixed correlations, and remains to be ascertained.
5.4.3 Points of convergence: ACTA and ‘convince me’

The utility of the mixed-methods approach adopted within this study is addressed through consideration of the parallels that exist between the ‘convince me’ models and the earlier ACTA thematic analysis, to which the focus now turns.

Portfolio Manager (A)’s ‘convince me’ model displayed a high degree of similarity to the elements elicited from ACTA. Qualitative review of the content of Portfolio Manager (A)’s causal belief map suggests for example, coherence to be achieved through the ‘reconciliation of the global environment with micro-level activity’ i.e. that growth in the stocks under consideration is likely given the growth observed in the developing world. Portfolio Manager (A) also used the ‘price/earnings (P/E) ratio’ as a means of making sense of the valuation of stocks and drew upon ‘past experience’ documenting the Chinese links to Western Australia as created by their need for iron ore as analogous to the demands of the Brazilian marketplace. A final example, ‘relevant cues’ i.e. the fact that the stock had reached a low (to date) of 60p, demonstrates the linkage between the elements elicited from ACTA and the nature of causal beliefs shaping the in ‘convince me.’

Portfolio Manager (B)’s causal belief map also drew strong links to the elements raised in the earlier thematic analysis. Specifically, these included ‘expectancies’ i.e. the belief that higher income returns will not be achieved by tracking the market and the ‘reconciliation of the global environment with micro-level activity’ i.e. a return of 8% from equity portfolios is likely in a low inflation environment. Whilst the elements of ‘story-building’ and ‘natural completeness’ remained implicit within the causal belief models, the content of Portfolio Manager (B)’s model was marked by strong arguments against the mainstream perspectives of the investment industry. Although the concomitant model built a story-like representation of these views, failure to adequately emphasise his beliefs in relation to this led to a high number of contradictory arguments and a consequential lower degree of overall coherence.

This approach to data interpretation has emphasised the centrality of the concepts of sense-making and coherence to understanding the nature of Portfolio Managers’ decision-making. As such, this provides evidence for the value of employing mixed-methods research designs for the study of cognition.

5.4.4 Difficulties encountered: Accessing expertise

This study revealed a number of problems inherent in accessing expertise. The central difficulty experienced concerned the problem of establishing relations with relevant
professionals within the investment industry. Few Portfolio Managers were willing to commit the necessary time to participate in this study, due to the time-demands imposed by their own business. Even in the event of participatory agreement being established there were still difficulties of negotiating a suitable time period in which to complete the research. One method to circumvent these difficulties would be to present the opportunity to conduct the research at the end of the working day or during ‘quiet periods,’ in order to minimise the impact upon their day-to-day activities.

A second problem to emerge related specifically to the use of the ACTA techniques. As the interviews progressed there appeared to be a distinctive weakening in the depth of participants’ responses (See Tables 5.1 and 5.2). This can be attributed to participant fatigue and should be borne in mind in future studies utilising this technique.

A final point to highlight regarding the use of the ACTA techniques, is that some of the probes used during the ‘knowledge audit’ were not always appropriate such as ‘improvising / self-monitoring.’ ‘Tricks of the trade’ also appeared to be initially misunderstood and viewed as somewhat patronising to their field of expertise. In future, better terms might be used to characterise these probes or these aspects omitted from the interview.

Note that the difficulties of accessing expertise in relation to (i) the accurate representation of cognition, (ii) decay in recall (iii) dynamic nature of the investment industry and (iv) ill-structured nature of decision tasks, in ‘convince me’ have already been extensively reviewed.

5.4.5 Recommendations for the future
Building upon this preliminary research, it may be fruitful to: (i) conduct a second, more comprehensive examination of ‘convince me’ in order to establish the utility of the method in light of the varied correlations that emerged from this study and (ii) examine the merits of producing a ‘cognitive demands’ table within the ACTA method. Both of these avenues for future study will be useful in informing the research questions shaping this preliminary work. This critical evaluation of data and methods also identified a number of weaknesses, which might also be used as points for orientating future work:

ACTA: Fatigue and ‘knowledge audit’ prompts
This preliminary research has highlighted the need to be aware of the performance of participants and in the event of participant fatigue provide a reasonable break before the
interview process is resumed. It has also highlighted the need to ensure that prompts used during ‘stage 2: knowledge audit’ that are less appropriate for the investment industry are tentatively posed during interviews.

‘Convince me:’ Reduce time period between Time₁ and Time₂.
A number of possibilities exist that can reduce time period between the elicitation of the causal belief map and the collection of ratings. This can be achieved by arranging at the time of recruitment a second interview within a 1-3 day period from which the researcher can extract the necessary information before re-convening for the elicitation of ratings at Time₂. Alternatively, ‘convince me’ could be used as tool from which the investment professionals interact directly, completing all tasks at Time₁. In future it would thus be both advantageous and best practice to be explicit about this requirement at the time of recruitment.

Interpretative phenomenological analysis (IPA)
The wealth of data generated during the interviews lead to a substantial amount of information regarding Portfolio Managers’ expertise being omitted. This was a particular concern because the interview transcripts revealed the socially situated aspects of Portfolio Managers’ decision-making, of which only elements could be integrated into the ACTA and ‘convince me’ analyses. For instance, it was not feasible to include adequate discussion of the social interactions that occur between team members and shape decision processes in either ACTA or ‘convince me.’ Thus, understanding the broader context within which Portfolio Manager’s practices reside might be informative in providing a more holistic account of their expertise. Therefore it may be of value in future studies to complement main data collection methods with an interpretative phenomenological analysis (IPA) that draws attention to the more socially embedded aspects of cognition.

5.5 Concluding Remarks
In response to the call within the social sciences for greater integration in the psychological analysis of cognition in organisations, this study has illustrated potential to exist in the cross-fertilisation of methods across NDM and managerial cognition. Specifically, the thematic analysis of ACTA and data derived from ‘convince me’ have both contributed towards addressing the appropriateness of epistemological-methodological debates that have permeated these fields and expressed utility in a rudimentary understanding of how the concepts of sense-making and coherence are implicated within Portfolio Managers’ decision-making. The promise associated with this preliminary examination has provided a tentative platform as to how future methodological exchange might progress.
6.1 Introduction

This chapter seeks to build upon the Preliminary Study of Chapter Five, in which the promise of cross-fertilisation between NDM and managerial cognition was examined. In line with this aim, this next chapter seeks to develop this methodological agenda by exploring the utility of ‘convince me’ in more depth.

This chapter begins with a summary of the key issues to be explored in a way that systematically develops the findings reported in Chapter Five. In light of these issues, Montgomery’s (1989) dominance search model is outlined, as is the choice in Fund Managers as the loci of investigation and the justification for the application of a situated approach using interpretative phenomenological analysis (IPA). The second section of this chapter moves on to discuss details of the design and method shaping this study before reviewing the results from both ‘convince me’ and IPA. The chapter concludes with a discussion of the implications of the results for theory and practice, the limitations of this work and considers possible directions for future study.

6.1.1 Key issues explored

The key issues to be addressed in this study largely echoes those of Chapter Five:

- To examine the degree to which inter-disciplinary collaboration might address the methodological challenges associated with NDM and managerial cognition
- To understand the benefits of studying Fund Managers’ decision-making from NDM a perspective

Given the variable success of the ‘convince me’ models developed in the Preliminary Study, the true utility of the method was intrinsically difficult to judge. This study therefore sought to rectify this issue through a more comprehensive examination. Similarly, the task-focus of the ACTA techniques did not provide the socially situated insights anticipated, and as such...
this study complements ‘convince me’ with an IPA. In addressing these issues, this chapter is marked by the following research questions:

(i) Can the contextually bound study of NDM draw value from formal modelling applications?
(ii) Are connectionist architectures able to provide NDM with a basis for theoretical refutation?
(iii) Can the quantitative-qualitative divide in NDM research be addressed using connectionist architectures?
(iv) How if at all, can the intersection of computational-interpretative thinking be captured through the use of connectionist architectures?
(v) How if at all, can connectionist architectures (a) integrate the strengths of causal beliefs into maps and (b) represent and compare causal belief maps without proximal measures of similarity / dissimilarity?
(vi) What NDM and managerial cognition can draw value from understanding the situated nature of cognition i.e. through IPA?

Note that one final parallel drawn from Chapter Five to the current study pertains to the congruence of decision elements to the principles of dominance search. The author’s choice of dominance search theory as a backdrop for this work is defended below.

6.1.2 Dominance search theory
Dominance search is one type of NDM theory (See Chapter Two - page 18 to view others alongside RPD) and is introduced to appropriately add depth to understanding of Fund Managers’ decision-making.

Montgomery’s (1989) dominance search theory is a prescriptive theory of NDM, where the decision process is conceptualised as a search for a dominant structure denoted by high-quality arguments. A dominance structure is broadly defined as “…a cognitive structure in which one alternative can be seen to be dominant over the others” (Montgomery, 1989: p.23). As can be viewed in Figure 6.1 (overleaf), the search for dominance structure is marked by four key phases - an overview of each is provided in Figure 6.2 (page 130).

The appropriateness of dominance search
The rationale for introducing the dominance search model as a theoretical framework for this study, is informed by two lines of reasoning:
Start

Pre-editing
Selecting and evaluating attributes

Screening

Is it possible to find a new promising alternative within current representation?

Yes

Finding a promising alternative

Dominance testing of promising alternative

No

Give up or postpone decision

Is it worthwhile to continue the decision process?

Yes

Violations of dominance found?

No

All relevant information evaluated?

Yes

Dominance structuring

De-emphasising
Bolstering
Cancellation
Collapsing

Violation eliminated or neutralized?

No

Yes

Decision

Figure 6.1: Dominance Search Model (Montgomery, 1989)
Phase 1: Pre-Editing
- Pre-editing is characterised by the selection of alternatives and attributes viewed as integral to the representation of the decision space
- Depending upon the importance assigned, specific attributes are selected or discarded
- Those alternatives that display a low likelihood of becoming a part of the dominant structure are discarded

Phase 2: Finding a Promising Alternative
- This phase is marked by the objective of finding an alternative that is reasonably likely to emerge as dominant in relation to other alternatives
- A promising alternative is defined as one that is more attractive than the other alternatives on an important attribute
- By the end of this stage, the search for dominance will be partially satisfied in that the selected alternative is more desirable than the others on at least one attribute

Phase 3: Dominance-Testing
- During this phase, decision-makers conduct a test of whether the selected alternative is more dominant in comparison to other alternatives
- Attention is focused upon establishing whether the selected alternative has any foreseeable disadvantages via: (i) direct comparison in relation to the available alternatives and/or (ii) comparison of the selected alternative to criterion values on different attributes
- In the event that the promising alternative is found to be dominant, this alternative is selected and the decision process is complete

Phase 4: Dominance-Structuring
- In the event that the selected alternative contravenes a dominance structure, information is restructured in order to achieve a dominance structure
- 4 mechanisms by which decision-makers attempt to counter-balance the weaknesses of the selected alternative:
  (i) De-emphasising (i.e. De-emphasising may also involve comparison of a specific attribute of the alternative to other alternatives)
  (ii) Bolstering (i.e. Enhancing the importance of an aspect by ‘bolstering’ the advantages of a promising alternative or disadvantages of non-promising alternatives)
  (iii) Cancellation (i.e. This process is used as a means of counter-balancing a disadvantage by relating it to an advantage that has some natural connection to the disadvantage in question. This mechanism is denoted by a natural trade-off relationship)
  (iv) Collapsing (i.e. Two or more attributes are collapsed into one more comprehensive attribute)

Figure 6.2: Description of Dominance Search Process (Adapted from: Montgomery, 1989; Montgomery and Svenson, 1989)
(i) Emergence of dominance search processes

The Preliminary Study elicited a number of decision elements that appeared to be congruent with the principles of dominance search. For instance, the emergent ‘natural completeness’ of portfolios and the use of logical ‘stories’ based upon previous experiences and future projections, whilst abstract are broadly analogous to the generation of a coherent decision structure.

The descriptive representations of decision processes also displayed similarities to the pre-editing phase Montgomery proposes, in the use of valuation tools for screening stocks. The limited frame of expertise (i.e. limited knowledge of stocks trading on the current market) is similarly congruent with the idea of ‘pre-editing’ and facilitates the generation of alternatives.

A final illustration lies in the Portfolio Managers’ inherent ability to know what constitute relevant cues e.g. when identifying weaknesses in expert systems’ stock projections, and to be able to weight alternative arguments accordingly. These processes relate to those described in phase 4 – dominance structuring whereby there is an implicit understanding of the weighting to be attributed i.e. during ‘de-emphasising.’

(ii) Dominance search and theory of explanatory coherence (TEC)

A second platform upon which a case is made is manifest in Montgomery’s proposition that the outcome of a decision is intricately related to a commitment to perform a particular action. For dominance search this assumption is denoted by the idea that decision-makers are able to protect ongoing activities from competing action tendencies (Kuhl, 1985; Lewicka, 1985; Shallice, 1978) by increasing the attractiveness of aspects supporting a particular decision and by decreasing the attractiveness of aspects that go against a decision. These processes are analogous to the explanatory and contradictory relations that comprise causal belief maps in ‘convince me,’ and the connectionist-settling process applied via ECHO. (ECHO is the computational component of ‘convince me’ that computes the overall coherence of the causal belief map by correlating participants’ ratings of the believability and reliability of hypotheses and statements of evidence against those generated according to TEC’s propositions.) In a manner analogous to the process of dominance search, ECHO activates the nodes representing the most mutually coherent hypotheses and deactivates the nodes representing inconsistent rivals.
The second assumption of dominance search assumes that an intention is backed by beliefs about the implications of acting in line with the intention (as demonstrated in Ajzen and Fishbein's (1980) seminal work). This is fitting with the use of hypotheses and statements of evidence and the concomitant believability ratings upon which coherence / incoherence is established in 'convince me.' Whilst this discussion is by no means exhaustive, it suggests that it may be profitable to consider the relationship of the theoretical concept of 'coherence' in relation to dominance search theory.

6.1.3 Background – NDM and Fund Managers

The shift in focus from Portfolio Managers (Chapter Five) to Fund Managers in this study is driven by two observations. First, although marked by conditions of uncertainty, risk, action / feedback loops and organisational goals and norms, the decision environments of Fund Managers adopt a comparably more attenuated form than those of Portfolio Managers. For instance, the stakes associated with funds-under-management (FUM) are characteristically higher holding implications for the entirety of private and institutional investors in their fund, as opposed to the Portfolio Manager for whom decisions typically relate to one client. Closely affiliated with this, is the difference in the holding period of stocks. Portfolio Managers tend to invest long-only, holding currently under-valued securities over the long-term in the hope that their value will rise. Fund Managers on the other hand, employ a more active investment approach that is reflected in their comparatively higher turnover of stocks.

The second observation is that Fund Manager decision-making has not been studied in an absolute sense, within the context of NDM or managerial cognition. Rather, the mainstay of research into Fund Managers' decision processes has adopted a BDM approach characterised by a lean towards heuristics and biases as typified by behavioural finance. The use of questionnaire data (Drachter, Kempf and Wagner, 2007; Lütje and Menkhoff, 2004; Masood and Tunaru, 2005; Menkhoff and Schmidt, 2005) is an over-arching concern, due to the lack of regard for the broader operating environment within which decisions are enacted.

There also remains a tendency to conceptualise decision-making as probabilistic choice among options and as the maximisation of utility (Cheng, Liu and Qian, 2006). There are of course notable exceptions to this rule such as Clark, Caerlewy-Smith and Marshall's (2007) work that suggests the integration of values and probabilities during option evaluation to be dependent upon the quality and availability of information. Whilst such research represents a movement that acknowledges the incomplete information environments decision-makers
operate within, the approach to understanding the impact upon decision-making is generally underpinned by probabilistic methods.

In line with the overall approach of this thesis, this study therefore advocates the use of a naturalistic mode of enquiry that gives precedence to the decision environments Fund Managers operate in. Indeed, as Simon (1956) proposed, cognition is one blade of a pair of scissors; the other blade is the environment, inferring that human behaviour is to be found at the point of intersection.

6.1.4 Situated approach

The final component of this section provides a justification for the application of a situated approach using interpretative phenomenological analysis (IPA) to complement the decisions modelled in ‘convince me.’ One of the limitations to the work outlined in Chapter Five related to the surfeit of information generated that was inappropriate for inclusion given the task-focus of the ACTA techniques. Whilst not always integral to the decision at stake, the information derived was nevertheless important for understanding the broader practices of Portfolio Managers’ decision-making. Indeed, Schatzki (2001) states that...

“...what is opaque to both computer and neural-net models of human activity is the embedding of knowledge and action within social contexts.”

(Schatzki, 2001: p.9)

As Collins (2001) states below the integration of social context into models of cognition is arguably a difficult objective:

“When we move to the aspects of human action that are socially embedded it is far harder to imagine them being inscribed in a computer model, whether the computer be symbolic or subsymbolic. These kinds of actions that require that behavior be varied, not randomly, but according to the social circumstances.”

(Collins, 2001: p.116-117)

Whilst ‘convince me’ permits the integration of social context, it is argued that understanding of the practices surrounding Fund Managers’ decision-making can be enhanced through the use of IPA. Schatzki (2001) suggests actions to be embedded in practices that are more broadly driven by institutions and structures. Thus, not only will the use of IPA facilitate an inductive account of the author’s experience, but will serve to socially embed this study.
6.1.5 Study objective

This study seeks to explore the utility of 'convince me' in more depth, as a basis for methodological interchange between NDM and managerial cognition. Specific insights are drawn from dominance search theory to develop the depth of interpretation afforded through 'convince me.' IPA is also used with the purpose of providing a more complete understanding of Fund Managers' decision processes and the social environments in which they operate.

6.2 Method

6.2.1 Domain specific knowledge: Fund management

See Appendix Seven for a summary of the process of knowledge acquisition.

6.2.2 Design

This study adopted a concurrent nested design, as defined by Hanson et al.'s (2005) classification typology. This permitted the simultaneous collection and analysis of quantitative and qualitative data. Specifically, priority was given to quantitative data derived from the method 'convince me,' as the primary concern of this thesis is the cross-fertilisation of methods to understand expertise. The 'nested' or more embedded forms of qualitative data that were generated during this process were used as a backdrop for contextualising the practices denoted by the 'convince me' models through a lens of naturalistic enquiry.

6.2.3 Participants

Participants were eleven Fund Managers (eight Male and three Female; Mean age = 40.7 years; SD = 12.08) from seven UK-based investment houses. The participating organisations were all authorised and regulated by the Financial Services Authority (FSA). Participants had an average of 8.5 years of experience (SD = 7.24) within their current fund management position and an average of 17.4 years experience (SD = 12.23) working within the financial services industry more generally (average statistics are based upon mean calculations). Of the participating investment houses, three principally invested in private equities, three adopted a fund-of-funds approach investing in collective investment vehicles and one specialised in corporate finance. The distribution of participants within each type of investment house is displayed in Table 6.1 overleaf.

Only two of the participants had received any training focusing upon decision-making. For one individual this involved a variety of courses on investment appraisal. For the second, the decision-making training was addressed through participation in seminars hosted by one of
Table 6.1: Distribution of Participating Investment Houses and Fund Managers Per Type of Investment House

<table>
<thead>
<tr>
<th>Type of Investment House</th>
<th>Private Equity</th>
<th>Fund-of-Funds</th>
<th>Corporate Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participating Investment Houses</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>(n = 7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participating Fund Managers</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>(n = 11)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
the industry's leading Banks, and also by more formal means via The Chartered Financial Analyst Institute, The Institute of Chartered Accountants and the Institute of Investment Management and Research. These were formally addressed as a means of attaining chartership as a Chartered Financial Analyst and an Associate Chartered Accountant.

6.2.4 Materials

The computational modelling architecture 'convince me' (Schank, Ranney and Hoadley, 1996) was used to model the coherence of Fund Managers' decisions. In accordance with the Preliminary Study outlined in Chapter Five, the software was downloaded from: http://www.soe.berkeley.edu/~schank/convinceme/index.html. The set of instructions and ratings tables used within the Preliminary Study were also utilised with no significant amendments to ensure procedural similarity in the elicitation of cognitive maps across participants (See Appendix Four).

The rating tables permitted the specification of information obtained from participants' causal belief maps as either hypotheses or statements of evidence. Participants were required to classify these as one or more of the following: 'acknowledged fact or statistic,' 'observation or memory,' 'one possible inference, opinion or view' and / or whether 'some reasonable people might disagree.' Inputs into the 'convince me' model also required judgements regarding the believability of hypotheses (scale of 1-9) as depicted in Figure 6.3 (page 137). In addition to the categorisation of information and ratings of believability, judgements of reliability (scale of 1-3) were required for each statement of evidence as displayed in Figure 6.4 (page 138).

6.2.5 Procedure

The procedure for this study was divided into three phases: data collection and model development (Time1), data collection and analysis (Time2) and the interpretative phenomenological analysis (IPA) all of which are described in detail below. The overall process of data collection and analysis is illustrated diagrammatically in Figure 6.5 (page 139) for Fund Manager (C).

Data collection and model development (Time1)

Each interview commenced with the discussion and presentation of an information sheet to the participant. This had the objective of (i) explicating the goal of the interview, (ii) ensuring participants of the confidentiality of information disclosed, of their identity and organisational affiliation, (iii) specifying the interview requirements (i.e. cognitive mapping
Figure 6.3: ‘Convince Me’ Dialogue Box: Hypothesis Ratings
Figure 6.4: ‘Convince Me’ Dialogue Box: Statement of Evidence Ratings
Negotiation of Access: Correspondence (30 minutes)

Pre-Interview Discussion (20 minutes)

‘Convince Me’ Interview (Causal Belief Map) (Time₁) (1 hour 30 minutes)

Interview Transcription (15 hours)

‘Convince Me’: Construction of Model / Ratings Task (35 hours)

‘Convince Me’: Ratings Task (Time₂) (20 minutes)

‘Convince Me’: Run Simulation (30 minutes)

IPA: Initial Iteration Identifying Preliminary Themes (3 hours 30 minutes)

IPA: Organisation of Themes into Clusters of Shared Meanings (1 hour NB¹)

IPA: Formal Arrangement of Master Themes and Sub-Themes (3 hours NB¹)

IPA: Iteration of Transcript to Ensure Grounding (1 hour)

IPA: Selection of Representative Quotations From Transcript (1 hour)

NB¹. The reported time is proportionate to the total time for the task divided by participants.

Figure 6.5: Illustrated Data Collection and Analysis for Fund Manager (C)
task and ratings task) and (iv) outlining any subsequent uses of the data. Permission was then obtained to digitally-record the interview.

Overall, data collection at Time; took an average of 2 hours 30 minutes per participant. This included pre-interview discussions through email correspondence, telephone and one-to-one meetings. This was used to enable the establishment of participant-researcher rapport and as a means of understanding the nature of their decision-making. Each formal interview typically lasted 40 minutes – 1 hour 30 minutes. The interviews were structured to allow discussion of the types of decisions typically encountered in their day-to-day activities. This formed the basis for the participant’s selection of a decision task upon which to root their causal belief map. Once the decision task had been specified, the researcher adopted a more facilitative role to the participant in providing guidance for the elicitation of their causal belief map. A series of prompts were used which are outlined in Appendix Four.

Each interview was then transcribed, which typically took between 4.5 – 6.5 hours (40 minute interview) and 10.5 - 15 hours (1 hour 30 minute interview) as dependent upon the interview length. Transcribed interviews were in the range of 3,000 words to 11,200 words, resulting in a total analysis of 71,400 words. The average transcript was 6,491 words in length. See Appendix Eight for an illustrative extract of a transcript.

The development of each model in ‘convince me’ was constructed using each participants’ causal belief map and was complemented with additional data regarding the inter-relation of concepts derived from the transcripts. This approach was adopted as a result of the limited access to and time availability of participants. The development of participants’ causal belief maps in ‘convince me’ was a largely iterative process (between causal belief map and transcript) to ensure technical accuracy and accurate representation of participants’ decision-making processes. Each ‘convince me’ model took 24 - 40 hours to construct using this procedure. The final stage of this was the construction of a ratings table for each participant based upon their ‘convince me’ model. This typically took 1 hour per participant to construct.

Data collection and analysis (Time;)
The ratings tasks for each participant were then distributed via e-mail and were completed remotely at Time; This typically took 15-20 minutes to complete per participant. These ratings were then input into the ‘convince me’ model, from which simulations were run for each participant. The simulations generated a correlation per participant based upon the
coherence of their arguments to ECHO's activations. The period of inputting ratings, running the simulations and adjusting the parameters typically took 30 minutes per participant.

Interpretative phenomenological analysis (IPA)

The IPA was based upon the transcripts generated from participants' interviews at Time. During initial encounters with each transcript, emergent themes and connections were noted, before transformation into preliminary lists of themes. This process took an average of 3.5 hours per transcript. Clusters of themes were then identified from the preliminary list, which were taken to reflect shared meanings between participants and hierarchical relationships between themes. During the process of systematic reading, themes would be dropped and others added. Themes across interviews were then integrated into master themes and sub-themes. Integrative themes were then checked against transcripts to ensure grounding in data. The IPA was complete when all shared knowledge was identified within the master themes. This process of analysis took approximately 36 hours in total.

6.3 Results

The results are organised as follows: First, the results derived from the 'convince me' models are outlined and presented through a number of illustrative examples. Interpretative phenomenological analysis is then used to complement the decision-making assumptions and insights drawn from 'convince me.'

6.3.1 'Convince me'

The results based upon the correlations between participants' causal belief maps and ECHO are summarised in Table 6.2 (page 142).

Table 6.2 demonstrates six of the simulations to display a moderate relationship (based upon the range of 0.40 - 0.69) between ECHO's activations and participants' ratings. A further four of the simulations were classified as 'mildly related' as the correlation between ECHO's activations and participants' ratings were in the range of 0.01 - 0.39. The average correlation across all eleven Fund Managers was $r = 0.36$. The parameters used for each simulation were varied according to the degree of scepticism each participant displayed and consequentially levels of excitation, inhibition and data priority were manually set in order to maximise the degree of overall coherence. The parameter settings used for each participant are displayed in Table 6.3 (page 143).
Table 6.2: Correlations Between ECHO’s Activations vs. Participants’ Ratings

<table>
<thead>
<tr>
<th>Fund Manager</th>
<th>Correlation (Fund Manager’s ratings vs. ECHO’s activations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>0.31</td>
</tr>
<tr>
<td>(B)</td>
<td>0.12</td>
</tr>
<tr>
<td>(C)</td>
<td>0.56</td>
</tr>
<tr>
<td>(D)</td>
<td>0.19</td>
</tr>
<tr>
<td>(E)</td>
<td>0.46</td>
</tr>
<tr>
<td>(F)</td>
<td>0.67</td>
</tr>
<tr>
<td>(G)</td>
<td>-0.04</td>
</tr>
<tr>
<td>(H)</td>
<td>0.14</td>
</tr>
<tr>
<td>(I)</td>
<td>0.47</td>
</tr>
<tr>
<td>(J)</td>
<td>0.45</td>
</tr>
<tr>
<td>(K)</td>
<td>0.60</td>
</tr>
<tr>
<td>Parameters</td>
<td>Excitation</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Fund Manager (A)</td>
<td>10</td>
</tr>
<tr>
<td>Fund Manager (B)</td>
<td>0</td>
</tr>
<tr>
<td>Fund Manager (C)</td>
<td>20</td>
</tr>
<tr>
<td>Fund Manager (D)</td>
<td>0</td>
</tr>
<tr>
<td>Fund Manager (E)</td>
<td>0</td>
</tr>
<tr>
<td>Fund Manager (F)</td>
<td>0</td>
</tr>
<tr>
<td>Fund Manager (G)</td>
<td>0</td>
</tr>
<tr>
<td>Fund Manager (H)</td>
<td>60</td>
</tr>
<tr>
<td>Fund Manager (I)</td>
<td>0</td>
</tr>
<tr>
<td>Fund Manager (J)</td>
<td>0</td>
</tr>
<tr>
<td>Fund Manager (K)</td>
<td>0</td>
</tr>
</tbody>
</table>
Descriptive overview of Fund Managers’ decisions

Before providing illustrative examples of the models, a description of the types of decisions that formed the basis of participants’ causal belief maps is provided. The types of decisions encountered by Fund Managers varied according to the type of investment house they worked within. For those Fund Managers who were principally investing in private equities, the decisions discussed generally occurred at the stock level. For example, typical causal belief maps outlined the arguments surrounding the purchase of an individual stock and either their arguments surrounding the sale of the stock (as actioned), or the arguments in favour of a future sale. Conversely, Fund Managers also used the sale of a stock as a starting point for the decision to re-invest the capital. Thus, stock purchases and subsequent sales operate as a part of a continuing cyclic order that populate funds-under-management (FUM).

Whilst fundamental analysis underpinned these decisions at a broad level, the degree to which varied across Fund Managers according to their individual investment approach. Those decisions that were strongly influenced by fundamental analyses outlined in a more focused and detailed manner the nature of the mispriced security, for example, the failure for Analysts to factor-in the conviction a company will make acquisitions or that the restructuring of a challenged franchise has not been taken into account within the share price. Whilst, the identification of investment opportunities of this order led to causal belief maps that were more isolated in terms of their relationship to other purchases and sales within the fund, decisions of this nature placed greater precedence upon the macro-environment of the industry. A final type of decision that typified Fund Managers’ private equity investments, concerned decisions regarding the population of a new fund, for instance, decisions regarding thematic plays on trends.

The Fund-of-Funds Managers’ decisions echoed the cyclic nature of investing (as seen in private equity stock decisions). For example, a proportion of the decisions discussed concerned the withdrawal from a fund due to either under-performance and / or regulatory issues and the identification of more appropriate funds to re-invest into. Decisions also included those surrounding investments into new funds to emerge within the market, and decisions to invest in funds denoted by conflict i.e. high quality reputation vs. low performance to date. These decisions were marked less by the type of fundamental analyses characteristic of private equity funds and more by qualitative and team-based judgements.

The one instance of Fund Manager decision-making within corporate finance concerned a management buy-out. This decision was quite distinctive from the other types in that the
decision process was depicted through the Fund Manager’s interaction with the vendor. It was similar to the Fund-of-Funds Managers’ in the sense that the decision-making was team-based and utilised a combination of both fundamental analyses and qualitative judgements. Three illustrative examples of the ‘convince me’ models are outlined below:

Illustrative example 1: Fund Manager (F) (UK Equities Fund Manager, Oxfordshire)

**Background demographics**

At the time of interviewing, Fund Manager (F) was 33 years old and held ten years experience within the investment industry. Working for one of the UK’s leading independent investment management organisations, this Fund Manager acquired seven years of experience managing UK Equity Funds for the retail market. No training focusing upon decision-making or problem-solving had been received throughout his investment career.

**Decision Time: Stock purchase**

Fund Manager (F) chose the purchase and subsequent sale of a stock decision within an established fund to form a basis of their causal belief map. Thus, the decision consisted of a stock purchase at Time₁ and retraction of the sale at Time₂. Representation of Fund Manager (F)’s causal belief map in ‘convince me’ may be viewed in Figure 6.6 (page 146). Note that hypotheses are depicted as yellow nodes and statements of evidence as green nodes. Explanatory relations are represented as solid connecting arcs and contradictory relations as dashed arcs. Figure 6.7 (page 147) provides an illustrative example of the hypotheses and statements of evidence used by Fund Manager (F). It also illustrates an example specification of the nature of the hypothesis ‘H₁’ and its associated level of believability. Finally, Figure 6.7 also displays Fund Manager (F)’s believability ratings and ECHO’s concomitant activations in the far-right columns.

Specifically, the decision to invest in stock A was rooted in two assumptions. Firstly, it was marked by the identification of a broad investment theme, which suggested investment in the telecommunications infrastructure at a global level would be profitable. Second, it was manifest in the specific assumption that company A had potential for generating value. The foundation for such a belief was rooted in the company’s provision of network equipment and services in the telecommunications industry. It was also marked by the fact that the company had previously been insolvent and had been re-floated. Essentially, it was an established company and had some major clients (such as company B). Moreover, company A was expected to be the provider for a major forthcoming contract at company B. Both
Figure 6.6: Illustrative Example 1: ‘Convince Me’ Diagram “Stock Purchase and Subsequent Retraction” (Fund Manager F)
Figure 6.7: ‘Convince Me’ Text “Stock Purchase and Subsequent Retraction” (Fund Manager F)
companies had been in close talks regarding the contract and it was rumoured that company B had been testing company A’s equipment within their laboratories. The expectation was that whilst company A would not ‘win’ the contract in it’s entirety, it would gain a substantial proportion. Thus, stock in company A was purchased at 500p, with upside expected following the contract to be in the vicinity of 700p. As this was a risky decision, marked by considerable uncertainty, a position of 3% FUM was adopted. The stance taken on valuation was grounded in the belief that the impact of the contract had not been fully discounted into the share price.

*Decision Time:* Retraction of stock

Following the purchase of stocks in company A, company B their largest, long-standing client walked away. Consequently, company A was deleted from the contract and thus failed to win any of the envisioned business with company B. It was inferred that company C, another major player in the telecommunications market had outbid company A and whilst they did not have the technology to fulfil the order they would be able to subcontract the business overseas.

Consequentially, company A’s stock fell by approximately 50% representing a share price movement of 500p to 250p. Although company A then stopped trading at 250p, Fund Manager (F) perceived a fair valuation to be 500p, representing a 200p impairment between the original expected upside of this asset at Time, and the current projections of company A. This belief was rooted in a number of arguments: (i) the closed trading price was unreflective of company A’s real value (as communicated by Finance Representatives and Chief Executive of company A), (ii) Analysts suggested the price at which company A closed to be lower than the ‘true worth’ of the stocks, (iii) the remaining assets and businesses on the balance sheet, valued at a level higher than the closed trading price, (iv) valuations of company A’s cash assets were perceived as reasonable by Analysts and (v) the belief that future legacy revenues from company B will have a positive effect upon company A’s valuation and stock price. Weighting was thus positioned on the basis of the expectation that the stock price will double and represented for Fund Manager (F) a clear value opportunity in terms of the future valuation of the business (i.e. to double up). Circa 6 months later, company C bids for half of company A, and the remaining half is re-floated and re-named. The decision to exit from the stock at this point produced a net-zero effect upon the portfolio during this 18-month period.
**Decision coherence: Fund Manager (F)**

As can be seen in Figure 6.6 (page 146) the beliefs surrounding the investment in company A's shares at Time$_1$ and sale of the shares at Time$_2$, are related via a number of contradictory links. The left-hand side of the map connotes the decision to invest at Time$_1$. The upper segment of the map denotes beliefs surrounding the existence of company C and the right-hand side of the map represents the beliefs surrounding the decision to sell. It is important to emphasise that Fund Manager (F) rated his beliefs for all hypotheses and statements of evidence as believed at Time$_2$. (Note that elements of the arguments underpinning the investment potential in company A at Time$_1$ were still strongly believed at Time$_2$). Coherence in the decision to sell the stock was assessed via the correlation between ECHO's activations and Fund Manager (F)'s ratings across the whole map. The overall correlation was $r = 0.67$. An illustrative log of the output from 'convince me' of Fund Manager (F)'s decision is provided in Appendix Nine.

**Illustrative Example 2: Fund Manager (C) (Analyst, London)**

**Background Demographics**

Fund Manager (C) is 34 years old and works as an Analyst at the London office of a leading South African asset management company. He has worked for two years in his current position, substantiated by twelve years experience working within the investment industry. Specifically, Fund Manager (C) is involved in the management of international assets focusing upon fund-of-hedge-funds or specialist long-only fund-of-funds. To date, Fund Manager (C) has not received any training specific to decision-making.

**Decision: Fund redemption and re-investment**

This decision occurred within one of the firms' established fund-of-funds. Essentially, the decision process was prompted by the requirement to redeem from a fund they had previously invested in due to regulatory issues with the FSA. It was believed that the Fund Manager of the redeemed fund might be distracted by this regulatory issue, to the neglect of running the fund efficiently. This action necessitated the re-investment of capital within the fund in a way that (i) maintained the asset allocation of the recently redeemed fund, (ii) permitted the preservation of capital and (iii) would deliver absolute returns. Figure 6.8 (page 150) displays the 'convince me' implementation of the causal belief map elicited for Fund Manager (C). Specific hypotheses and statements of evidence underpinning this model are documented in Figure 6.9 (page 151).
Figure 6.8: ‘Convince Me’ Diagram “Fund Redemption and Re-Investment” (Fund Manager C)
**Figure 6.9: ‘Convince Me’ Text “Fund Redemption and Re-Investment” (Fund Manager C)**

<table>
<thead>
<tr>
<th>Label</th>
<th>Hypotheses</th>
<th>You</th>
<th>ECHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Initial identification of Investment House A’s Funds’ as a potentially profitable investment opportunity</td>
<td>8</td>
<td>0.5</td>
</tr>
<tr>
<td>H2</td>
<td>Monitor quality of decisions: Performance of Investment House A’s Global Fund and European Fund remains comparatively strong at present</td>
<td>8</td>
<td>0.5</td>
</tr>
<tr>
<td>H3</td>
<td>Decision to invest: Investment House A’s investment philosophy and performance track record will lead to positive returns</td>
<td>8</td>
<td>0.5</td>
</tr>
<tr>
<td>H4</td>
<td>Investment House A’s “People Philosophy” suggests a cohesive approach to their investment strategy</td>
<td>8</td>
<td>0.6</td>
</tr>
<tr>
<td>H5</td>
<td>“Performance Philosophy” of Investment House A fits in with preferred approach of Investment House B</td>
<td>8</td>
<td>0.8</td>
</tr>
<tr>
<td>H6</td>
<td>Investment House A’s “Process Philosophy” ensures their investments are thoroughly researched and implemented with high conviction</td>
<td>8</td>
<td>0.7</td>
</tr>
<tr>
<td>H7</td>
<td>The construction of our portfolio at Investment House B would be enhanced by investing Investment House A’s Global Fund</td>
<td>8</td>
<td>0.6</td>
</tr>
<tr>
<td>H8</td>
<td>The successful track record of Investment House A’s in-house research makes it likely their future research will be successful</td>
<td>8</td>
<td>0.4</td>
</tr>
<tr>
<td>H9</td>
<td>Performance of Investment House A’s Funds is both sustainable and sustainable</td>
<td>8</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Label</th>
<th>Data</th>
<th>You</th>
<th>ECHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Marketing contact promoted Investment House A as a profitable investment house</td>
<td>8</td>
<td>0.5</td>
</tr>
<tr>
<td>E2</td>
<td>Phrasing from meeting with Marketing contact suggests a similarity to Investment House A’s and Investment House B’s people, process, and performance philosophy</td>
<td>8</td>
<td>0.5</td>
</tr>
<tr>
<td>E3</td>
<td>Investment House A’s Global Fund compares positively against peer Funds</td>
<td>8</td>
<td>0.7</td>
</tr>
<tr>
<td>E4</td>
<td>Preliminary screening of similar funds for performance using database suggests the performance of Investment House A’s Funds to be favourable</td>
<td>8</td>
<td>0.5</td>
</tr>
<tr>
<td>E5</td>
<td>Alternative investment ideas are considered but do not yet challenge Investment House A’s Global Fund performance</td>
<td>7</td>
<td>0.5</td>
</tr>
<tr>
<td>E6</td>
<td>Excluded Funds continue to perform comparatively less well than Investment House A’s Global Fund</td>
<td>7</td>
<td>0.5</td>
</tr>
<tr>
<td>E7</td>
<td>Investment House A’s Global Fund continues to perform well against Investment House C’s Global Fund</td>
<td>6</td>
<td>0.5</td>
</tr>
<tr>
<td>E8</td>
<td>Management should not have regulatory issues</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>E9</td>
<td>Performance track record of Investment House A is in line 3.5 years</td>
<td>4</td>
<td>0.6</td>
</tr>
</tbody>
</table>

**Explanations**

H1 explains H1
H1 explains H2
E4 explains H1
E5 explains H3
H4 explains H3
E6 explains H6
E7 explains H7
H8 explains H4
E9 explains E9
E10 explains E10

**Contradictions**
Prompted by the requirement to re-invest capital within their fund-of-funds, the decision developed as follows: Fund Manager (C) identified Fund A as a potentially profitable investment opportunity through a marketing contact. The rhetoric of the marketing contact suggested a similarity between investment house A (managing Fund A) and their own people, process and performance (3P’s) philosophy (investment house B). This was complemented early on in the decision process by a preliminary screening of similar funds for performance. The positive outcome of this comparative review prompted discussion with the investment house of Fund A. This meeting with the CIO / investment team further emphasised the congruence of Fund A’s integrated 3P’s philosophy as a sound basis for investment decisions.

Specifically, their ‘people philosophy’ was marked by a number of beliefs. First, that the Chief Executive has an excellent investment background with a long-track record from highly respected UK investment houses. Second, the snowball recruitment style used within their boutique meant that all members of the team were internally recommended. Thirdly, the size of the team was perceived as optimal. Finally, Fund Manager (C) believed that Analysts’ / Portfolio Managers’ autonomy and sole discretion during decision-making to be a positive attribute and a function of the high quality nature of their research.

Fund Manager (C) also believed that the ‘process philosophy’ of the investment house managing Fund A, ensures their investments are thoroughly researched and implemented with high conviction. In particular Fund Manager (C) gave weight to their use of active risk management processes, the use of screening on value metrics to generate ideas, the completion of in-house research and the construction of their portfolios using concentrated position sizing. From this Fund Manager (C) believed that the successful track record of their in-house research makes it likely their future research will be successful.

The ‘performance philosophy’ of Fund A’s investment house was also perceived to fit with their preferred approach. In particular, it was hypothesised that whilst the track record of Fund A is only 2.5 years, the performance is both sustainable and repeatable. This was bolstered by the funds’ favourable comparisons to peer funds and the benchmark. Moreover, the decision was made to invest in Fund A on the basis that performance is valuation-driven, with investments typically taking a long-only form. This belief was rooted in Fund A’s recent investment in stocks whereby despite short-term under-valuation the company was in fact a part of a longer-term growth trend. Thus, it was believed that the investment team of Fund A would be able to generate alpha from the long-side of their investments, which is
fitting with the preferred approach of Fund Manager (C) and the investment house he works for. Further still, whilst the investment team of Fund A are prepared to be contrarian (i.e. take a contrary position to the prevailing crowds view), volatility (and hence risk) of returns is of a medium-level.

The final component of Fund Manager (C)’s causal belief map assessed the impact of investment in Fund A upon the fund-of-funds portfolio overall. Fund Manager (C) runs a concentrated portfolio (consisting at the time of interviewing of eleven funds (two European / two US / two Asian / three Global / two Japanese). Like the Investment Managers of Fund A, high weightings in the fund-of-funds portfolio are taken to be a reflection of their high conviction in the Fund Managers invested in. Whilst, the objective was to populate Fund Manager (C)’s fund-of-funds with another European Fund (Fund A), the high performance of the Global Fund (Fund B) was also deemed interesting in that it could rectify the current under weighting of the US in the long-only fund-of-funds (long-only fund-of-funds is benchmarked against an index which has 50% exposure to US, compared to their 30% actual exposure). Furthermore, it was conveyed that the regional weightings across multiple sectors of the Global Fund (Fund B), would overcome their previous exclusion from emerging markets. Thus, the decision was made to invest in both the European Fund (Fund A) and the Global Fund (Fund B), with a weighting of 5% respectively.

**Decision coherence: Fund Manager (C)**

As Figure 6.8 (page 150) displays, there were no contradictory links between any of the hypotheses and statements of evidence that featured within Fund Manager (C)’s decision, although ratings of believability and reliability were variable. The causal belief map depicts the beliefs regarding people, process and performance as the main clusters of nodes on the right-hand side of the map. The network of nodes on the bottom-left denotes the beliefs surrounding the impact of investing upon their own fund and regarding the impact of redeeming from the initial fund. The overall coherence of this argument was $r = 0.56$.

**Illustrative example 3: Fund Manager (G) (Head of International Equities, Oxfordshire)**

**Background demographics**

Fund Manager (G) is 48 years old and works for one of the UK’s leading investment houses. She has been working for one year as Head of International Equities that is complemented by 26 years of experience within the investment industry. She is responsible for a number of Multi-Region Equity Funds including: International Equities, Emerging Markets and Global
Smaller Companies Funds. Fund Manager (G) has not received any training focusing upon decision-making or problem-solving during this period.

**Decision: Population of a new global best ideas fund**

This decision focused upon the population of a new Global Best Ideas Fund. This fund is an unconstrained fund in which there are no benchmarks or indices to constrain thought. The objective of the fund is to deliver long-term capital growth. Whilst, the fund is populated via regional specific Fund Managers presenting their ‘best ideas’ to Fund Manager (G), this investment decision focused upon the purchase of stocks in a Chinese Tracker Fund that drew upon Fund Manager (G)’s expertise. The causal belief map produced by Fund Manager (G) can be seen in Figure 6.10 (page 155). Figure 6.11 (page 156) displays an illustrative set of hypotheses and statements of evidence that underpin the ‘convince me’ implementation.

The choice in a Chinese Tracker Fund resided in a number of beliefs both about the future of the Chinese economy and China’s inefficiencies at the stock level. These are each discussed in turn. First, Fund Manager (G) held a number of strongly held beliefs regarding the future projected state of the Chinese stock market, which was based upon her own germane knowledge of the growth, development and opening of the Chinese economy. Fund Manager (G) gave weight to the recent liberalisation of the Chinese stock market, the broadening and deepening of the Capital market and the high level of economic growth experienced within the Chinese economy. It was viewed that this high-level of economic growth experienced in China would be sustainable in the medium-term. Whilst, Fund Manager (G) perceived the economic state of China to be marked by the early stages of a bubble, she perceived the Chinese markets as an opportunity to derive value in the short-medium term.

The choice in a Tracker Fund as a tool for gaining exposure to China was deemed appropriate by Fund Manager (G) for a number of reasons to be discussed. First China was portrayed as an inefficient market, particularly at the stock level where there are very inefficient levels of information. Coupled with the assumption that investing in China is still rather clouded, the macro-level of the Chinese Tracker Fund overcomes the problem of stock specific risk i.e. that the Fund Manager has been wrong in some of their assumptions. The second component of her choice in a Tracker Fund was rooted in the hypothesis that the thematic play on broad trends seen in Chinese economy is likely to deliver strong capital returns in a 1-3 year time frame. Specifically, Fund Manager (G) felt that the Tracker Fund would exploit the key drivers of the Chinese economy and minimise the role of economic excesses and that the Global Best Ideas Fund may benefit from a play on the opening of
Figure 6.11: ‘Convince Me’ Text “Population of a New Global Best Ideas Fund” (Fund Manager G)
the "A Share Market." Finally, it was also stated that the Chinese Tracker Fund was appropriate because it would provide diversified access to the Chinese economy and would thus help to eliminate some of the risk associated with investing in China.

The final element to Fund Manager (G)'s decision to invest in the Chinese Tracker Fund concerned the choice in the time of purchase. At the time of purchase (December 2006) the market conditions in China were perceived to be favourable i.e. broker's suggestions that prices were increasing and would thus maximise exposure of the investment to Chinese markets. This was also marked by sufficient liquidity within the Global Best Ideas portfolio. Given that the Chinese Tracker Fund is a volatile investment in an emerging market, Fund Manager (G) limited total exposure to 1% of the Global Best Ideas Fund.

**Decision Coherence: Fund Manager (G)**

Fund Manager (G)'s ratings of believability and reliability as displayed in Figure 6.11 (page 156) were consistently high for each hypothesis and statement of evidence. The upper strata of nodes in Figure 6.10 (page 155) display Fund Manager (G)'s beliefs regarding the Chinese economy. The central strata represent the benefits of utilising a Tracker Fund to access this market, whilst the lower strata denotes beliefs surrounding the local environment conducive to purchasing the Chinese Tracker Fund. Overall, the coherence between Fund Manager (G)'s ratings and ECHO's activations was $r = -0.04$.

**6.3.2 Interpretative phenomenological analysis (IPA)**

An interpretive phenomenological analysis (IPA) derived from the Fund Managers' interviews also complements the results from the 'convince me' models. Table 6.4 (pages 158-159) outlines the master themes and the constituent sub-themes that emerged from analysis of Fund Managers' discourses. The four master themes are: (i) 'the art of fund management,' (ii) 'order in the Fund Managers' world,' (iii) 'exploiting the market: practices in fund management' and (iv) 'making sense of complex information environments.'

Note that Table 6.4 is a summary and provides only a number of illustrative examples. The complete IPA is contained in Appendix Ten, whilst a full analysis of Table 6.4 occurs in the discussion (section 6.4 of this chapter).
<table>
<thead>
<tr>
<th>Master Themes</th>
<th>Constituent Themes</th>
<th>Illustrative Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: The Art of Fund Management</td>
<td>Idealist Rationality</td>
<td>“...the world has become too complex. And from my perspective – I don’t believe that I have the ability to process it. It is configural. It is not logical.” (Fund Manager D, 69-71)</td>
</tr>
<tr>
<td></td>
<td>Bounded Rationality</td>
<td>“...I mean any individual Fund Manager would assert that they are not a member of the stampeding herd and that they are able to be objective and it might be a part of your research to prove that actually that’s not really possible because we are all human-beings.” (Fund Manager G, 415-420)</td>
</tr>
<tr>
<td></td>
<td>Fund Management: Science or Art?</td>
<td>“A lot of people view this is a very mathematical industry and a sciencey industry. But, actually it’s not. There is a lot of judgement here. So, it’s like an art in a way.” (Fund Manager E, 90-93)</td>
</tr>
<tr>
<td></td>
<td>Emotion and Action</td>
<td>“It is quite an emotional industry – you get angry, you get fired up by things. And it is very easy to throw the baby out of the bathwater ... in a sort of pressured environment.” (Fund Manager F, 17-19)</td>
</tr>
<tr>
<td>2: Order in the Fund Managers’ World</td>
<td>Organisational Rules and Norms</td>
<td>“There are rules in the venture capital world about how you value your companies. The rules generally are that you have got to be very conservative.” (Fund Manager I, 149-152)</td>
</tr>
<tr>
<td></td>
<td>Dynamic and Embedded Nature of Decision-Making</td>
<td>“...none of the decisions that you make about a stock exist in isolation, nor is one a eureka moment. There is no eureka moment about this at all. It is a very long-term, long-standing deep-rooted set of decisions that are based on knowledge.” (Fund Manager G, 378-382)</td>
</tr>
<tr>
<td></td>
<td>Structural Components of Investment House</td>
<td>“A lot of the thinking and strategy behind building the team it is to get people from slightly different backgrounds so that the input. I mean, ultimately what we are focusing upon is the best quality investment decision-making process that we can build.” (Fund Manager B, 12-15)</td>
</tr>
<tr>
<td><strong>Master Themes</strong></td>
<td><strong>Constituent Themes</strong></td>
<td><strong>Illustrative Example</strong></td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td><strong>3: Exploiting the Market: Practices in Fund Management</strong></td>
<td>Individual Differences in Investment Style</td>
<td>“Well, I think that you could say that different team members focus on different things. So, I’m more of a qualitative man. I’m not an accountant. I’m not inclined to spend lots of time on spreadsheets.” (Fund Manager I, 162-165)</td>
</tr>
<tr>
<td></td>
<td>Market Efficiencies</td>
<td>“The efficient market hypothesis is wrong in as much as it’s being maintained to being a golden rule – But it’s not because it breaks down.” (Fund Manager D, 156-159)</td>
</tr>
<tr>
<td></td>
<td>Valuation and the Adoption of Contrarian Positions</td>
<td>“So, what I think other Analysts have failed to appreciate is that this company will make acquisitions.” (Fund Manager E, 228-229)</td>
</tr>
<tr>
<td></td>
<td>Performance Paradoxes: Past, Present and Future</td>
<td>“Obviously the risk and returns are unknowns in terms of you don’t actually physically know what the return is going to be over a certain time period. All you can do is base it on the past and just sort of ignore the fact that, the fantastic disclaimer that past performance is not a guide to the future. That does make me laugh when everything you do, when you talk about a fund is based on what has been done in the past. And so you can use your knowledge of what has happened in the past to create forecasts.” (Fund Manager K, 256-276)</td>
</tr>
<tr>
<td><strong>4: Making Sense of Complex Information Environments</strong></td>
<td>Cloud in Industry</td>
<td>“Yeah, so in a sense what I’m trying to do is to put a reality check on some of the deals that they’re doing. You’d be surprised at some of the shit that gets through in this industry.” (Fund Manager J, 364-367)</td>
</tr>
<tr>
<td></td>
<td>Sense-making Through Conviction</td>
<td>“What do I believe...? Do I believe what the Analyst is saying? Which in itself is quite an important...because sometimes Analysts can become very focused.” (Fund Manager K, 699-700)</td>
</tr>
<tr>
<td></td>
<td>Knowledge and Experience</td>
<td>“There’s a deep bedrock of experience if you like that you are tapping into.” (Fund Manager G, 187-188)</td>
</tr>
<tr>
<td></td>
<td>Intuition and Trust</td>
<td>“So, a lot of it is trust. I suppose at the end of the day – you know it’s trust. Is it gut?” (Fund Manager I, 134-135)</td>
</tr>
</tbody>
</table>
6.4 Discussion

The intention of this study was to build upon the promise of methodological cross-fertilisation identified in Chapter Five, by exploring the utility of 'convince me' in more depth. It also sought to use IPA to socially embed this study in order to provide a more complete understanding of the social environment in which Fund Managers operate.

This discussion opens by discussing the correlations derived from the simulations produced in 'convince me.' Drawing upon these results, the contribution of 'convince me' as a point for methodological exchange is reviewed. Insights derived from the IPA are also described and considered in relation to the value of complementing naturalistic research with interpretative forms of inquiry. Finally, some of the limitations of this work are considered, as are implications for future study.

6.4.1 'Convince me' simulations

The 'convince me' simulations produced an average correlation of $r=0.36$ between Fund Managers’ ratings and ECHO’s activations. As 'convince me' is a connectionist implementation of TEC, it is assumed that correlations derived from each simulation are representative of the overall degree of data-theory fit i.e. the actuality of Fund Managers’ decision-making to TEC. The degree to which data-theory fit was achieved across the Fund Managers’ models is discussed.

Whilst variability existed in the degree to which ECHO and consequentially TEC could map decision coherence, the overall success of the models (especially given their rooting in naturalistic methods) provides some support for this concept. Those models that elicited moderate relations (i.e. in the range of $r=0.4 - 0.7; n=6$) will firstly be discussed. These are denoted by illustrative examples 1 and 2 (Fund Managers (F) and (C) respectively). The moderate degree of correlation between ECHO's activations and Fund Managers’ ratings appears to depict TEC as an appropriate account of Fund Managers’ decision processes.

However, a number of the simulations produced mild positive correlations (i.e. in the range of $r=0.01 - 0.39; n=4$). The degree to which TEC is able to operate as an explanatory account for these models is less certain. The results are further perplexed by the existence of a final model that produced a mild negative correlation (i.e. in the range of $r=-0.01 - -0.39; n=1$). Illustrative example 3 is an example of one of the decisions within this range, whereby the correlation of $r=-0.04$, suggested ECHO’s activations to mildly oppose those of Fund Manager (G). The implication of which cast doubt on the appropriateness of TEC as an
account of Fund Managers’ decision-making. A number of explanations that account for the variability in these results across participants exist. These are summarised as follows:

**Proposition 1: Data error**

The character of naturalistic approaches increases the likelihood of eliciting unavoidable sources of error in the data, which impact the corresponding correlations between ECHO’s activations and Fund Managers’ ratings.

**Proposition 2: Individual differences: Inadequacy of TEC**

TEC is simply an inadequate account of Fund Managers’ decision-making.

**Proposition 3: The difficulty of modelling dominance structures in ‘convince me’**

The connectionist principles underpinning ‘convince me’ are unable to model the dominance structure stage of Montgomery’s theory of dominance search.

**Proposition 4: Inappropriateness of parametric assumptions**

The use of parametric assumptions as a basis for determining the correlation between Fund Managers’ ratings and ECHO’s activations is inappropriate.

The first proposition suggests that the issue may lie with the method of data collection that is inherently error prone. The character of naturalistic approaches increases the likelihood of eliciting unavoidable sources of error in the data, which is likely to impact correlations. The effect of which is the generation of random, spurious correlations. Errors in the data may also have been amplified by the time lag between elicitation of the causal belief maps and completion of the rating task. The dynamic nature of this industry means that changes in the degree of belief in certain propositions during this time period may have impacted the overall degree of coherence. The variation in data as reflected in the range of correlations produced in Table 6.2 (including the existence of a negative correlation) is evidence to the argument of error-prone data.

The second proposition suggests quite simply that TEC is an inadequate account of Fund Managers’ decision-making. Whilst, this explanation is able to account for the existence of mild correlations and the emergent negative correlation within the data, it is unable to explain those instances whereby ECHO did display moderate correlations to Fund Managers’ ratings. This opens the possibility that experts think differently i.e. that whilst some Fund Managers’ decision-making utilises principles denoted by TEC, others do not. This individual differences account, appears at first to be fitting with the results derived from the
simulations. However, attaining a valid rationale for the occurrence of these differences was met with difficulty. Despite extensive consideration of the content and structure of each simulation, an explanatory account of the differences could not deciphered.

The third proposition lies in the suggestion that the principles underpinning the connectionist implementation of 'convince me' are unable to model dominance structures. Using Fund Manager (G)'s causal belief map as an illustrative example, it is apparent that it exhibits a fully developed dominance structure: (i) no contradictory relations exist within the argument and (ii) almost all of the hypotheses and statements of evidence received high believability ratings. The implication of which is that most of the nodes will have high activations, making it unlikely that the connectionist-settling network will reject them. If almost all of the nodes have high activation, and/or almost all of the nodes receive high ratings, there is no basis for a correlation because one or both of the correlates has a restricted range. This compounds the no-contradiction problem outlined earlier, since all the activations are also likely to be high. The correlations could therefore be viewed as merely modelling noise due to the restrictions in variance of ratings.

The value of this explanation is that it accounts for the inability of 'convince me' to model the coherence of decisions exhibiting dominance structures, despite expectations of non-controversy data to exhibit high correlations. However, it is important to emphasise that the creation of a dominance structure is not absolute. As Montgomery states:

"A representation of a decision situation may also be more or less close to a fully developed dominance structure. In a fully developed dominance structure there are either no disadvantages of the chosen alternatives on any of the attributes that have been considered by the decision maker or the disadvantages have been completely neutralised by means of cancellation or collapsing. In a less developed dominance structure the disadvantages are dismissed by declaring them to be small or negligible (de-emphasizing) or the decision maker simply restricts his attention to those combinations of attributes and alternative that do not violate a dominance structure."

(Montgomery, 1989: p.30)

Therefore the existence of correlations in the range of \( r = 0.4 - 0.7 \) suggests that ECHO is picking up some signal, that are marked by less developed dominance structures.

The fourth proposition that parametric assumptions used within 'convince me' are inappropriate, offers a final explanation for the variability of this study's results. The
conditions for the use of parametric tests require data to exhibit both a normal distribution and homogeneity of variance. It emerged through consideration of Fund Manager (G)'s 'convince me' model that her ratings violated the conditions necessary for using parametric tests of correlation (the ratings were highly negatively skewed and displayed low variance). In order to establish whether the difficulty lay in the inappropriate use of parametric calculations or in Fund Manager (G)'s causal belief model itself (i.e. in the existence of a dominant structure), Spearman's Rho non-parametric correlation was used as an alternative measure of data fit. ECHO's activations using the parameters from the original simulation and Fund Manager (G)'s ratings formed the basis of the non-parametric correlation. The results produced a correlation of Spearman's rho = 0.47 (Critical value = 0.45, p = 0.01, n = 30). It therefore appeared that the correlation between ECHO's activations and Fund Manager (G)'s ratings may have been distorted by the parametric assumptions that underpin 'convince me.' Consideration of the distribution of ratings for all participants following this finding has shown that in general they did not meet the required normal distribution parameters.

Whilst, it is unlikely for any one of these propositions to be the sole cause of the variability in the correlations, the view is taken that propositions 3 and 4 (i.e. the difficulty of modelling dominance structures in 'convince me' and the inappropriateness of parametric assumptions) hold the most significance for the inconsistency in findings. Propositions 1 and 2 (i.e. data error and individual differences: inadequacy of TEC) are considered to be inevitable counter accounts of the results.

6.4.2 Interpretative phenomenological analysis (IPA)

Supplementing the methodological contribution afforded by 'convince me,' is an IPA of participants' discourses that emerged during the elicitation of the participants' causal belief maps. The IPA produced four broad master themes that characterised a number of dimensions of decision-making that were not appropriate for inclusion within the 'convince me' models, but were deemed important for a more comprehensive understanding of the nature of Fund Managers' decision processes and the environments they operate within. The insights derived from this analysis are discussed below and are accompanied by a number of implications for progressing theory.

The first master theme 'the art of fund management' uses the concept of idealist rationality as a backdrop for the construction of participants' views surrounding Fund Managers' decision-making. Contra to pure implementations of rationality, particular attention was
drawn to the bounded nature of rationality through the existence of bias and prejudices. It also represented participants’ re-definition of fund management as an art as opposed to a science and the inextricable link between emotion and action. This analysis suggested ‘credibility’ and the establishment of ‘rational constructs’ to infiltrate early stages of the decision-making process i.e. when deciding what constructs to use and the relative importance of specific attributes during stock screening activities. The use of ‘credibility’ from the Fund Managers own inductive accounts, draw obvious parallels to ‘convince me’ in the use of ‘believability’ and ‘reliability’ in the establishment of coherence.

The second master theme described - ‘order in the fund management world’ clustered around three broad themes. These centred upon the role of organisational rules and norms and the existence of structural components of the investment house in guiding Fund Managers’ cognition (including parameters restricting the nature of investments). It also emphasised the dynamic and embedded nature of their decision-making. The continuously changing and superfluous nature of decision environments was shown to challenge participants’ achievement of coherence. One limitation of ‘convince me’ revealed by this analysis, is that as an architecture it presumes a discreteness or what may be termed an ability to bound the information environment.

Emerging discourse also highlighted the role of team-based decision-making and in particular the value of diversity with those teams. This dialogue also emphasised the act of accepting or challenging other’s judgements as an inherently socio-cognitive activity. Judgements of this nature reflect the basic tenet of ‘convince me’ in which coherence is determined across a network of knowledge and beliefs.

The third master theme ‘exploiting the market: practices in fund management’ delineates some of the practices in fund management that emerged from participants’ discourses. These included the impact of individual differences upon participants’ investment style. For fund-of-funds investment houses, investment styles had a more qualitative focus as opposed to equity-based investments that yielded a higher quantitative component by virtue of the focus upon valuation parameters. As suggested in this analysis, the basis from which coherence is achieved as an individually, socially and institutionally driven process, is one that is reflected in the structured approach of ‘convince me’ to the representation of cognition in a way that permits heterogeneity.
This analysis also drew attention to participants' assumptions of market efficiency and the inextricable tie this has to valuation and the adoption of contrarian positions. The belief in market inefficiency and as a consequence the existence of arguments against particular ideas, add to the practical difficulties experienced in finding 'coherence' within arguments.

A final point to emerge surrounded the paradoxical use of past performance as indicators of future states. Whilst the disseminated disclaimer that past performance is not indicative of the future is contradictory with the practice of fund management, it is noteworthy to highlight the congruence that exists between the reality of Fund Managers' decisions and the mechanisms underpinning 'convince me.' For instance, Fund Managers use of past (and projected future) performance as a point for valuation is reflected in the specification of hypotheses and statements of evidence based upon what is already known in 'convince me,' which augments the appropriateness of this architecture for this type of decision-making.

The final master theme 'making sense of complex information environments' focused upon the manner in which participants' made sense of the environments in which they operate. It emphasised participants' use of sense-making through conviction and the reliance upon knowledge, experience, intuition and trust in order to make sense of the opacity in information that exists within this industry. The idea that 'coherence' could be achieved through sense-making is grounded in participants' use of a number of concepts. For example, 'conviction,' 'comfort,' 'reasonability,' 'believability' and 'sense checks' were all used to in order to make sense of the accuracy of information. These in conjunction with 'trust' are equivalent to the judgements of reliability used in 'convince me.' 'Analogy' also emerged as a mechanism for dealing with conflicting agendas during sense-making and corresponds with TEC's instantiation of analogy for determining explanatory coherence.

6.4.3 Methodological contribution

Concluding this discussion is an examination of the degree to which 'convince me' and the IPA have been successful in addressing the call for inter-disciplinary collaboration and providing insights to the research questions posed at the start of this chapter.

The first research question to be considered pertains to the issue of whether NDM can elicit value from formal modelling applications? Particular utility has been drawn from the concept of explanatory coherence and ECHO's connectionist instantiation of the sense-making process. These complement the NDM literature in a number of ways, not least in the
parallels that exist between the models produced in ‘convince me’ and Montgomery’s concept of dominance structures.

Value may also be drawn from ‘convince me’ in addressing the challenge of theoretical refutation currently facing the field of NDM. The simulations produced in this study permitted an explicit test of data-theory fit using the theoretical conjectures of TEC. Note that whilst paralleling NDM thought, TEC is not explicitly a NDM theory. This study opens the possibility for the development of models along similar lines within the NDM community that provide a critical test of their own theoretical assumptions.

This leads to the question regarding the appropriateness of the quantitative-qualitative divide facing the NDM community. By the above arguments, this study suggests the quantitative-qualitative divide to be fundamentally inappropriate for the naturalistic study of decision-making and cognition. Indeed, the intersection of findings across this divide (as documented in the discussion of the IPA) resonates throughout this study and demonstrates the value of combining quantitative approaches with interpretative forms of inquiry.

Concomitant with the situated approach of NDM and practice turns in contemporary theory this study has also provided insights into the orders and practices that exist within the investment industry and the role these play in guiding cognition. These contextual underpinnings add much to the understanding of Fund Managers’ decision processes that would not have been obtained through ‘convince me’ alone, highlighting the utility of supplementing exploratory research with more interpretative methods.

With regard to the methodological challenges faced by the managerial cognition this study has made a number of contributions. First, it has demonstrated utility in the use of the connectionist architecture ‘convince me’ as a means for integrating the strengths of beliefs into causal maps. Second, it has permitted the representation and comparison of causal belief maps on the basis of their overall coherence as opposed to proximal measures of similarity / dissimilarity. The combination of a naturalistic approach to data elicitation and connectionist modelling has also suggested potential in the integration of computational and interpretative thinking by demonstrating the symbolic representation of socially-situated cognition.

To conclude, a final question posed at the start of this chapter concerned the benefits of studying Fund Managers’ decision-making from NDM a perspective. This study has made a contribution in locating the point of study at the intersection of cognition and the
environment. In emphasising the ‘insider’s perspective’ the IPA has informed understanding of the way in which complex information environments are both conceptualised and negotiated. Whilst, the modelling using ‘convince me’ has suggested utility to exist in the conceptualisation of decision-making as a process of sense-making denoted by the establishment of coherence as opposed to one of probabilistic choice among options that is concerned with the maximisation of utility.

6.4.4 Limitations

There were a number of limitations that emerged during this study that specifically relate to the use of the ‘convince me’ modelling architecture. First, is the issue of delay between Time₁ (elicitation of causal belief maps) and Time₂ (ratings task). This was due to under-estimation of the time required to construct the models in ‘convince me.’ For the practitioner the ‘convince me’ architecture is a method that is not time-efficient in practice.

There also existed a number of limitations concerning the assumptions of the ‘convince me’ connectionist-settling method ECHO. As discussed earlier the parametric assumptions made upon the data limited the success of some of the models. Although the use of parametric assumptions cannot be adjusted according to distributions of each data set, manual calculations using non-parametric measures of correlation can be used to overcome this difficulty. ‘Convince me’ also displayed difficulty by virtue of the connectionist-settling scheme in modelling decisions that exhibited dominance structures. As such this modelling architecture is perhaps more suited to modelling cognition at earlier stages in the decision-making process.

A final point to raise that stems from the IPA, is that participants’ knowledge and reasoning are largely embedded and as such are hard to express as specific relations within a causal belief map as ‘convince me’ requires. Whilst, this is not a problem unique to ‘convince me’ (indeed it is problematic for all cognitive mapping methods) it highlights the utility in understanding the embedded nature of Fund Managers’ cognition as afforded by IPA.

6.4.5 Future Directions

A number of directions for future research that build upon this study exist and are outlined as follows. First, from a methodological point of view it would be interesting to assess the potential of ‘convince me’ as a method for understanding Fund Managers’ cognition earlier in the decision-making process. This would circumvent the issues arising surrounding the
elicitation of dominance structures and would also provide clarity on the relationship between skewed data sets and the elicitation of dominance structures.

A second direction concerns the degree to which the concept of explanatory coherence is evident in the task-focused study of expertise and is not merely a function of the ‘convince me’ method used in this study. Further cross-validation of these concepts might be useful. The degree to which the socially situated approach of IPA is useful in complementing not just quantitative methods such as ‘convince me,’ but also qualitative methods such as ACTA, also presents a fertile ground for future examination. Finally, in line with the attenuated form of naturalistic conditions exhibited in the study of Fund Managers (Study II) relative to Portfolio Managers (Preliminary Study), it might be of utility to examine the decision-making of Day Traders. It is these research directions that form the basis of Chapter Seven - Study III.

6.5 Concluding Remarks

This chapter has outlined a second study that builds upon the findings of Chapter Five by demonstrating the utility of ‘convince me’ in addressing the methodological challenges of NDM and managerial cognition. The application of connectionist architectures coupled with the insights drawn from the IPA have been integral in informing epistemological-methodological debates and by consequence setting a new agenda for methodological practice within these fields. Chapter Seven continues to explore the boundaries of useful cross-fertilisation examining the sense-making process and the utility in the concept of coherence through ACTA’s task-based method.
CHAPTER SEVEN

Study III: An Examination of Day Traders’ Decision-Making

7.1 Introduction

The overarching objective of this thesis is to bridge methodological advances that have occurred across NDM and managerial cognition. Chapters Five and Six have revealed the potential of ‘convince me’ and ACTA to this means. Continuing this methodological thread, this next chapter builds upon the cursory conjectures of Chapter Five, by examining the promise of ACTA in more detail.

This introduction continues with the statement of the key issues to be explored and a review of the existing day trading literature in order to provide a context for this study. The selection of Day Traders as a focus for this investigation is justified herein. The rationale for the adoption of a situated approach that uses IPA is then outlined, as is statement of the study’s aim. This chapter then outlines the methods underpinning this study and uses a number of illustrative examples to consider the results derived from ACTA and the IPA. The chapter closes by considering the implications of these results and by underscoring a number of directives for future study.

7.1.1 Key issues explored

The key issues to be explored are as follows:

- To examine the degree to which inter-disciplinary collaboration might address the methodological challenges associated with NDM and managerial cognition
- To understand the benefits of studying Day Traders’ decision-making from a NDM perspective

In particular it is envisaged that this study will contribute towards understanding of the following research questions:
(i) Do structured approaches to the elicitation and representation of cognition drawn from outside of the field of managerial cognition permit cognitive heterogeneity?
(ii) What managerial cognition can draw from understanding the situated nature of cognition?

7.1.2 Background – NDM and Day Traders

This shift of focus in previous chapters from Portfolio Managers to Fund Managers (Chapter Five to Chapter Six) is echoed in this chapter, through the decision to locate this study within the context of day trading. The rationale for the authors’ choice in day trading is rooted in two beliefs: (i) Day Traders’ decision-making encompasses the principles of NDM in an attenuated form and (ii) the limitations of existing day trading perspectives could benefit from a NDM approach. These are discussed in detail below.

The choice in Day Traders’ as the focus for this study has evolved in response to the exploratory findings of Chapter Six. Using Orasanu and Connolly’s (1993) typology of NDM, Study II found that Fund Managers’ decision-making was principally marked by uncertain and dynamic environments, action / feedback loops, high stakes, multiple players and organisational goals and norms. Put simply, Day Traders’ decision-making provides a manifestation of these principles in a more attenuated form. To illustrate, the uncertain and dynamic environments experienced by Fund Managers are magnified for Day Traders by the comparatively fast-pace of markets in which they work. Consequently, the pace at which Day Traders receive feedback based upon their action is almost immediate due to the intraday trading of positions. The high stakes associated with such transactions are amplified in relation to Fund Managers’ decisions, due to the uncertainty and risk associated with the short-term volatility of markets and the exposure to one commodity, as opposed to Fund Managers’ long-term, diversified investments.

Not only are those characteristics of NDM exhibited by Day Traders comparatively more acute than Fund Managers manifestations, but Day Traders’ decision-making addresses a further two characteristics of NDM specified by Orasanu and Connolly (1993). First, unlike the investment professionals studied so far, Day Traders operate with a significant amount of time stress, often necessitating instantaneous calls of judgement. As outlined above, this is directly attributable to the precariousness of markets. A second characteristic is the shifting goals Day Traders experience. Whilst the overarching objective is to create profit, the natural fluctuation and pattern of markets may necessitate changes in trading strategies (i.e. trading ranges or jobbing) and positions (i.e. long / short). Day trading environments are highly
structured and regimental and as such, are not considered to fulfil the ill-defined component stipulated by Orasanu and Connolly.

Despite this congruence, day trading has not been examined from a NDM perspective. This leads to a second point of this study's rationale namely, that existing perspectives could benefit from a NDM approach. The core of research into Day Traders' decision-making has been viewed through a behavioural finance lens. An emerging trend within the social sciences has been the integration of social psychological concepts in an endeavour to understand the nature of Day Traders' expertise. What follows is a summary of some of the main limitations of this existing research:

(i) **Conceptualising expertise**
An unanticipated conclusion drawn from Mieg's (2001) theoretical exposition of the financial forecasting literature is that forecasting expertise is not experience driven. In so doing, he denounces a strong form of expertise rooted in individual experience, for a weak form that results from the use of information or technology. The basis of this conclusion is grounded in literature that is methodologically impaired (See also (iii) below). Moreover, whilst he highlights the "intricate recursivity and interdependence of participants (and their actions)" (p.122), he suggests Day Traders lack insights in the complexity that drives the market. An assumption fundamentally disputed within this thesis.

(ii) **Use of laboratory settings to compare expert–student performance**
In examining the role of experience in financial markets, research within behavioural finance has displayed a tendency to compare expertise in relation to non-domain participants within artificial environments. See for example, Anderson and Sunder's (1995) comparison of laboratory market behaviour between experts trading commodities / stocks and MBA students. The value of knowing that trading experience was a determinant of how well market outcomes approximated efficient market predictions and bias levels in markets is inherently limited when the comparative basis is students.

(iii) **Probabilistic forecasting**
Research has also studied stock price forecasting using probabilistic judgements of the likelihood of price increases or decreases (Stael von Holstein, 1972). Research of this type has unsurprisingly been met with limited success. As Mieg (2001) notes, experimental tasks of this nature lack the realism necessary for informative conclusions, as in reality stock prices are judged directly, not in terms of categorical
judgements of probabilities. Research of this type also fundamentally neglects the role of social networks and inter-correlated markets as a basis of informational leverage.

(iv) Personality profiling and risk

The integration of social psychological concepts has led to a proliferation in the personality profiling of Day Traders in relation to risk propensity (Fenton-O'Creevy et al., 2005). The limited insights this approach has afforded, coupled with Fenton-O'Creevy et al.'s suggestion that risk propensity is only one factor in Day Traders' behaviour, suggests value in an approach that gives credence to context, training and socialisation.

(v) Evolution of expertise

On the evolution of Day Traders' expertise, Fenton-O'Creevy et al. (2005) have outlined a process of expertise acquisition: anticipation, encounter, adjustment, and stabilisation. However, the process specified operates at such an abstract level that it could extend to any domain. Fenton-O'Creevy et al. have justified this process using qualitative interviews suggesting the most pertinent episodes shaping trading styles to include early experiences of loss / gain, emotional experience of the former and beliefs about the market (based upon cause and effect and decision outcomes). However, this process could benefit from a more intimate interaction with Day Traders' tasks.

In response to the above, this study defends the use of a naturalistic method to better conceptualise and understand the nature of Day Traders' decision-making. As such, the focus of this study is to examine Day Traders' decision-making in their 'own terms,' with an intrinsically more 'task focused' approach (using ACTA) than typically has been afforded to date. The acknowledgement for a more situated approach to understanding their expertise as proposed by Fenton-O'Creevy et al. (2005) is outlined below.

7.1.3 Situated approach

This section provides a justification for the use of IPA to complement the ACTA method. As demonstrated in Chapter Six, there is value to be gained in adopting nested approaches to data collection that harness data from a variety of perspectives in order to achieve a completeness of the whole. Indeed as Schatzki states "...practices, meanings, objects and mental contents are inextricably intertwined" (Schatzki, 2001: p.12). This is a view resonated by Collins (2001) who advocates an "interactional expertise" whereby ...
"... the idea of polimorphic action and social embedding is the most fundamental notion."

(Collins, 2001: p.117)

Polimorphic actions are defined as those that depend upon context and local convention for interpretation and propagation. Schatzki suggests the discursive nature of language to be an appropriate medium for developing understanding:

"Actions, for instance, are embedded in practices, just as individuals are constituted within them. Language, moreover, is an activity (discursive) and hence a practice phenomenon, whereas institutions and structures are effects of them."

(Schatzki, 2001: p.3)

This forms the basis of the rationale in favour of complementing the structured approach of ACTA in uncovering the mental contents of decision-making, with an IPA in order to understand the broader forces shaping cognition and action. A final point upon which to conclude this section, makes reference to the impact of this approach upon the current state of the art in managerial cognition:

"To some extent the adoption of these alternative determining factors is part of a general anti-Cartesianism in contemporary academic culture that sees 'mental states' as irredeemably contaminated by the 'Cartesian' interpretation of them as occupants or aspects of a distinct space or realm."

(Schatzki, 2001: p.7)

Giving precedence to the interaction that arises between cognitive states and social context forms the backbone of this study on Day Traders' expertise.

7.1.4 Study objective

The objective of this study is to explore the potential of ACTA as a point of methodological exchange between NDM and managerial cognition. This is complemented by the completion of an IPA, with the aim of understanding in more detail the social-psychological basis of Day Traders' cognition and action.

7.2 Method

7.2.1 Domain specific knowledge: Day trading

See Appendix Eleven for a summary of the acquisition of domain specific knowledge.

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7.2.2 Design

This study uses a mixed-methods concurrent nested design. Whilst, most mixed-methods classifications (including Hanson et al.'s (2005) typology) assume a bridging of qualitative and quantitative methods, the design of this study differs in that it seeks to draw upon two different modes of qualitative inquiry. The principal objective of this study lay in the use of ACTA as a qualitative method to map Day Traders’ expertise. This was complemented by an IPA that sought to draw upon the abundance of data generated by ACTA. It was also envisaged that the IPA would aid in the contextualisation of trading practices and understanding of Day Traders’ social construction of reality.

7.2.3 Participants

The sample comprising this study consisted of eight Day Traders (eight Male; Mean age = 34.75 years; SD = 5.50) recruited from four trading firms. All participating firms were authorised and regulated by the Financial Services Authority (FSA). Participants had worked in the industry for an average of 10.9 years (SD = 4.22), and had acquired an average of 4.8 years of experience (SD = 2.97) within their current position. Day Traders interviewed occupied positions ranging from Director of Trading to more junior positions. The types of trading firms that participated are summarised in Table 7.1 overleaf:

All participating firms had divisions that traded with a proprietary element i.e. trading for a direct profit from the market rather than earning commission from processing trades. Whilst, participants were recruited from within these divisions, the focus of trading varied across firms. For instance, participants recruited from Banking and Energy Providers principally traded power commodities. Participants from Brokerage Firms traded Foreign Exchange (FX) and in one instance Bullion. It is important to emphasise that whilst the principal focus of participants was day trading, four of the power Day Traders interviewed also used swing trading as a method for capitalising on market movements.

All participants used derivatives (defined as financial instruments whose price and value derive from the value of underlying assets) as trading mechanisms. Financial instruments traded by participants within these derivative transactions included futures (62.5%); forwards (87.5%); swaps (75%) and options contracts (75%). Note that futures are defined as a contractual agreement to buy or sell an asset at a pre-determined price in the future. Forwards are an agreement to buy or sell a commodity or financial instrument at a pre-agreed future point in time. Unlike futures contracts (which occur through a clearing firm) forward contracts are privately negotiated and are not standardised. Swaps are defined as a
Table 7.1: Distribution of Participating Trading Firms and Day Traders
Per Trading Firm Type

<table>
<thead>
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<th>Type of Trading Firm</th>
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<tr>
<td></td>
<td>Banking</td>
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<tr>
<td>Participating Trading Firms (n = 4)</td>
<td></td>
</tr>
<tr>
<td>Participating Day Traders (n = 8)</td>
<td>1</td>
</tr>
</tbody>
</table>

| Participating Day Traders (n = 8) | 1 | 4 | 3 |
contract whereby two counter-parties exchange cash flows dependent upon the price of an underlying asset. Options contracts involve the right but not the obligation to buy or sell a specific amount of an asset at a specified price during a specified period of time.

All eight firms were trading members of the Intercontinental Exchange (NYSE:ICE), which operates an electronic futures and options exchange for global energy markets. Firms were also affiliated with Euronext.liffe (one of the leading international derivative markets offering futures and options on interest rate products and commodities); The London Metal Exchange (LME); The London Bullion Market Association (LBMA); Eurex (Leading futures and options market for Euro denominated derivative instruments) and New York's Commodity Exchange (COMEX) (Dominant precious metals exchange).

Assets traded included energy, bullion i.e. gold, silver or palladium (commodity derivatives), FX rates (currency derivatives) and weather (weather derivatives). Only one participant was involved in portfolio management and one in execution only / with advice activities. Of the participants interviewed 50% had received training. The manner of training ranged from on desk tuition to in-house training courses, internal MBA’s and externally arranged events.

7.2.4 Materials
The ACTA techniques were used to elicit Day Traders’ expertise. The ACTA multi-media instructional CD and booklet (Militello, Hutton and Miller, 1997) was used in preparation for the interviews. These were used to form a set of instructions for eliciting knowledge and a booklet for recording data generated during stages 1 and 2 to ensure procedural similarity. The instructions used to structure the interviews can be found in Appendix Three. These are broadly similar to those used in the Preliminary Study (Chapter Five), with only minor amendments. The amendments pertained to the ‘tricks of the trade’ aspect of expertise and involved the de-Americanisation of the phrases ‘working smart’ and ‘accomplishing more with less.’ These were replaced with the term ‘rules of thumb,’ which was deemed to be less patronising and less ambiguous for an English audience. These changes occurred in response to criticisms of the language used during the Preliminary Study. In terms of knowledge elicitation, the interview was structured as follows:

**Stage 1:** The ‘task diagram’ interview, aiming to provide a broad overview of the task, identifying areas requiring complex cognitive skills.

**Stage 2:** The ‘knowledge audit,’ focusing on a cognitive sub-task from stage 1 identifying cues and strategies used and elements that may present difficulties for novice Day Traders.

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Due to the limited time available with each Day Trader ‘stage 3: simulation scenario’ was not conducted.

7.2.5 Procedure

The design of this study permitted data collection at one point in time, despite the use of a mixed-methods nested approach. As such, the procedure is addressed in two sections: (i) principal data collection and analysis using ACTA and (ii) data analysis using IPA. An illustrative example of the entire data collection and analysis process for Day Trader (F) is outlined in Figure 7.1 (page 178).

Data collection and analysis: Applied cognitive task analysis (ACTA)

Information sheets were presented to participants at the start of each interview. These were used as a means of clarifying the goal of the interview and provided a starting point for discussion and the establishment of rapport. The purpose of the information sheets was also to provide a formalised means of assuring participants of the confidentiality of interview content, their identity and firm affiliation. It also provided a means for obtaining permission for any subsequent use of the data and to digitally record the interview.

Data collection using ACTA took an average of 2 hours 20 minutes per participant. This included pre-interview and post-interview discussions, email correspondence, telephone contact and one-to-one meetings. This reflects the proportion of time in addition to the ACTA interviews spent not only with participating Day Traders and Directors of Trading, but those who operated as initial points of contact. This additional period of data collection provided a foundation for establishing rapport with key personnel during the recruitment process and provided invaluable insight into the nature of day trading practices.

Each interview (formally defined through the use of ACTA) lasted between 50 minutes and 1 hour 35 minutes. The interviews opened with a discussion of the current research study and provided an opportunity for the participant to ask any questions. It then progressed to allow discussion of the types of financial instruments and assets traded. This was integral to the establishment of researcher-participant rapport early on in the interview process. Once familiar with the domain of expertise, stages 1 and 2 of ACTA were completed. During stage 1, participants were allowed to freely map an overview of their chosen task. During stage 2 the researcher recorded notes in a ‘knowledge audit’ table.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negotiation of Access: Correspondence</td>
<td>(30 minutes)</td>
</tr>
<tr>
<td>Pre-Interview Discussion</td>
<td>(20 minutes)</td>
</tr>
<tr>
<td>ACTA Interview: Stages 1 and 2</td>
<td>(1 hour 25 minutes)</td>
</tr>
<tr>
<td>Interview Transcription</td>
<td>(12 hours 30 minutes)</td>
</tr>
<tr>
<td>ACTA Data Analysis: Stages 1 and 2</td>
<td>(10 hours)</td>
</tr>
<tr>
<td>ACTA Data Analysis: Integration into 'Cognitive Demands' Table</td>
<td>(6 hours 15 minutes NB)</td>
</tr>
<tr>
<td>IPA: Initial Iteration Identifying Preliminary Themes</td>
<td>(4 hours)</td>
</tr>
<tr>
<td>IPA: Organisation of Themes into Clusters of Shared Meanings</td>
<td>(1 hour NB)</td>
</tr>
<tr>
<td>IPA: Formal Arrangement of Master Themes and Sub-Themes</td>
<td>(2 hours 45 minutes NB)</td>
</tr>
<tr>
<td>IPA: Iteration of Transcript to Ensure Grounding</td>
<td>(1 hour)</td>
</tr>
<tr>
<td>IPA: Selection of Representative Quotations From Transcript</td>
<td>(1 hour)</td>
</tr>
<tr>
<td>IPA: Write-Up</td>
<td>(4 hours NB)</td>
</tr>
</tbody>
</table>

Figure 7.1: Illustrated Data Collection and Analysis for Day Trader (F)

NB¹: The reported time is a proportionate amount based upon the total time for the task divided by participants.
Following data collection, each interview was transcribed. This task typically took between 5 hours 50 minutes - 8 hours 18 minutes (50 minute interview) and 11 hours 5 minutes - 15 hours 50 minutes (1 hour 35 minute interview) as dependent upon interview length. Transcribed interviews were in the range of 6,903 words to 17,185 words, resulting in a total analysis of 101,222 words. The average transcript was 12,653 words in length. An illustrative transcript is provided in Appendix Twelve.

The creation of ‘task diagrams’ and ‘knowledge audit’ tables for each participant was a largely iterative process between the researchers’ notes and participants’ diagrams recorded during the interview and the transcript. This process ensured technical accuracy and the correct representation of concepts and processes. Each ‘task diagram’ and ‘knowledge audit’ typically took between 6 – 10 hours to construct per participant. The ‘knowledge audits’ were then merged to produce a ‘cognitive demands’ table that represented those key elements that present difficulty for less experienced Day Traders. This process took in the region of 50 hours and involved the thematic arrangement and synthesis of data across the eight participants.

Data analysis: Interpretative phenomenological analysis (IPA)

In a similar vein to the process outlined in Study II (Chapter Six), the transcripts generated from ACTA were used as a basis for the IPA. A preliminary list of themes was constructed from initial encounters with each transcript, which sought to identify emerging themes and their inter-connections. Typically, this process took an average of 4 hours to complete per transcript. Clusters of themes were then organised in a form that reflected shared meanings and the nature of inter-relations between themes. This was a largely iterative process requiring multiple readings of transcripts and the re-organisation of themes. The final stage of the IPA required the formal arrangement of themes into master themes and their constituent sub-themes. This interpretative structure was once again compared to transcripts to ensure grounding in data. The point of completion was identified when all knowledge common to the transcripts had been integrated into the master and sub-themes. This process of analysis took approximately 38 hours in total.

7.3 Results

The results from this study are addressed into three sections: (i) a descriptive overview of the Day Traders’ decisions is provided, (ii) the findings drawn from ACTA are reviewed and (iii) a summary of the results obtained from the IPA is then presented with the objective of contextualising the Day Traders’ practices.
7.3.1 Descriptive overview of Day Traders' decisions

Prior to the presentation of the ACTA results a descriptive overview of the decisions made by the Day Traders is provided. The types of contracts traded varied according to the type of asset i.e. Energy, FX or Bullion (Although all participating Day Traders specialised in derivatives contracts). This was by implication, related to the type of trading firm i.e. Bank, Energy Provider or Brokerage. For example, Day Traders' from the Brokerage firms interviewed, concentrated their trading efforts in FX and Bullion. The effect of trading currency and commodity derivatives was that their positions were typically closed within day or overnight (i.e. day trading in it's most definitive form). Day Traders recruited from Banks and Energy Providers (in this study) typically traded power (i.e. natural gas and oil) and weather derivatives. The nature of positions taken therefore included within day, swing trades (positions held for a few days or a few weeks) and/or long-term contracts.

Despite longitudinal variation in positions adopted, the financial instruments traded (i.e. futures, forwards, swaps and options) tended to be similar. The only exception was the use of spot trades in FX transactions. Spot trades in FX involve the purchase of a foreign currency for immediate delivery and are thus settled “on the spot” as opposed to a specified future date. Spot transactions are therefore broadly conceived of as being the opposite of future contracts i.e. futures contracts usually expire prior to physical delivery. FX contracts generally take this form with compensation expected for the time value of money (for the duration of the delivery) if a spot contract is not settled immediately. (Although futures transactions that expire in the current month are also regarded as spot trades because in the case that goods are delivered, delivery time is expected to be 1 month).

Micro level decisions within the aforementioned derivative contracts included buy or sell positions on the forward curve. These were informed by sub-decisions pertaining to the Day Traders' market view and consequently the adoption of long (the purchase of an asset on the expectation that it will rise in value) or short (the purchase of an asset on the expectation that it will fall in value) positions, risk and the execution of appropriate stop loss orders (an order to sell a security when it reaches a specified level in order to limit losses). Decisions were also framed by the extant state of play of Day Traders' Profits and Losses (P&L). For those trading power and weather derivatives (i.e. within Energy Providers and Banks in this study) the seasonal changes that occur in supply and demand additionally underscore Day Traders' choice in trading strategy.
Decisions were at their most broad level, underpinned by activities of fundamental analysis, technical analysis and market sentiment. Fundamental analysis is essentially a method of evaluating a security through the assessment of its intrinsic value by considering related qualitative and quantitative factors i.e. macroeconomic variables. Technical analysis is quantitatively based and attempts to evaluate securities through examination of past market activity i.e. price and volume. In contrast to fundamental analysis, technical analysis does not aim to measure a security's intrinsic value, but seeks to identify patterns from historical performance that are indicative of future activity. Finally, Day Traders' also relied upon market sentiment i.e. the beliefs of the market as a whole, which is reflected in market activity. The degree to which these elements were weighted in Day Traders' decision-making varied across participants.

Finally, variation existed in the trading styles adopted by participants. Some participants were more naturally inclined to create value through the identification of overall bull market / bear market trends. Others were more adept at identifying and exploiting weaknesses in counter-party trading activities or spread trading (i.e. the exploitation of small price gaps within bid-offer spreads). Finally, other Day Traders sought profit from the adoption of contrarian positions, from news playing (i.e. profiting from the volatility created from emerging news releases) and from range trading methods (i.e. creating value from an asset that is fluctuating within a specific price range that is bounded by a support and a resistance price). Depending upon the technique adopted, the frequency of trades therefore varied greatly between Day Traders i.e. spread and range trading methods produce quick profits from small moves in contrast to positions on bull or bear trends which will take longer but, provide a stronger move.

7.3.2 Applied cognitive task analysis (ACTA)

The results derived from Stages 1 and 2 of ACTA are presented using three illustrative examples. Data obtained from the 'knowledge audit' (stage 2) is synthesised across all participants and represented in a 'cognitive demands' table. The results are presented in sequence below:

Illustrative example 1: Day Trader (C) (FX and Bullion Trader, London)

Background demographics

Day Trader (C) is 25 years old and holds seven years of experience within the investment industry, four years of which was administrative prior to moving to the trading desk. Working for a brokerage firm in the city, this Day Trader has acquired three years of
experience trading FX and Bullion. Principal financial instruments utilised include spot, futures, swaps, options and forward transactions. He also offered execution only / with advice services to clients. Day Trader (C) received decision-making training in the form of on desk tuition.

Stage 1: Task diagram

The ‘task diagram’ for Day Trader (C) focuses upon ‘FX Spot Transactions.’ Figure 7.2 (page 183) provides the ‘task diagram’ elicited by Day Trader (C). The four broad components underpinning the decision-making process and execution of ‘FX Spot Transactions’ are considered in turn.

The first component involves establishing what currency pair is going to form the basis of the trade? This could include the 5 majors i.e. Dollar–Yen (USD–JPY), Sterling–Dollar (GDP–USD), Euro–Dollar (EUR–USD), Euro–Sterling (EUR–GBP) and Dollar–Swiss (USD–CHF) or exotic currencies i.e. Indonesian Rupiah (IDR) from emerging markets. This stage is likely to be marked by Day Traders’ attention to news releases and their assessment of its likely impact upon foreign currencies.

The second stage of the diagram involves decisions related to currency pair performance i.e. which currency is going to perform or not perform? This decision is driven both by technical analysis i.e. historical performance of market data and fundamental analysis i.e. data or news releases and factors such as the price of oil and its impact upon currencies.

The third broad stage entails decisions regarding the size of the trade and level at which the market will be entered. This may involve the identification of a level, that if broken a given security is bought, or the identification of a dip in the market as an opportunity to buy. Technical analysis drives this stage through consideration of resistance and support levels on chart points. One mechanism used by Day Trader (C) to identify levels is Fibonacci retracements. Fibonacci retracements are used on the premise that any given security will retrace a percentage of the previous move before reversing. These often occur at three levels: 38.2%, 50% and 61.8% (Note that the Fibonacci levels reported in Appendix Twelve by Day Trader (C) are incorrect, but serve the purpose of illustrating their usage). The patterns exhibited reflect corrections in the market and as such represent opportunities to buy into a given market. A second method used by Day Trader (C) is Elliot Wave Theory. Here the emergence of impulsive waves inline with the main trend, often display five waves in its
pattern. Impulse waves denote the corrections against the trend that occur. The initial move up is often a Fibonacci level and is denoted by a small correction. The second correction wave increases in magnitude, whilst the third is the longest and is therefore considered the main driver. The fourth wave continues this trend, whilst the fifth marks the involvement of the masses before the trend cuts out.

The final stage of the ‘task diagram’ involves the selection of levels from which a given position is exited. This is integral for both instances where profit has been maximised and capital needs to be locked in and instances whereby a position is losing money and needs to be stopped out to maintain a positive P&L.

**Complex component**

The third stage i.e. size of the trade and entry levels, was identified as the most cognitively complex component within Day Trader (C)’s ‘task diagram’ and formed the focus for the rest of the interview.

**Stage 2: Knowledge audit**

Table 7.2 (page 185-186) provides a synopsis of Day Trader (C)’s ‘knowledge audit.’ Due to the wealth of data generated, the illustrative examples provided throughout this analysis seek to convey only the key components elicited.

**Illustrative example 2: Day Trader (A) (Director of Trading, London)**

**Background demographics**

At the time of interviewing, Day Trader (A) was 41 years old and had been working within this industry for 14 years. He had occupied his current position as Director of Trading of a leading Energy Provider for the last 5 years. Contracts traded include futures, forwards, swaps and options. The focus of his expertise is in oil futures, which are traded on a daily, swing and long-term basis. His role as Director of Trading also necessitates an element of portfolio management activities. Day Trader (A) has received decision-making training external to the firm at a leading UK Business School.

**Stage 1: Task diagram**

Day Trader (A)’s ‘task diagram’ depicts the broad stages involved in “Oil Futures Transactions.” Figure 7.3 (page 187) represents the ‘task diagram’ for this task. Day Trader (A) broke down the task into three key stages, which are addressed below.
Table 7.2: Illustrative Example 1: Knowledge Audit (Day Trader C)

<table>
<thead>
<tr>
<th>Aspects of Expertise</th>
<th>Cues and Strategies</th>
<th>Why Difficult?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Past and Future</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euro–Dollar (EUR–USD) currency pair trend last year. Market performed inline with previous and current expectations.</td>
<td>Use technical analysis to reveal daily trending up: (i) channel of higher highs and higher lows and (ii) increasing high of the day and low of the day; market performance to date has been in accordance with expectations; there is an expectation for the trend to continue rising; there is an element of comfort with emerging trend and position; “The trend is your friend” strategy is to immediately place a position on the emerging trend.</td>
<td>A novice may lack the conceptual understanding of trending; less experienced Day Traders may have insufficient knowledge of technical analysis methods to identify trends in market.</td>
</tr>
<tr>
<td><strong>Big Picture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The big picture involves tracking the fundamentals behind the currency that are driving the market (Monetary policy of Banks, inflation targets, interest rates, retail sales etc) i.e. Expected Federal Open Market Committee (FOMC) to leave interest rates on hold anticipating the US Dollar to be sold off afterwards.</td>
<td>React to data as it is released; ensure broader context surrounding figures is considered i.e. prices may exceed market expectations however, historically they may be poor numbers; appreciate that choppiness around figures following a release may reflect mixed views of market players; understanding other market players’ interpretations of data releases and likely actions; strategy¹: be proactive in front of data releases by leaving resting orders in the market i.e. “If-Done” and “Market–If–Touched” (MIT’s); strategy²: anticipate and exploit overnight currency movements in other markets i.e. long Dollar–Yen (USD-JPY) position.</td>
<td>Without experience and knowledge incoming data can be meaningless; novices may find it difficult to look behind the fundamentals; novices may struggle to anticipate how data releases will affect the market and how the market will react to certain data reports; may fail to consider the bigger picture surrounding the release of figures; may not understand that choppiness around figures following a day’s release is due to the mixed views of market players.</td>
</tr>
<tr>
<td><strong>Noticing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detecting market movements in minor currency pairs e.g. collapse of Thai Baht (THB) or significant price move of New Zealand Dollar (NZD).</td>
<td>Monitor market activity of major and minor currency pairs; experience suggests that large, rapid movements are usually driven by data releases (e.g. release of Monetary Policy statement expecting the Dollar (NZD) to weaken in New Zealand) or shock wave type releases (e.g. bomb explosion in New Zealand); strategy: “The trend is your friend” place a position immediately in response to rapid price movements in minor currencies; do not attempt to locate the source of movement until after bid has been placed or the opportunity will be lost.</td>
<td>Novices attention may not be directed towards movements within minor currencies i.e. it simply may not have been on screen; may be tempted to find out what is happening as opposed to immediate execution; dealing with position once acquired would present difficulties due to uncertainty surrounding cause and expected duration of movement; might find market starts to bounce; uncertainty makes picking exit levels a difficult task to execute.</td>
</tr>
<tr>
<td><strong>Rules of Thumb</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Playing the percentage game: Limiting risks and running profits i.e. Purchase of £1 million at 197 with a stop loss at 19650, on expectation that the market will rise. If price moved to 19710, you would not take 10 points. Taking 10 pips whilst risking 50 pips over the course of time would lead to a negative P&amp;L.</td>
<td>Play the percentage game: Give yourself the best opportunity to make money i.e. limit risks and run profits; determine downside by daily stop loss limits and percentage game i.e. risk; exit levels need to be more of a profit than stop levels; use technical and fundamental analysis to select levels based on anticipated market movement and view of market support; run positions further on the topside than on the downside; use the success / failure of prior trades to shape subsequent action i.e. if P&amp;L is negative, select levels in relation to stop loss.</td>
<td>Novices may find trading large capital uncomfortable, overawing and experience difficulty distancing themselves from the value of money traded; they may take profit too early i.e. 10-point move is £1,000 profit; may find the charts and trend lines afforded by technical analysis to be meaningless; novices may risk lower amounts and will therefore need to take profit more frequently to cover losses, than if less trades were placed with higher amounts of risk.</td>
</tr>
</tbody>
</table>

185
<table>
<thead>
<tr>
<th>Aspects of Expertise</th>
<th>Cues and Strategies</th>
<th>Why Difficult?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opportunities / Improvising</strong>&lt;br&gt;Identification of dip in market as an opportunity to buy e.g. Fibonacci retracement level on Euros (EUR) suggested an opportunistic level to buy prior to a rally in market (Overnight order bought €2,500,000 at 130140 and the next day market rose to 132).&lt;br&gt;Use of Fibonacci retracement levels to indicate buying opportunities; knowledge that Fibonacci retracements do not work on “reaction highs” (i.e. spooked up markets that crash downwards and do not move up due to a fundamental behind the move) can be used to discount dips in markets as “reaction highs”; knowledge of Elliot waves to anticipate market corrections; strategy - “Buy in dips, sell in rallies”: Hold position through surge until opportunity to sell; infer counter party positions i.e. market is long, so correction will stop people out.&lt;br&gt;Insufficient knowledge of Fibonacci retracement cues; difficult to identify buy opportunity; lack the experience to appreciate that the dip does not always indicate a rally; erroneous expectation for dip to bounce when it may be a collapse; confusion of a rally in market with “reaction highs”; failure to attend to news that would indicate a “reaction high” that does not change fundamentals but, creates a reaction within the market, will not have acquired the intuitive modes of thought to anticipate market correction levels.</td>
<td><strong>Self-Monitoring</strong>&lt;br&gt;Identifying cause of trading losses last year. Consequently changed market view of Euro and trading strategy to ranges.&lt;br&gt;Negative P &amp; L is an indicator of an inefficient trading strategy; step back and consider trading method and its appropriateness to market performance; assess any changes in market conditions i.e. movement from trending markets to range-bound markets; strategy¹: change market view i.e. Erroneous view that Euros were rising was matched with a trading strategy that bought Euros regardless of market conditions; strategy²: change trading strategy i.e. trade ranges; strategy³: do nothing if unsure where market is going.&lt;br&gt;Novices may not appreciate the importance of adapting their strategy; may not know how to pick themselves up from a negative P&amp;L; inexperienced Day Traders may find it difficult to assess the point at which they need to stop or cut down their positions if a trading strategy is proving unsuccessful; may lack the confidence to sit back and refrain from placing a trade.</td>
<td><strong>Anomalies</strong>&lt;br&gt;Exploitation of FX spread price anomalies through price arbitrage for the exotic Maltese Lira (MTL) and the Euro (EUR).&lt;br&gt;Spotting errors in spreads (i.e. discrepancies between bid and offer prices) across Bank platforms i.e. Euro spread at Bank A is 68 / 69 (Buy at 68 / sell at 69) whilst at Bank B it is 70 / 71 (Buy at 70 / sell at 71); strategy: exploit anomaly by trading between platforms (i.e. buy at 69 from Bank A and sell to Bank B for 70, for profit).&lt;br&gt;Novices may find it difficult purely on the basis that the anomaly does not normally stay like that for long due to the rise in the number of ‘arbitrage traders’ waiting for such opportunities.</td>
</tr>
</tbody>
</table>
Fundamentals

Supply    Demand    (Flows)

Sentiment    (Fundamentals)

Relationships
  *Game theory

Governance
  Limits
    - Credit
    - Position

Buy / Sell

Stop / loss Run

Fight
Flight
Rabbit headlights

Figure 7.3: Illustrative Example 2: Task Diagram “Oil Futures Transactions” (Day Trader A)
The first stage is broadly concerned with analysis. As depicted in Figure 7.3, this includes fundamental analysis in the form of supply / demand flows. It also includes qualitative analysis surrounding market sentiment on a given day i.e. How are the fundamentals being interpreted? A further sub-component of this stage draws upon knowledge of relationships within the market i.e. “who else is in the game?” Day Trader (A) describes this element to be integral in informing his game theory, through anticipation of how other counter party players will react to certain positions. The final component of this stage concerns the governance of credit and position limits. The aforementioned components all feed into a second stage which Day Trader (A)’s marks as a simple “Buy / Sell” decision. The final component “Stop Loss / Run” is focused upon the selection of an appropriate course of action once a position has been placed i.e. whether a position uses a stop loss to close it out or if it is simply run? This final stage is underpinned by a desire to run profits and cut losses in order to maximise profit i.e. buy low, sell high.

**Complex component**

The final stage “Stop Loss / Run” was identified as the most cognitively complex stage of the ‘task diagram.’ Day Trader (A) suggested that its inherent complexity lay in the rapidly changing and uncertain nature of this stage. In accordance, he described it as a scenario requiring a “fight or flight” response. Furthermore, in the event that a “fight or flight” response fails, he described an emergent confusion that is analogous to a “rabbit in the headlights.”

The second justification for the selection of this stage was rooted in the complexity surrounding the modelling of human relationships. The unpredictable nature of markets and human behaviour within those markets makes it difficult to generate expectancies and implement appropriate action i.e. run or close a position out. Day Trader (A) notes the tendency to look for patterns in market behaviour and the rooting of expectancies within these blueprints. Whilst, he appreciates the value in these patterns for exploiting markets, he notes the importance of staying cognitive of incremental news releases that may dramatically change patterns of market behaviour, and therefore his trading strategy.

**Stage 2: Knowledge audit**

The stage identified as cognitively complex (i.e. “Stop Loss / Run”) formed the basis of Day Trader (A)’s ‘knowledge audit.’ A ‘snap-shot’ summary of the ‘knowledge audit’ may be viewed in Table 7.3 (pages 189-190).
### Table 7.3: Illustrative Example 2: Knowledge Audit (Day Trader A)

<table>
<thead>
<tr>
<th>Aspects of Expertise</th>
<th>Cues and Strategies Used</th>
<th>Why Difficult?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Past and Future</strong></td>
<td>Short-term price change i.e. prices drop at source (supply-end) and rise at point of output (demand-end) due to increased demand; use previous encounters to identify steps; react quickly to minimise short-term losses; utilise contacts to gather ‘insider’ information; gather long-term information regarding nature / extent / expected duration of disruption; use information to guide long-term trading strategy i.e. decide how far forward you would try to rectify the situation?</td>
<td>Panic due to stressful situation; uncertainty surrounding future repair of pipeline and long-term impact; unable to relate unfolding situation back to previous experience to identify necessary steps; no established industry networks to draw upon and acquire additional information i.e. informal “favourites”; would either ‘do nothing’ mitigating degree of loss as prices change or ‘over-react’ and close out all positions.</td>
</tr>
<tr>
<td><strong>Big Picture</strong></td>
<td>Supply from Organization of the Petroleum Exporting Countries (OPEC); energy demand of countries, oil / gas in storage; gas flows in pipelines; weather expectancies; factors affecting demand; technical models of power stations; mindful of other Day Traders’ aims to ensure objective to create value coincides so the overall is maximised; strategy: adopt a rational-economic objective i.e. maximisation of opportunities; develop mental framework of market fundamentals and value creation; evaluate information for trust worthiness and degree are “talking their book” vs. reality; identify knowledge gaps.</td>
<td>It is difficult to determine the relevance and appropriate weighting of information; data / information overload; transactions with more than one commodity can be complex and require an understanding of their interaction and their different drivers; “If you can’t see the fool in the market, it’s probably you” i.e. alternative market views vs. own ‘hype’; unable to identify knowledge gaps and therefore blindly continue; difficult to maintain a global view i.e. where one trade creates value at the expense of another.</td>
</tr>
<tr>
<td><strong>Noticing</strong></td>
<td>Acknowledge that the market is never wrong (Sum of hopes and fears); ‘normal’ supply and demand; examine market sentiment in relation to fundamental analysis and current oil prices; consider ‘soft’ information i.e. other Day Traders’ interpretation of information; appreciation that other market player’s may have made incomplete or erroneous assessments of the market; understand broader context i.e. Financial Institutions investing in commodities as opposed to stocks.</td>
<td>Under pressure novices exhibit a tendency to anchor themselves in what they understand and know; can become wedged to their view; may assume market is interpreting data incorrectly and may find it difficult to retract from a particular viewpoint; may erroneously interpret perceptions of market sentiment as reality; over- rely upon technical analysis and be less able to appreciate the human dimension of the scenario.</td>
</tr>
<tr>
<td><strong>Rules of Thumb</strong></td>
<td>Create high level of trust and ‘chemistry’ between representatives of two parties for discretion and reciprocation of information; learn from previous faux pas; use sixth sense to gauge the appropriateness of information exchange; understand the boundaries of information to be shared i.e. knowing whom you can talk to without the other parties’ betrayal.</td>
<td>Difficulty of getting close to parties whilst remaining commercial; it is not a taught practice therefore may not ‘pick up on’ this method; may not be sensitive to prompts for the interchange of information; difficulty of integrating ‘black box analysis’ with ‘softer’ components; may not understand the boundaries of information to be shared, or parties that can be approached without ‘betrayal.’</td>
</tr>
<tr>
<td>Aspects of Expertise</td>
<td>Cues and Strategies Used</td>
<td>Why Difficult?</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Opportunities / Improvising</td>
<td>Be alert to commercial opportunities i.e. changes in countries infrastructure, changes in energy infrastructure, regulatory and legislation changes; strategy: create a deal that changes over time to both parties' mutual advantage; ensure practices / deals do not contravene FSA regulations; ascertain limits of plausible action (governance).</td>
<td>Novices may not have commercial acumen to sense business opportunities nor to create new types of deals; may lack necessary commercial experience to execute type of transaction and may not have had training in market abuse; may not have experience to recognise when new deals may contravene FSA regulations or be linked to money laundering schemes i.e. some deals in natural gas.</td>
</tr>
<tr>
<td>Self-Monitoring</td>
<td>Use amount of deals processed as a cue for strategy change; loss of business and profit; awareness of growth in competitors' business; converse with new clients / market players; recognition that “Anglo-Saxon attitude” is not always apt for conversing with individuals with different social models and cultural sensitivities; modification of recruitment criteria to attract more culturally sensitive individuals.</td>
<td>Novices may not be sensitive to changes occurring within markets; inexperienced Day Traders' practices are inflexible; a newcomer to the industry may not implement a strategic course action quickly enough.</td>
</tr>
<tr>
<td>Anomalies</td>
<td>Prices are a lagging indicator of fundamental change; use awareness of changes in market fundamentals i.e. merging of supply companies to interpret price anomalies (produces consolidation, causing constraint on supply side); adopt position during early stages of regime shift before others realise the potential; anticipate future market states following regime shift i.e. market players will infer that price shift is related to less supply, which will cause a further shift up.</td>
<td>Less experienced Day Traders would not have the experience to recognise the patterns that emerged during this situation that would aid the identification of a regime shift: a novice would have difficulty relating the facts together to create a coherent story.</td>
</tr>
<tr>
<td>Equipment Difficulties</td>
<td>Evaluation of less tangible aspects of market sentiment in conjunction with price action; knowledge of the basis of supply forecasts; equipment has suggested the oil market is overdone; develop an awareness of behaviours of interested parties within the market; understand views of parties both as corporates following risk manuals and individuals interpreting the market inside corporations; knowledge that timing differences can create asymmetry and cause prices to rise.</td>
<td>Without experience novices may over-rely on technical analysis due to interpretative ease as opposed to more qualitative judgements; it is difficult to evaluate less tangible aspects such as what people are saying; less experienced Day Traders will shy away from the complex task of gauging the behavioural aspects of what people are saying.</td>
</tr>
</tbody>
</table>

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2The theory of mean reversion suggests that price cycles occur in commodities and shares that move back towards the mean. However, there are times where a regime shift occurs in the price that fundamentally shifts the market away from the mean.
Illustrative Example 3: Day Trader (B) (Power Trader, London)

Background Demographics

Day Trader (B) is 32 years old and works for a leading American Investment Bank as a Proprietary Trader in the city. He has worked for 4 years within his current position, totalling 10 years within investment industry as a whole. His focus of expertise is in the forward trading of derivative products, specialising in UK physical electricity and similar correlated products such as French power or UK gas. Trading is executed through a number of mechanisms i.e. swap, option and forward contracts on a day ahead to 5 years on a calendar basis. Day Trader (B) has not received any formal decision-making training to date.

Stage 1: Task Diagram

Day Trader (B)'s ‘task diagram’ deconstructed the key stages involved in completing “Power Futures Transactions.” Figure 7.4 (page 192) displays the ‘task diagram’ for this decision. The three broad stages are outlined in more detail below.

The first decision is illustrated by the stage Day Trader (B) termed “Long / Short.” This stage divides into two components. The first is concerned with establishing whether he is going to buy, sell or buy and sell (i.e. trading a spread) a given asset. The second component of this stage is concerned with deciding whether the position is going to be long or short? Day Trader (B) affirms the importance of this stage claiming: “Until I know whether I want to do anything I’ve nothing to do.”

The second decision entitled “Where / Curve,” focuses upon the point at which Day Trader (B) wants to purchase a given asset on the curve. In demonstrating the factors that feed into this stage, an illustrative chart mapping the price of power over time was drawn (See Figure 7.4). Day Trader (B) highlighted the similarity between this curve and one charting demand on the assumption that price (approximately) mirrors demand. The dip in the curve at June reflects low power market demand, and in the winter the highest demand driven by a combination of heating and lighting. Intersecting both demand and price is what was termed the “availability scenario,” which complicates the relationship due to unequal availability throughout the curve. Thus, demand and availability were identified as key drivers of Power markets. In deciding where on the curve to place a position, Day Trader (B) uses comparable points i.e. relationships between a given pair of peaks or troughs.
Figure 7.4: Illustrative Example 3: Task Diagram “Power Futures” (Day Trader B)
The final stage of the ‘task diagram’ entitled “How Much Risk?” is concerned with establishing how much value you want to put at risk? This final stage broadens out into various decisions under the concepts of volatility, liquidity and credit (i.e. credit risk scenario). In combination these elements impact Day Trader (B)’s expectancies regarding the ease and frequency at which a positions may be traded. In instances of limited liquidity in the UK Power markets, similar products that exhibit a high degree of correlation may be traded such as UK gas or French power.

Complex Component
The final stage of the ‘task diagram’ was acknowledged as the most cognitively complex component on the assumption that the management of risk is key to their trading activities. This component was used as a basis for the ‘knowledge audit.’

Stage 2: Knowledge Audit
A summary of Day Trader (B)’s ‘knowledge audit’ is contained in Table 7.4 (pages 194-195). Like illustrative examples 1 and 2, Table 7.4 is intended to capture only the most pertinent elements of expertise extracted during the interview.

Cognitive demands table
A ‘cognitive demands’ table was compiled that synthesised data drawn across all of the conducted ‘knowledge audits.’ The objective of this stage was to provide a generic overview of: (i) the difficult cognitive elements, (ii) why it is difficult for a novice Day Trader, (iii) errors a novice might commonly make and (iv) cues and strategies experienced Day Traders use to overcome cognitively difficult elements. Overall, nine common elements of expertise that exhibited significant cognitive demands for the Day Traders interviewed were extracted. The ‘cognitive demands’ table is displayed in Table 7.5 (pages 196-197).

One of the key elements of Day Traders’ expertise concerned the ability to detect significant movements in the market as opposed to short-term fluctuations. For instance, identifying emerging trends, responding to trend reversals and detecting regime shifts that can be acted upon before the rest of the market, presents a significant challenge to their expertise. This is especially challenging given the limited (and largely still emerging) nature of information upon which judgements are placed. Table 7.5 shows that Day Traders’ expertise is such that they are able to use a combination of technical analyses and their understanding of the psychology of financial markets to pre-empt others’ market behaviour as a basis for their own action, despite operating within limited information environments.
## Table 7.4: Illustrative Example 3: Knowledge Audit (Day Trader B)

<table>
<thead>
<tr>
<th>Aspects of Expertise</th>
<th>Cues and Strategies</th>
<th>Why Difficult?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Past and Future</strong></td>
<td>Power markets are young with no established trends - easier to trade with potential for greater returns; other market players were pulling back the bids and allowing price to be pushed down; estimations of risk to be sold were created; mass selling without a fundamental reason may be due to somebody panicking which can be taken advantage of; &quot;Only monkey’s pick bottoms!&quot; come in as point of resistance on downward trend and buy into the sell at base of trough before other Day Traders; &quot;The trend is your friend&quot; profit from impact of rising trend upon discounted price.</td>
<td>May lack confidence to be involved in opportunities contra to the norm; may not realise a sensible strategy can be to take no action; lack confidence to utilise overlapping experience of team pre-action; may incorrectly believe more experience means you are always right; following unsuccessful trades, novices may feel frustrated and hastily execute subsequent trades leading to errors; understanding that trades are sometimes successful due to (i) luck or (ii) alternative reasons that had not been factored into the analysis or strategy.</td>
</tr>
<tr>
<td><strong>Big Picture</strong></td>
<td>Use supply / demand changes to understand price movements; congestion borders limit ability to move power between countries; interpret German Day Traders’ focus on border as an expectation for a lot of wind in West Denmark; understand economic impact i.e. extra 10 gig of wind power would crush German oil price; appreciate impact upon availability i.e. extra 8 gig in West Denmark will be catastrophic for the producers, but providential for consumers; use other trades to diversify risk and displace positions i.e. long position in UK power, masked by purchase of UK gas.</td>
<td>Supply / demand relationship takes time for novices to appreciate; ability to execute a strategy is important and is marked by experience; novices need to understand that the key is speed i.e. how quickly information is understood and digested in order to get there first, because there is no point in being right after the event.</td>
</tr>
<tr>
<td><strong>Noticing</strong></td>
<td>Impact of production difficulties upon UK market i.e. period of congestion; track market movements; observation that risk premium sold by others’ was erroneously perceived to be justified based upon knowledge of prices, market views and long-term strategy; strategies available: if short, buy it back or reduce position size; consolidation of trade with another strategy on desk with offsetting position; proxy hedging i.e. transfer capacity between countries to mitigate existing risk and reverse what is moving against you.</td>
<td>May not be aware of proxy hedging i.e. using transfer capacity between countries; may not consider consolidation of a trade with another strategy on the desk that has an offsetting position; unless acquired the experience of an event for themselves it is difficult for it to become imprinted; key is to react quickly and take appropriate action to ‘fix’ problem; may panic and procrastinate as opposed to raising issue with experienced Day Traders i.e. a ‘storm in a teacup’ or close positions immediately to cut losses.</td>
</tr>
<tr>
<td><strong>Rules of Thumb</strong></td>
<td>Day Trader (B) reported that this aspect of expertise was not applicable on the grounds that short cuts do not exist and that every execution should be at its optimum. Moreover, the extremely self-contained nature of his work i.e. trading a particular portfolio within a localised trading environment, means that for Day Trader (B) it is difficult to ‘call in the cavalry’ or draw favours.</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Aspects of Expertise</th>
<th>Cues and Strategies</th>
<th>Why Difficult?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunities / Improvising</td>
<td>In a similar manner to the rationale reported for ‘Rules of Thumb’ Day Trader (B) highlighted the inappropriateness of improvising to this task. An example of improvising in a ‘softer’ form was outlined i.e. moving into a new role and making it your own by finding and establishing new techniques, however, this was not elaborated.</td>
<td>Novices may lack confidence to network due to their lack of trading experience i.e. I don’t have a view; may lack the trading successes of other Day Traders and may therefore believe their opinion does not count; may find it difficult to approach colleagues and ask to be shown alternative trading techniques; novices are likely to have less established relationships with colleagues; inexperienced Day Traders may lack confidence and belief in self i.e. ‘This is the week I’m going to get found out that I don’t know what I’m talking about!’</td>
</tr>
<tr>
<td>Self-Monitoring</td>
<td>Comparison of one’s knowledge to that of colleagues’ i.e. their actions and techniques; use colleagues as a point of access to new brokers; draw upon colleagues’ experience to identify new software i.e. spreadsheets unfamiliar with that provide a different level of analysis; appreciate the problem of being taught a position and the amplifying effect of incoming signals upon it; understanding that having no position can lead to a more analytical and pragmatic appraisal; talk to producers / consumers; high achieving individuals bolsters quest for self-improvement.</td>
<td></td>
</tr>
<tr>
<td>Anomalies</td>
<td>Anomaly signal: price move of 1op in 2 trades; knowledge that a 10p or 100 point move is not a case of buying, as gas trades in 0.1p; look for immediate changes in stock from demand point of view; examine news releases for cause i.e. explosion; knowledge that gas is the marginal fuel source for UK power stations; appreciation of importance of gas storage i.e. permanent live flow from field is not enough for winter demand; establish likelihood of fixing extraction unit in short to long-term and assess uncertainty with this analysis; strategy to buy quickly.</td>
<td>Novices may not have the knowledge to be critical of news reports and analyse incoming data themselves; may lack mechanical knowledge of nuclear and gas power plants to interpret incoming reports of malfunction and its potential effects; uncertainty surrounding timescale for resolution; may weight higher importance to weather forecasts in relation to demand, not appreciating the fact that everyone considers them and that they do not take a great deal of skill.</td>
</tr>
<tr>
<td>Equipment Difficulties</td>
<td>Identification of bullish / bearish signals; use previous experience and fundamental analysis to falsify Analysts’ judgement; judge whether reports reflect reality of market place; judge views of other market players i.e. the market appears bullish and will therefore buy; project impact of other players’ positions in relation to own following occurrence of bear trap i.e. they will start sell and I know that it will turn around quickly.</td>
<td>Analyst’s recommendations may not account for hidden factors and may lead to bear traps i.e. a false signal that the rising trend has reversed when it has not; novices may not see the signals; may not consider the notion that it may not be a proper sell-off, but simply a false signal; may trust the Analysts’ recommendations to buy / sell.</td>
</tr>
</tbody>
</table>
Table 7.5: Cognitive Demands Table

<table>
<thead>
<tr>
<th>Difficult Cognitive Element</th>
<th>Why Difficult?</th>
<th>Common Errors</th>
<th>Cues and Strategies Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) “Bucking the Market.”</td>
<td>Distinguishing market rumour vs. real trend; inferring rationale of others’ actions; identifying buy opportunity; uncertainty of cause and expected duration - difficult to pick exit levels; dips do not always indicate rallies; requires technical analysis and intuition to anticipate market correction levels.</td>
<td>Unlikely to factor in psychological element; attempt to establish cause of trend as opposed to placing trade; temptation to interfere with position once placed; erroneously placed trend line; “booking a trend” i.e. picking a top, confusion of rally with “reaction highs”; failure to attend to news releases.</td>
<td>Technical analysis (long positions, channel of higher highs / lows, daily highs / lows); infer counter party positions and actions; “Trend is your friend” let trend work position; Fibonacci retracements do not work on “reaction highs”, anticipate market correction via Elliot waves; “Buy in dips, sell in rallies”; irrational exuberance.</td>
</tr>
<tr>
<td>Responding to trend reversals i.e. collapsing market or trend moving against short position.</td>
<td>Is almost impossible to identify; reaction moves are quicker than grinds with the trend, may not be a proper sell-off, but a false signal, difficult deciding between courses of action i.e. short position in rising market (i) close current position and lose value vs. (ii) turn position and go long; textbooks caution against doubling up.</td>
<td>May not react quickly to downside trend; naively hopeful scenario will reverse instead of cutting losses; expectation for dip to bounce when it is a collapse; sucked into bear traps, may become wedged to particular prices; if short in rising market, may fail to recognise that going long is as suicidal as selling and going short.</td>
<td>Bullish / bearish signals (candlestick charts i.e. filled bars vs. clear bars); play the percentage game; result is important not the game (take position off); anticipate selling behaviour, go against tide and buy; project reactions to bear trap i.e. sell, locate own position in anticipation; short in rising market - double up to improve price average and exit chance.</td>
</tr>
<tr>
<td>Detecting regime shifts.</td>
<td>Identifying cause of price anomaly; difficult to identify price movement as a regime shift; may not notice new variables at play in UK market; may not have experience to recognise emerging patterns; difficult to integrate changes in market fundamentals to create a coherent story.</td>
<td>Early detection of regime shift may be thwarted through erroneous interpretation of price movement as a cyclic iteration in the sense of mean reversion; may not have an established knowledge base to distinguish between normal business and the emergence of a new paradigm.</td>
<td>Awareness of changes in market fundamentals as a framework for interpreting price anomalies (prices are a lagging indicator of fundamental change); adopt a position on emergent trend before other market players and anticipate future market states following regime shift.</td>
</tr>
<tr>
<td>Taking action following sudden interruption to supply.</td>
<td>Unable to relate unfolding situation to previous experience; lack vision to see possible actions; uncertainty of long-term impact; lack of mechanical knowledge to interpret reports of malfunction and potential effects; tightness of UK supply / demand balance; no established industry contacts to access ‘insider’ information.</td>
<td>Panic due to nature of stressful situation and either ‘do nothing’ mitigating loss or ‘over-react’ and close out all positions; may attempt to understand current position as opposed to future action; may not appreciate that although incident has never happened before, does not mean that it cannot occur; may not situate event politically.</td>
<td>Analysis of UK storage levels; ascertain extent of interruption and market sentiment; assess relativity of gas in market over-time; quickly cover short positions to minimise losses; scenario generation: future market action and relative value of contracts; logical position to sell, but infinite risk on upside due to storage void prompts buy strategy.</td>
</tr>
<tr>
<td>Exploiting price anomalies in markets i.e. arbitrage opportunities.</td>
<td>Anomaly may only appear briefly; may miss spike in candle chart, may not want to execute arbitrage deals; difficult to infer ulterior motive of Bank / producers from bids and offers; difficult to infer trading ‘games’ counter parties play; lack knowledge of where real market is and not notice Bank/ producers bidding the price.</td>
<td>Too slow to take advantage of price mismatch; try to alert other Day Trader’s on desk to price anomaly instead of hitting it; may assume that a good price to sell means you should be selling; fail to consider ulterior motives of counter parties; price action i.e. a large order to buy or they are buying because price is going to rise.</td>
<td>Spotting errors in spreads across Bank platforms (discrepancies between bid and offer prices = “free trade”); “Low hanging fruit” - exploit opportunity by trading between platforms; alternatively, recognising price higher than rest of market hit worst price to buy, on assumption that if Bank wants to buy then price likely to rise.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Difficult Cognitive Element</th>
<th>Why Difficult?</th>
<th>Common Errors</th>
<th>Cues and Strategies Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>(vi) Anticipating effect of change in market fundamentals.</td>
<td>Novices would find extrapolating today's market into the future difficult; lack understanding of how changes in infrastructure would affect future market movements; difficulty anticipating effect of data releases upon market and market reactions; may not have an awareness of the different factors involved.</td>
<td>Failing to consider the bigger picture surrounding the release of figures i.e. it may appear to be better than the market expected, but historically is a poor number; not appreciating that chopiness around figures following a release is due to market players' mixed views; errors in extrapolations i.e. basing hypotheses upon low probability scenarios.</td>
<td>Monitor affect of anticipated and actual change upon daily balance; consider impact upon supply / demand balance (determined by what is happening today / forward curve); monitor affect upon other market fundamentals and price; base strategy on extrapolations of today's action to a forward date; be proactive by leaving resting orders in market i.e. &quot;If - Done&quot; and &quot;MIT's&quot;.</td>
</tr>
<tr>
<td>(vii) Using inter-relationships between alternative markets to inform market view.</td>
<td>Localised focus of attention; novice may not have considered prices / data releases within alternative markets; may not realise inter-relationships exist between markets; may not know usual width of bid-offer spreads in inter-related markets; may not have the information flow available to them like more established Day Traders.</td>
<td>Less experienced Day Traders will either: follow actions of the herd, and/or continue in line with market trend; may not notice that a price movement was significant in comparison to usual market spreads and thus fail to anticipate impact upon own market.</td>
<td>Search for price anomalies in inter-related markets as a point of informational leverage; use knowledge of alternative market as a benchmark for understanding current and future behaviour of market i.e. anticipate 'spill effect'.</td>
</tr>
<tr>
<td>(viii) Amending trading strategy in lieu of shifting market conditions.</td>
<td>May be wedded to view; lack sensitivity to market changes; new markets may be iteratively changing; identifying cause of negative P&amp;L is difficult; uncertainty due to market volatility; difficult to switch between mental trading systems; restricted capital hampers change in trading style; practices are inflexible; resistant to change to the unfamiliar.</td>
<td>Novices may not react with a change in strategy; may continue to place trades despite negative P&amp;L; may not take stock of situation; may not cut down positions or stop trading; may not attribute negative P&amp;L to changing market.</td>
<td>Negative P&amp;L indicates inefficient strategy; do nothing until have a view; review price action; trading style and market congruence; detect other Day Traders' strategies; &quot;Jobbing&quot; to deal with volatility (trading shorts to catch each wave) or run smaller positions further to reduce over-trading or aggressive trading to convince others market is short / long; larger positions if on a winning streak.</td>
</tr>
<tr>
<td>(ix) Trying not to sub-optimise given opportunities.</td>
<td>Transactions over a period of time involving more than one commodity or multiple players, can be complex and require an understanding of their interaction and their different drivers; data / information overload; difficult to determine relevance and weighting of information; novices may find process overawing and trading with large amounts of money uncomfortable.</td>
<td>May risk lower amounts and need to take profit more frequently to cover losses than if less trades were placed with higher risk; novices may take profit too early; difficulty in maintaining global view i.e. avoiding instances where one trade creates a lot of value at the expense of another; may be wedded to a particular price; may favour complicated strategies over simple ones.</td>
<td>Play 'percentage game'; trade in lags; marry own and client positions; place opposite spreads to net length (minimise risk / catch big moves) i.e. net long with bear spread / net short with bull spread; create new deals helpful to both sides of transaction; play near term contracts against dated contracts; trade contracts with optionality, exploit trends trading less when market less favourable.</td>
</tr>
</tbody>
</table>
The ‘cognitive demands’ table also draws attention to the need at once for a specialised focus of expertise and a broad understanding of financial markets as a point of informational leverage. This is reflected in the use of inter-relationships between alternative markets to inform their view of the market in which they operate. This echoes the dichotomy between experts’ limited frames of expertise and their need for a broad-level awareness of the global economy that emerged during the Preliminary Study (Chapter Five) in the analysis of Portfolio Managers’ expertise.

7.3.3 Interpretative phenomenological analysis (IPA)

The second component of this mixed-methods study is an IPA based upon the interview data derived using ACTA. Table 7.6 (pages 199-200) provides a summary of the master themes and constituent sub-themes alongside a number of illustrative examples that emerged from analysis of the Day Traders’ narratives. The four themes drawn from this analysis are as follows: (i) ‘natural-born traders,’ (ii) ‘beyond quantification: re-conceptualising trading,’ (iii) ‘trading praxis’ and (iv) ‘the social grounding of trading.’ The full IPA is provided in Appendix Thirteen.

One of the key points that illustrate the utility of the IPA in understanding Day Traders’ decision-making came under the theme ‘trading praxis.’ This theme emphasised the role of the firm in constraining Day Traders’ decision behaviour through the management of cost and risk. It also drew attention to the manner in which Day Traders’ conceptualise trading as a game (also denoted as a percentage trade-off between cost and risk) and the reality of optimisation trading strategies.

Also to emerge from this analysis was an understanding of the ‘social grounding of trading.’ As can be seen in Table 7.6, three components denoted this theme namely, the conceptualisation of ‘markets as social psychological sites,’ the role of ‘informational interchange’ and ‘communities of practice.’ Whilst brief reference was made to the social basis of markets during ACTA, this analysis permitted a deeper exploration of the role of social networks as points of information exchange and in fostering Day Traders’ learning and development.

7.4 Discussion

The objective of this final study was to build upon the promise of methodological cross-fertilisation in Chapters Five and Six by (i) exploring the utility of ACTA in more depth and (ii) social embedding the study of expertise using IPA.
<table>
<thead>
<tr>
<th>Master Themes</th>
<th>Constituent Themes</th>
<th>Illustrative Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Natural-Born Traders</td>
<td>The Significance of Ego</td>
<td>“I think when they look at traders individually there’s a lot of people saying ‘well, you need someone with a very significant ego.’ And that’s right you do need someone who is confident, but you also need someone who has got enough humility to know that the market is bigger than them, because many, many traders have taken on a market and paid for it!” (Day Trader A, 693-705)</td>
</tr>
<tr>
<td></td>
<td>Views of the Self: Contrarian Traders</td>
<td>“… [I] decided to take on a position that really only maybe one other person in the market took on. So, it was a bit of a contrarian view. But erm, I do tend to be a bit of a contrarian trader as well anyway …” (Day Trader G, 301-306)</td>
</tr>
<tr>
<td></td>
<td>Niche Trading Styles</td>
<td>“Ed is very good at finding out where people’s weaknesses are. He is very good at that. He can just … he can just smell it. He can smell blood in the water.” (Day Trader F, 2127-2135)</td>
</tr>
<tr>
<td>2: Beyond Quantification: Re-Conceptualising Trading</td>
<td>Rational - Emotional Dichotomy</td>
<td>“When markets are moving around there’s generally excitement generated at this end … so you can feel excitement. So, sometimes it’s very exciting, but not always for the right reasons. I mean sometimes because you’re losing money as well, it’s still exciting. It still gets your emotions flowing!” (Day Trader F, 1599-1607)</td>
</tr>
<tr>
<td></td>
<td>Trading: The Sixth Sense</td>
<td>“I spent a lot of my morning looking at research and formulating my view as to where I think it is going. Erm, I try and swing that 80% on gut feeling and 20% by being backed up by you know, looking at a chart … or a similar sort of technical analysis.” (Day Trader E, 97-107)</td>
</tr>
<tr>
<td></td>
<td>The Art of Trading</td>
<td>“I’m not, you know, we’re not psychic! It’s not an exact science what we do” (Day Trader D, 351-356)</td>
</tr>
<tr>
<td>Master Themes</td>
<td>Constituent Themes</td>
<td>Illustrative Example</td>
</tr>
<tr>
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</tr>
<tr>
<td>3: Trading Praxis</td>
<td>Trading as a Game – One of the Same?</td>
<td>“You have got certain little tips which I suppose it’s, you could say it’s a bit like playing poker. Because what you want to do is play the percentage game.” (Day Trader C, 104-106)</td>
</tr>
<tr>
<td></td>
<td>Reality of Optimisation</td>
<td>“I mean my view is that if you’re not already working optimally, you’re not really the ideal person for the job. And that’s not to say that we are all perfect. What I mean is every execution really should be at its optimum.” (Day Trader B, 1391-1403)</td>
</tr>
<tr>
<td></td>
<td>Constraining Trading Behaviour: The Firm</td>
<td>“But, it depends on the firm. And obviously here they are very conscious about cost and risk so … Erm, so you know, you have to manage that risk. And try not to lose too much money each day!” (Day Trader E, 1024-1033)</td>
</tr>
<tr>
<td>4: The Social Grounding of Trading</td>
<td>Markets as Social Psychological Sites</td>
<td>“…the market is just a collection of views of human psyche about where people think they should go.” (Day Trader H, 2100-2105)</td>
</tr>
<tr>
<td></td>
<td>Informational Interchange</td>
<td>“…it’s very difficult to operate in, in this market without having a lot of good relationships because things go wrong all the time and you do need to have, erm you know people who will help you out when the going is tough … because they know that one-day the boot will be on the other foot and you’ll be there to help them out. And so there is a lot of sort of almost favours stored up to keep the industry going.” (Day Trader A, 532-544)</td>
</tr>
<tr>
<td></td>
<td>Communities of Practice</td>
<td>“…it is the confidence to say to somebody I really like the way you do that. I think the way I do that is stupid! Can you show me you know how you do it? Erm, and that just comes through developing a relationship with the guys you work with.” (Day Trader B, 1698-1708)</td>
</tr>
</tbody>
</table>
The first part of this discussion considers in turn, the results derived from ACTA and the IPA. Consideration of the methodological value of ACTA as a method for understanding cognition is then discussed in relation to the situated aspects of expertise. The value of employing mixed-methods qualitative designs is underlined. This discussion concludes by considering some of the limitations of this research and makes a number of recommendations for study beyond the remit of this thesis.

7.4.1 Applied cognitive task analysis (ACTA)

This first section considers the data elicited using the ACTA techniques. These are addressed in a progressive manner calling upon the ‘task diagrams’ derived from stage 1 through to the ‘knowledge audits’ of stage 2 and the resultant ‘cognitive demands’ table.

Stage 1: Task diagram

Comparative review of the ‘task diagrams’ suggests the decision-making process to be a highly structured procedure, guided by trading style. The basis of this conclusion is illustrated in the dissimilarity that exists between Day Trader (A) and Day Trader (B)’s ‘task diagrams,’ despite both Day Traders exchanging derivative products on the futures market. To illustrate, Day Trader (B)’s ‘task diagram’ denotes a particularly regimental approach characterised by technical analysis. By contrast, Day Trader (A)’s ‘task diagram’ integrated what was termed ‘softer’ informational components into this process integrating in fundamental analyses, market sentiment and the role of relationships in informing his ‘game theory.’

A similar pattern emerges when participants’ were asked to consider the cognitively complex element of their ‘task diagram.’ Indeed, trading style seemed to depict participants’ choice, with Day Trader (C) and Day Trader (B) selecting the technical challenge of placing trades and managing risk in contrast to the difficulty of predicting human behaviour and the uncertainty information environments selected by Day Trader (A).

Stage 2: Knowledge audits

The sheer depth of data elicited at this stage (as seen in Tables 7.2, 7.3 and 7.4) is virtue of ACTA’s structured approach to knowledge elicitation and representation. Due to constraints within this thesis discussion of specific contents within the ‘knowledge audits’ will be considered as a composite within the next section, which examines the ‘cognitive demands’ table. This section will therefore build upon the discussion above, illustrating further the impact of trading style upon the nature of Day Traders’ expertise.
The task-focus of this analysis permitted insight into the analytical and interpretative approaches to making sense of markets as a precursor to decision action. As can be seen through comparative review of the illustrative ‘knowledge audits,’ the knowledge elicited from Day Trader (C) and Day Trader (B) tended to be more technically focused than Day Trader (A). This continues the pattern seen in their ‘task diagrams.’ For example, for the ‘noticing’ aspect of expertise, Day Trader (C) focused upon the detection of market movements in minor currency pairs i.e. the collapse of Thai Baht (THB) and the significant price move of New Zealand Dollar (NZD). The technically driven aspects of Day Trader (B)’s expertise were also reflected in his detection of the imminence of a period of congestion in the UK due to production difficulties.

Day Trader (A) by comparison, focused upon the ‘softer’ components of his expertise, choosing to focus upon the detection of omissions in his own and market sentiment. Thus, Day Trader (A)’s breakdown of expertise was more concerned with noticing errors commonly associated with the interpretation of the more implicit market psychology.

Cognitive demands table

The ‘cognitive demands’ table (Table 7.5 - pages 196-197) elicited nine elements deemed cognitively difficult for Day Traders: (i) “bucking the market:” identifying emerging trends, (ii) responding to trend reversals, (iii) detecting regime shifts, (iv) taking action following sudden interruption to supply, (v) exploiting price anomalies in markets, (vi) anticipating effect of change in market fundamentals, (vii) using inter-relationships between alternative markets to inform market view, (viii) amending trading strategy in lieu of shifting market conditions and (ix) trying not to sub-optimise given opportunities.

It is at this point that it becomes useful to extrapolate some broad themes based upon the ‘cognitive demands’ table as a basis for discussion. Four broad clusters of expertise are outlined below:

**Challenge 1: Identifying trends in market**

One of the key elements of Day Traders’ expertise lies in the early identification of emerging trends in order to maximise the value gained from market moves. This is represented by the following ‘cognitive demands:’ (i) ‘bucking the market:’ identifying emerging trends, (ii) responding to trend reversals and (iii) detecting regime shifts.
Challenge 2: Exploitation of market anomalies

Day Traders’ expertise is marked by an ability to recognise and react quickly to anomalies in markets (i.e. price or supply / demand). This challenge is underpinned by two ‘cognitive demands’ namely, (iv) taking action following sudden interruption to supply and (v) exploiting price anomalies in markets.

Challenge 3: Use of market knowledge to anticipate change

The use of market knowledge (both within and between markets) is integral for the anticipation of changes within a particular market. The ‘cognitive demands’ (vi) anticipating effect of change in market fundamentals and (vii) using inter-relationships between alternative markets to inform market view, comprise this challenge.

Challenge 4: Performance monitoring

This final element of Day Traders’ expertise resides in their ability to monitor their performance and implement alternative trading strategies when necessary. This was rooted in the elicitation of the following: (viii) amending trading strategy in lieu of shifting market conditions and (ix) trying not to sub-optimise given opportunities.

What is interesting is that the broad challenges facing Day Traders draw attention to the sense-making process as both a prospective and retrospective activity. The first three challenges are prospective, albeit in response to past market activity i.e. emerging trends or anomalies. The ability to quickly shift perspective between the past, present and future states in anticipating market movements demonstrates the importance of sense-making in facilitating decision-making. Challenge 4 by contrast is located retrospectively and uses the hindsight of markets as an interpretative tool of performance.

Underpinning the sense-making process was the notions of automaticity and pattern recognition, which was especially pertinent for challenges 1-3. This can be seen not only in the cues and strategies detailed in Table 7.5, but also in the requirement for rapid price-action. The ‘cognitive demands’ table suggests the recognition of market patterns to be fundamentally experience-driven. By way of illustration, the detection of market anomalies was directly attributed to both recognition of inconsistency across platforms and in market trend. Experience was deemed integral to understanding the ‘norm’ of the particular market and in interweaving these factors together to correctly identify the anomaly. This example, demonstrates how at a broad level at least, the concept of coherence or indeed, incoherence might prompt decision action.
As suggested in Chapter Six, a final point to emphasise is that Day Traders’ experience was composed of both taught components such as technical analysis and fundamental analysis, but also the forms of expertise that are learned through experience i.e. interpretation of market sentiment and human behaviour in markets, through market psychology. The nature of this expertise is addressed in more detail in the IPA below.

Before moving on to discuss the findings derived from the IPA, it is also worth drawing attention to the utility of complementing the study of Day Traders with the RPD model (Chapter Two - Figure 2.1). Indeed, the time-critical nature of Day Traders’ activities makes Klein’s (1993) RPD model an appropriate framework (as opposed to Montgomery’s (1989) theory of dominance search as utilised in Chapter Six) for considering the data elicited using ACTA. Given the methodological focus of this study, points of convergence between aspects of the ‘cognitive demands’ table and the propositions of the RPD model such as the mental simulation of action and generation of expectancies present promising avenues for future exploration.

7.4.2 Interpretative phenomenological analysis (IPA)

The second component of this mixed-methods design extends the methodological contribution of ACTA, by reviewing the results derived from an IPA of participants’ narratives. As summarised in Table 7.6 (pages 199-200), four master themes were generated that captured the essence of Day Traders’ decision-making activities. In contrast to the ACTA method, which was inherently task-focused, the IPA (based upon ACTA and divergences during the interview) provided an understanding of the social-psychological elements of Day Traders’ expertise and afforded insight into the environments in which they operate. As such, the findings reviewed below are integral in achieving a more holistic representation of the world Day Traders inhabit.

This first master theme ‘natural-born traders’ focuses upon the intrinsic qualities of Day Traders that makes them pre-disposed to this type of decision activity. The emerging discourse draws attention to the intrinsic importance the concept of ‘ego’ and the linkage between ‘ego’ and the adoption of contrarian positions. Finally, it builds an understanding of participants’ natural aptitude for trading through consideration of their trading styles.

What is attractive about the IPA approach is that it is able to raise these insights in an informative way. Indeed, this first theme lies at odds with the mainstay of the day trading literature that considers personality characteristics through pre-defined assessment tools for
the purposes of recruitment (Fenton-O’Creevy et al., 2005). This analysis by contrast, explores the personalities of Day Traders in their own terms. With this ground-up approach, comes a concomitant honesty and inherent truthfulness that gives the data additional vigour. The nature of this approach also permitted insight into the inter-relationship that exists between these characteristics and trading behaviour i.e. through the adoption of contrarian positions and the natural diversity in participants’ trading styles. This draws obvious parallels to the comparative review of participants ‘task diagrams’ earlier in this section.

The second master theme ‘beyond quantification: re-conceptualising trading,’ examined the instinctive basis of trading practices. To this means, the first sub-theme, uncovered the emotive basis of trading specifically focusing upon the inter-relationship that exists between emotion and rationality. The role of emotion in guiding behaviour i.e. through biases in judgement as Day Traders become wedded to particular views, suggests a purely quantitative or experimental approach to the understanding of cognition to be insufficient.

The second sub-theme focused upon the intuitive basis of Day Traders’ expertise, induced by recognition of patterns formed through experience. The combinatorial results of the IPA and ACTA both suggest there to be utility in further consideration of Day Traders’ expertise in relation to the RPD model. The final component considered day trading as a complex interweave of science and art. The intersection of rationality and emotion denoted by this theme is an issue that has been met with limited interest in the research community, where the activities of Day Traders are typically interpreted as being quantitatively driven through rational and logical thought (although see Zaloom, 2006). This theme opens the possibility of rational and intuitively-based / experience-driven forms of thought to work in unison – a conclusion drawn by Fenton-O’Creevy et al. (2005). The suggestion that intuition is preempted by the recognition of patterns that have occurred in the market over time, lies in agreement with the basic premise of the RPD model (See Chapter Two).

The third master theme ‘trading praxis’ examines the practices used by Day Traders. The first sub-theme drew upon participants’ use of gaming metaphors as a lens for understanding the strategies they use and the environment in which they operate. It also considered participants’ use of optimisation as a rational ideal and explored some of the constraints that exist and limit Day Traders’ behaviour. Participants’ discourses were useful for understanding the reality of trading practices. This was particularly so with respect to constraints imposed by the firm and the difficulties Day Traders face in achieving optimality.
Participants' use of gaming metaphors was somewhat surprising. Two explanations exist. First, participants use the metaphors as a means of dissociation due to the stress associated with day trading (a suggestion explored within the IPA in more detail). Second, it may simply have been induced by the intrusion of the researcher, who with comparatively limited knowledge of the field implicitly invoked these concepts from participants during technical explanations.

A final point is the implications this master theme holds for the argument of antitheticality between NDM and CDM, as raised in Chapter Two. It is proposed that pure forms of both CDM and NDM are inappropriate within this domain, with Day Traders' decision-making operating at the intersection of the two. To illustrate, one of the key arguments presented by Beach and Lipshitz (1993) of the inappropriateness of CDM lay in the assertion that human decision-making consists of tasks different from gambling tasks. The use of gaming metaphors and use of the 'percentage game' to shape their trading behaviour adds to the suggestion that NDM and CDM are not mutually exclusive. This is echoed in Beach and Lipshitz’s further suggestion that the gambler exerts little control over the events, in contrast to the control that is a part of human decisions. However, this study would suggest that certainly for Day Traders the control exerted over events takes an incredibly limited form i.e. artificially pushing the market up, and as such their decision-making occurs at a point between the two extremes. These arguments are considered in more depth in Chapter Eight - Discussion.

This final master theme 'the social grounding of trading' is concerned with conveying the social basis of day trading thought and action. The first sub-theme explored the social psychological basis of markets. Whilst, there is recognition in the literature regarding the psychology of markets (Elder, 1993), this remains largely anecdotal in form. Indeed, Elder's (1993) proposition that …

"Technical analysis is applied social psychology. It aims to recognize trends and changes in crowd behaviour in order to make intelligent trading decisions"

(Elder, 1993: p.61)

... was a view echoed within this study. However, Elder's review of the psychological basis of individual and crowd behaviour in markets is both limited and abstract. The IPA approach within this study offers new insights into the role of psychological remorse and irrational exuberance in guiding market behaviour.

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The second sub-theme built upon this to examine the methods participants use to establish relationships of informational interchange. This was also an issue often neglected from mainstream trading literatures. It is possible to infer that this may be due to the underground nature of Day Traders’ practices i.e. in the form of ‘favours,’ that are obviously undesirable from the perspective of the firm. Thus, this analysis has unearthed important interactions that exist between counter parties which to date have not been examined. It is important to highlight the parallels that exist between Collins (2001) concept of ‘polimorphic action’ and the interactions of this sort, which are highly dependent upon context and local conditions. The use of ‘favours’ would certainly not be arbitrarily employed across firms.

The final sub-theme addressed the supporting role of communities of practice in the trading community in guiding both learning and trading behaviour. The emergence of this theme holds parallels to Schatzki’s (2002) The Site of the Social and Zaloom’s (2006) Out of the Pits. To illustrate, participants’ use of peers on their trading desk as a means for seeking reassurance pre-decision was also highlighted in Zaloom’s anthropological study of Day Traders.

7.4.3 Methodological contribution
This next section considers the utility of ACTA and the situated approach of IPA in addressing the research questions shaping this final study.

The objective of interdisciplinary collaboration as a means of addressing methodological challenges that exist within managerial cognition is first addressed. One of the central difficulties facing managerial cognition researchers has been a requirement for structured approaches for the elicitation and representation of cognition that also permit cognitive heterogeneity. This method was particularly constructive in terms of its ability to extract at once the breadth and detail of participants’ expertise. The ACTA techniques have also been useful in the provision of a progressive deepening of each participants’ domain of expertise through the ‘task diagram,’ ‘knowledge audit,’ and ‘cognitive demands’ table. This study found particular value in the use of the ‘cognitive demands’ table to synthesise and organise the abundance of data in a meaningful way for analysis. Overall, the ACTA techniques were considered a useful tool for quickly understanding the major cognitive challenges within this time-critical domain and thereby demonstrate the utility in studying Day Traders’ decision-making from NDM a perspective.
Arguably, there are also a number of disadvantages associated with the use of ACTA. First, despite the overwhelming amount of data generated, consolidation into both the ‘knowledge audit’ and the ‘cognitive demands’ tables resulted in the loss of a significant proportion of information. This was exacerbated further by the nature of Day Traders’ expertise, which necessitated detailed elaboration for each example due to the inextricable link between Day Traders’ own positions, market movements, and the behaviour of other market players. Condensing Day Traders’ examples often required a fine balance between useful abstractions without becoming meaningless.

Further still, no guidelines exist in the associated ACTA literature provided by Militello, Hutton and Miller (1997) regarding the optimal number of ‘cognitive demands.’ The judgement was therefore made that nine ought to be considered a maximum, but this is clearly open to interpretation. This judgement was rooted in the conventions of other researchers that have successfully used ACTA in the past (e.g. Gore, 1997; Gore, 2003b; Gore and Riley, 2005). The dichotomy the researcher faced between useful abstraction and data overload, was also evident in the above discussion of the ‘cognitive demands’ table. Thus, a thematic approach to analysis was useful for collaborating information across participants and extrapolating the broad emergent themes.

The ACTA method also presented difficulty with the elicitation of the social-psychological components of Day Traders’ expertise that participants’ reported i.e. the covert ‘favourites’ that were often used as points of informational interchange between counter parties. The concept of ‘informational interchange’ could only be given limited precedence within the ‘cognitive demands’ table and could not be represented as a standalone theme. This was similarly the case for participants’ portrayal of markets as social psychological sites and as distinct communities of practice. This was a limitation also found by Drury and Darling (2007) in their use of ACTA within a real-time command and control centre in the military.

A final point to conclude the discussion of ACTA with pertains to the appropriateness of the eight ‘aspects of expertise.’ The adaptation of the ACTA protocols to include the term ‘rules of thumb’ instead of the US terms ‘tricks of the trade,’ ‘working smart’ and ‘accomplishing more with less’ (on the basis of the Preliminary Study findings in Chapter Five) was largely successful. These amendments reflect those documented already in the literature regarding the use of ACTA and the appropriateness of US language to study the expertise of HR Directors (Gore and Riley, 2005) and pilots (Gore, 2003a, 2003b) in UK contexts. However, there were a number of instances whereby the aspects ‘rules of thumb’ and ‘opportunities /
improvising' were met with difficulty, that extended beyond the issue of language translation. This is particularly evident from the voids in Day Trader (B)'s 'knowledge audit' (See Table 7.4 - pages 194-195). Whilst, it is unrealistic to expect unanimous success across all aspects, the appropriateness of these components should be considered in more detail for future study.

It is at this point that it becomes valuable to consider how the study of NDM and managerial cognition can draw value from understanding the situated nature of expertise. The adopted IPA approach was useful in providing a more 'complete' understanding of the social psychological foundations of Day Traders’ practices. This was particularly useful in complementing the ‘task focused’ approach to expertise afforded by the ACTA techniques.

Data collection using IPA has been informative in a number of ways. The IPA was valuable in progressing understanding of the intrinsic qualities of Day Traders that makes them predisposed to this decision environment. It also permitted insight into the rational – emotional basis of their decisions and the highly emotive environments in which they operate. This detailed exposition of trading practices, also informed understanding of the reality of trading focusing upon behavioural constraints and the reality of optimisation. Finally, the IPA highlighted the social psychological basis of day trading, paying particular attention to the role of trading communities in shaping thought and action.

Whilst the insights drawn from these analyses are testament to the success of the mixed-methods qualitative design adopted, reconciling the wealth of data generated presented some difficulty. This was particularly problematic for this study given that both methods employed were qualitative in nature. However, the systematic approach to data analysis and interpretation adopted within this study, provides a depth of insight that otherwise might not have been achieved.

7.4.4 Limitations

A number of limitations relating to the sample of participants used within this study are reviewed. The first pertains to the geographic location of all participants in the city of London, UK. The fact that London is the hub of the UK investment industry, serves as an explanation of the recruitment of participants from within this exclusive region.

Technological advances and the increasing availability of trading software in the last decade make it possible that Day Traders work remotely. However, two issues prohibited recruitment from this sector: (i) the practicality of locating and recruiting Day Traders who
were trading independently (i.e. outside of a firm) was intrinsically difficult and (ii) distinguishing between ‘hobby traders’ and ‘professional traders’ within this sub-population (as necessary for the study of expertise) was problematic. Thus, a decision was made to recruit from within FSA regulated firms. This holds implications for the generalisability of the results within the UK trading community.

Generalisability is also an issue raised within the IPA whereby differences between UK and US socialisation patterns within trading communities were documented. On this note, it is also important to emphasise that this study was based on the views of eight Day Traders. Whilst, this led to an abundance of data (indeed more than could feasibly be incorporated into ACTA’s ‘cognitive demands’ table and far exceed Militello, Hutton and Miller’s (1997) suggestion of 3-5 SME’s) the views conveyed in this study are of a relative minority within the trading community. A final point to re-iterate is that the variability in what constitutes a ‘Day Trader’ and the variation in products traded led to a mixed-set of ACTA results, where some elements were more relevant than others i.e. occurrence of gas facility explosion is likely to be inappropriate to FX Traders.

7.4.5 Future directions

A number of directions for future study that build upon this work are appropriate. First, it may be of value (given the above limitations) to study the expertise of Day Traders in relation to specific products traded. This would involve exclusively focusing upon the domain of FX or Power Derivatives for example. This would rectify the limitation of applicability of ACTA’s ‘cognitive demands’ table.

Second, it may also be useful to compare the findings of the IPA cross-culturally, to test their generalisability, particularly, those pertaining to the social psychological role of trading communities. A third directive involves further examination of the appropriateness of the RPD model in relation to day trading decision behaviour. Whilst, this study has not provided a critical test of this theoretical framework, it has highlighted similarities that exist and is worthy of further consideration.

Finally, given the task-focus of ACTA, it may be useful to develop and integrate further ‘aspects of expertise’ that tap into the social psychological elements elicited by the IPA. This would be advantageous in maintaining the structured and systematic approach of ACTA, whilst benefiting from insights into the socially driven aspects of their expertise.
7.5 Concluding Remarks

This study has demonstrated the value in cross-fertilising methods drawn from NDM for the study of managerial cognition. Complementing the ‘task-focus’ of the ACTA data with the IPA provided a social psychological frame in which to understand Day Traders’ practices. This study has also demonstrated the value of adopting mixed-methods qualitative designs. The implications of these findings are discussed in more detail in Chapter Eight – Discussion in relation to those drawn from the Preliminary Study and Study II.
CHAPTER EIGHT

Discussion

8.1 Introduction

The aim of this thesis was to examine the potential of methodological cross-fertilisation between the fields of NDM and managerial cognition, in order to better understand investment professionals’ decision-making. This research objective (as outlined in Chapter One) has been fulfilled within this thesis, through exploration of the utility of methodological rapprochement between these two research communities. The central contribution of this research is therefore methodological in nature and is marked by an interdisciplinary exchange of methods between these parallel fields.

This chapter draws conclusions from the three studies conducted and discusses the impact of this research in addressing the challenges faced by these communities. The general significance of the findings is also discussed in relation to the methods employed within this thesis, and is used to address epistemological-methodological debates facing the fields of NDM and managerial cognition. The implications of this research for informing the paradigmatic debates of NDM-CDM are also assessed. The discussion then examines the nature of individual differences, as a precursor to the notion of interactional expertise and its suitability for the future study of NDM and managerial cognition. It also considers the utility of mixed-methods research and the practicalities of completing research of this nature. This chapter closes with a discussion of the limitations of this research and provides some directions for further research and recommendations for improving decision thinking.

8.2 Research Findings

This section reviews the main findings drawn from the three studies conducted within this thesis. As a point of reiteration, the research rationale (as outlined in Chapter Four) highlighted NDM and managerial cognition’s common call for the use of connectionist architectures in the study of cognition as an answer to recent epistemological-methodological debates. The research rationale also sought to address managerial cognition’s call for structured approaches to the elicitation and representation of cognition that permit cognitive
heterogeneity, through methodological exchange with NDM. The adoption of a naturalistic approach was also justified on the grounds of the arguable inappropriateness of BDM to the study of NDM and managerial cognition.

In response to the above, two research questions were derived as the principal basis of exploration within the three studies:

Question 1: To what degree do connectionist architectures exhibit methodological and practical value in the study of NDM and managerial cognition?

Question 2: How, if at all do qualitative methods (including those drawn from NDM's qualitative toolbox) assist understanding of contextual components i.e. task and social environment, within which cognition is situated?

The first study documents the preliminary work that piloted the ACTA and 'convince me' methods. Studies II and III examined the 'convince me' and ACTA methods in more detail respectively, complementing the insights drawn with IPA's. What follows, is a summary of the main objectives and conclusions from each study.

8.2.1 Preliminary Study

The Preliminary Study as reported in Chapter Five, was concerned with assessing the utility of ACTA and 'convince me' as methods for cross-fertilisation. The practicality of employing a mixed-methods design also formed a point of exploration. The limited applications of NDM that exist within the investment industry formed the backdrop for this work, on the conviction that Portfolio Managers share many of the characteristics that define NDM.

The successful application of NDM to the investment arena and of the ACTA and 'convince me' methods was marked by the importance of the concepts of 'sense-making' (Klein, Moon and Hoffman, 2006a, 2006b; Klein et al., 2006; Klein, Snowdon and Lock Pin, 2007; Snowdon, 2007) and 'coherence' (Ranney and Thagard, 1988; Thagard, 1989) to the understanding of Portfolio Managers' expertise. These themes were reflected in the thematic analysis derived from the ACTA techniques and served as an implicit mode for Portfolio Managers to evaluate the plausibility of decision choices. This analysis suggested that nested within these themes, a further nine elements exist that guide the process by which Portfolio Managers identify key cues and assess the reliability and credibility of information sources. These were viewed as integral to the achievement of coherence during the sense-making process.
The concept of 'coherence' was also operationalised through 'convinces me' via its formal implementation of the theory of explanatory coherence (TEC). However, variation in correlations between ECHO's activations (the computational component of 'convinces me') and Portfolio Managers' ratings, cast doubt over the theoretical appropriateness of TEC. The belief that the concept of 'coherence' was a wholly inappropriate mode for representing the decision-making of Portfolio Managers was rejected, on the grounds that the ACTA techniques had generated similar concepts that operate in line with TEC. Other concerns to emerge from this analysis centred upon the possible retrospective reconstruction of decision tasks and the impact of time delays between the construction of the causal belief map (Time1) and the ratings of believability and reliability (Time2). On this basis, the view was taken that further study of the 'convinces me' method ought to be undertaken in order to make a more informed assessment of it's value.

Although this mixed-methods approach was valuable in the wealth of data it generated, there was a significant amount of information omitted from the analyses that was informative in understanding the nature of Portfolio Managers' decision-making. Therefore, it was decided that IPA's would be used in Studies II and III (Chapters Six and Seven respectively) in order to harness the profusion of data generated. Whilst this was an approach that was largely emergent from the data in this preliminary work, the view was taken that an IPA approach and it's socially situated insights, might add to the understanding of naturalistic environments in which cognition is based.

8.2.2 Study II
This second study sought to build-upon the work conducted in the Preliminary Study by establishing the utility of the 'convinces me' method in more depth. It also sought to examine the decision-making of investment professionals by examining the expertise of Fund Managers and the social world they inhabit. It also served as a second point for examining the utility of mixed-methods research designs.

The first finding to emerge from Study II, was based upon the simulation of Fund Managers' decisions in 'convinces me.' The connectionist architecture was shown to exhibit a good deal of utility in the modelling of cognition and as a basis for theoretical refutation in NDM. It also demonstrated the ability to capture computational-interpretative thought, the suitability of the architecture for integrating the strength of beliefs and the possibility of comparing causal belief maps without proximal measures of similarity / dissimilarity.
A number of accounts of the variability of correlations were discussed including data error and the inadequacy of TEC to account for individual differences. It was concluded that the principal causes were likely to relate to the difficulty of modelling dominance structures in ‘convince me’ and the inappropriateness of parametric assumptions. The inappropriateness of parametric assumptions in ‘convince me’ was one of the significant findings to emerge from Study II, as was the existence of dominance structures in a small proportion of the causal belief maps. The completion of non-parametric tests that yielded significantly higher correlations certified this as a cause. Overall, this study in line with the preliminary findings of Chapter Five, were taken to confirm the utility of the ‘convince me’ method.

The IPA also produced a number of insights into Fund Managers’ expertise that had not been addressed using the ‘convince me’ models. Four themes were derived from the interviews that shaped the Fund Managers’ discourses. The first termed ‘the art of fund management,’ pitched participants’ local constructions against the concept of *idealized* rationality. This is a theme that emerged in the IPA of Day Traders in Study III (Chapter Seven) and is also addressed later in this discussion in terms of the implications it holds for the conceptualisation of NDM and CDM as antithetical.

The second theme ‘order in the fund management world’ considered the role of organisational rules and norms in shaping Fund Managers’ decision-making practice and highlighted the dynamic and embedded nature of their expertise. The third theme ‘exploiting the market: practices in fund management’ outlined the individual differences that exist in investment style, the inextricable tie assumptions of market efficiency have to valuation and their adoption of contrarian positions and the paradoxical use of past performance as indicators of future states.

The final theme ‘making sense of complex information environments’ drew attention to Fund Managers’ use of conviction in knowledge, experience, intuition and trust in order to make sense of information. This finding parallels the premise that runs throughout this thesis in the use of conviction as a sense-making mechanism by which coherence is achieved.

In summary, this study has supported the use of ‘convince me’ as a method for interdisciplinary collaboration in addressing the methodological challenges of NDM and managerial cognition. In doing so, it has suggested the epistemological-methodological divides characterising these fields to be inappropriate. Whilst, the method is not the most time-efficient in practice, it has been a useful tool for considering the concept of coherence.
in relation to decision-making. The utility of the mixed-methods approach of Chapter Five has been reiterated throughout this second study, most notably with regard to the use of the IPA in the social framing of Fund Managers’ cognition.

8.2.3 Study III

This third study sought to build upon the work in Chapter Five (Preliminary Study) that used the ACTA techniques to study expertise. The time-efficient nature of this method made it a comparatively more efficient method than ‘convince me.’ This study used Day Traders as the point of inquiry and as such, required a method that was informative within the constraints of time.

The ACTA techniques were employed as a method of addressing managerial cognition’s requirement for structured approaches to the elicitation and representation of cognition. The ‘cognitive demands’ table generated from the ACTA method, produced nine cognitively complex elements to Day Traders’ expertise. These were clustered thematically as follows:

(i) Challenge 1: Identifying trends in market  
(ii) Challenge 2: Exploitation of market anomalies  
(iii) Challenge 3: Use of market knowledge to anticipate change  
(iv) Challenge 4: Performance monitoring

Differences across the challenges were found to exist in relation to shifts in time-scale i.e. retrospective, prospective. Day Traders’ decision-making was also denoted by automaticity and pattern recognition as driven by experience. At the most broadest level, the ACTA analysis suggested that Day Traders’ experience was composed of both taught components such as technical analysis and fundamental analysis, but also the forms of expertise that are learned through experience.

These findings were complemented by the completion of an IPA in a similar manner to that conducted in Study II (Chapter Six). The first master theme ‘natural-born traders’ focused upon the intrinsic qualities of Day Traders, highlighting the intersection between the concept of ‘ego’ and the adoption of contrarian positions and in progressing understanding of the natural aptitude for trading they exhibit through consideration of their trading styles.

The second master theme ‘beyond quantification: re-conceptualising trading,’ examined the emotive basis of trading, focusing upon the emotion - rationality inter-relationship and the conceptualisation of day trading as a complex interweave of science and art. It also informed
understanding of the intuitive basis of Traders' expertise, induced by the recognition of patterns formed through experience of markets over time. For instance, the IPA outlined how Day Traders’ anticipation of future market states, is shaped by an understanding of past and current market behaviour. The suggestion that intuition is pre-empted by the identification of patterns emphasises the appropriateness of the RPD model and the processes of mental simulation of action and the generation of expectancies, for understanding this type of expertise (See Chapter Two).

The third master theme ‘trading praxis’ examined the practices used by Day Traders. The practices were denoted by gaming ideology and were situated against the rational ideal of optimisation. This holds implications for the issue of antitheticality between NDM and CDM, as has already been highlighted in Study II and is addressed later in the discussion. Some of the constraints that exist and constrain Day Traders’ behaviour were also examined. The final master theme ‘the social grounding of trading’ highlighted the social basis of Day Traders’ thought and action. It drew specific attention to the social psychological basis of markets, the role of informational interchange through relationships and the supporting role of communities of practice. This theme in particular reinforced the adoption of a mixed-methods approach by emphasising the role of ‘polimorphic action’ i.e. an interactional expertise, whereby expertise is granted property of the individual as opposed to an acquired status.

This final study was integral in confirming the value of mixed-methods designs that combine multiple qualitative methods. In particular, the task-focus of ACTA was informed by the IPA, which emphasised the importance of understanding the social conditions in which decision-making is situated in order to more completely appreciate the acquisition of task-based expertise. Overall, this final study continued to demonstrate the utility of methodological exchange across the fields of NDM and managerial cognition.

8.3 General Conclusions

The general conclusions drawn from across the three studies in this thesis are summarised below:

(i) Inter-disciplinary collaboration is constructive in order to address the methodological challenges faced by NDM and managerial cognition

(ii) The naturalistic study of investment professionals’ decision-making is both useful and valuable in complementing BDM research
In addressing the specific challenges faced by the NDM and managerial cognition communities the following points can be drawn:

(iii) Connectionist architectures can:
   a. Integrate the strengths of causal beliefs into maps
   b. Represent and compare causal belief maps without proximal measures of similarity / dissimilarity
   c. Capture the intersection of computational-interpretative thinking
   d. Provide NDM with a basis for theoretical refutation

(iv) The field of managerial cognition can take value from the structured approach of ACTA in the elicitation and representation of cognition in a form that also permits cognitive heterogeneity

(v) The quantitative-qualitative divide in NDM research is inappropriate

(vi) Paradigmatic interdependence exists between NDM and CDM

(vii) The study of NDM and managerial cognition can draw value from understanding the situated nature of cognition

The following sections discuss some of the implications of these conclusions.

8.3.1 Methods
Given the methodological focus of this study, this section is concerned with discussing the contributions of the choice in methods. Three different methods were applied within this thesis, namely ACTA, ‘convince me’ and IPA which are addressed in turn.

ACTA
The ACTA techniques provided useful insights into the task-focused nature of decision-making. As noted in Chapter Seven, the systematic approach of the techniques was integral in providing a progressive deepening of each participants’ domain of expertise. Certainly for the time spent conducting the interview, the relative wealth of data generated was unparalleled by any other technique used within this thesis. The central strength of this method concerned the ability of these techniques to extract at once the broadness and detail of participants’ expertise.

Although the task focus of ACTA was insightful, the effect of the social environment within which Day Traders’ work was somewhat overlooked. This was a criticism also highlighted by Drury and Darling (2007). This thesis overcame this problem by complementing the ACTA techniques with an IPA that gave primacy to these social aspects. For future research
however, it may be advantageous to develop some additional ‘aspects of expertise’ that tap into these more socially constructed dimensions.

A minor limitation of the ACTA method, concerned the lack of guidance in constructing the ‘cognitive demands’ table. The context-bound nature of Day Traders’ decision-making made it difficult to generalise actions, which was intensified further when the ‘cognitive demands’ table necessitated the aggregation of decision principles across participants. This imperfection led to the thematic clustering of the cognitive demands during the discussion of Study III in order to overcome this issue. Ultimately it was the diversity in the type of product traded that made it difficult to reconcile the ‘knowledge audits’ across participants. With hindsight it may have been more appropriate to recruit experts trading one particular type of commodity e.g. FX or power, in order that common principles could have been more easily derived. The practice however, of gaining access to Day Traders within one specialist domain, perhaps ought to be considered an ideal rather than a feasible reality for research of this type given the challenges faced during recruitment for this study.

A final point for future improvement centres upon the difficulties associated with the use of the prompts ‘rules of thumb’ and ‘opportunities / improvising.’ In the future it might be appropriate to provide illustrative examples of decision behaviour that denote these aspects of expertise as these were frequently met with difficulty. This might have helped obtain more technical examples from these prompts. Alternatively, these aspects could be replaced with others that tap into the socially relevant aspects of expertise.

In summary, the ACTA techniques have been useful in demonstrating how inter-disciplinary collaboration between NDM and managerial cognition can be informative in addressing the challenges these fields’ face. Specifically, it has demonstrated how the field of managerial cognition can draw value from the structured approach of ACTA for the elicitation and representation of cognition. The ACTA method has been of particular utility in addressing the challenge managerial cognition researchers face regarding the use of structured approaches for the elicitation and representation of cognition whilst also permitting cognitive heterogeneity. Finally, use of the ACTA method has also demonstrated how the naturalistic study of investment professionals’ decision-making is both a useful and valuable approach for complementing existing BDM research.
‘Convince me’
The ‘convince me’ method was much less pragmatic by means of comparison to ACTA. Whilst the time taken to elicit the causal belief maps and obtain the ratings was minimal, the time required to develop the models was enormous. This was in part attributed to by the complexity of Fund Managers’ decision-making. This follows discussions with the developers of the ‘convince me’ software (Michael Ranney, University of California, Berkeley and Patricia Schank, Center for Technology in Learning, California) and its theoretical counterpart TEC (Paul Thagard, University of Waterloo, Canada), who highlight the complexity of the models generated in this research in comparison to other studies that have employed the ‘convince me’ method.

The ‘convince me’ models however, were undoubtedly useful in providing an accurate description of the decision-making process. They also permitted assessment of the appropriateness of the concepts of coherence and sense-making to decision behaviour. It is important to note, that although making a contribution to knowledge by providing NDM with a basis for theoretical refutation in this instance (i.e. through the parallels that exist between the concepts of coherence and sense-making as denoted by TEC and NDM generally), ‘convince me’ cannot provide a direct test of NDM models.

Also, whilst, the knowledge base of the Fund Managers’ expertise could be inferred, ‘convince me’ did not (unlike ACTA) generate an understanding of the difficult components of tasks nor of the different aspects that form the basis of their expertise. Further drawbacks associated with the use of this method concern the use of parametric assumptions as a basis for calculation of correlations between participants’ ratings and ECHO’s activations and the difficulty of modelling dominance structures. Whilst the first might be rectified in future study by the completion of non-parametric calculations, the second might be addressed through the modelling of decisions ‘in progress.’ This latter point might also be useful in assessing the practical utility of the ‘convince me’ method as a tool for supporting decision behaviour (i.e. through iterative calculations of the coherence of arguments during the decision-making process). A final point would be to reduce the delay between the construction of the causal belief map \((\text{Time}_c)\) and participants’ ratings \((\text{Time}_r)\). This may be achieved (time permitting) through the construction of causal belief maps and the completion of ratings directly within the software environment. Although the by-product of this approach is that is requires a greater time commitment from participants.
To conclude, like ACTA, the ‘convince me’ method has been useful in illustrating the benefits of ‘borrowing’ methods from cognitive psychology in order to address challenges facing the managerial cognition research community. For instance, ‘convince me’ has been useful in enabling the integration of the strengths of beliefs into causal maps and for enabling their representation and comparison without recourse to proximal measures of similarity / dissimilarity.

Interpretative phenomenological analysis (IPA)

The IPA whilst not utilised as a method per se, was an important analytical tool within this thesis complementing the above methods. It is important to highlight that although the IPA was used, this occurred in response to the data elicited by ‘convince me’ and ACTA respectively, and was therefore not used as a data elicitation method. The key strengths of this interpretative approach for emphasising the more embedded aspects of Fund Managers’ and Day Traders’ expertise and the social worlds in which they make decisions makes IPA an important tool for understanding decision-making. As such, it offered a more complete understanding of investment professionals’ expertise.

Some of the limitations associated with this method of analysis concerned it’s time-consuming nature. The practicality of reconciling the IPA analysis with data derived from the other methods was also particularly labour-intensive. This was especially pertinent within Study III, which involved the aggregation of two qualitative methodologies (ACTA and IPA).

Building upon the demonstrated utility of the IPA, it might be appropriate during future studies to develop a more structured protocol for the elicitation of data, as opposed to the analysis of residual narrative generated by the ‘convince me’ and ACTA methods. The significance of insights provided by the IPA approach suggest that it might also be harnessed as a method in its own right in future research.

Understanding the situated nature of cognition has been shown to be informative for both the study of NDM and managerial cognition as demonstrated in Studies II and III. The value of inter-disciplinary collaboration has also therefore been demonstrated as constructive in addressing the challenges faced by these fields regarding the documentation of sense-making narrative (See Chapter Two for earlier discussion of sense-making narrative).
8.3.2 Epistemological-methodological debates

A number of epistemological-methodological debates exist within the NDM and managerial cognition literatures. The implications of the research reported in this thesis for these debates are considered.

Computation vs. interpretation

As reviewed in Chapters Three and Four, managerial cognition has seen a movement in recent years beyond the epistemological divides of interpretation vs. computation, conceptualising cognition as a ‘dynamic interplay.’ However despite theoretical advance (i.e. Fiol, 2002), this intersection had not been met methodologically. This thesis was therefore situated in line with Fiol’s (2002) suggestion of the value of connectionist architectures as a point of reconciliation of these perspectives. The relative success of the ‘convince me’ models in at once acknowledging the social basis of beliefs and modelling the coherence of investment professionals’ decisions is testament to the existence of this interplay of perspectives.

In conclusion, this thesis has demonstrated inter-disciplinary collaboration between cognitive psychology and the field of managerial cognition to be useful in addressing epistemological-methodological debates. In particular, it has demonstrated through the Preliminary Study (Chapter Five) and Study III (Chapter Seven) the potential of connectionist architectures for capturing the intersection of computational-interpretative thought.

Quantitative - qualitative debates

The field of NDM has not been without debate either. As outlined in Chapter Two, definition of the field of NDM has been situated antithetically against the CDM paradigm. A consequence of which has been an unequivocal rejection of CDM methods. As suggested in Chapter Four, the appropriateness of this qualitative-quantitative divide in method has been called into question (Todd and Gigerenzer, 2001). The application of the connectionist architecture ‘convince me’ within this thesis has demonstrated the utility of complementing the study of NDM with quantitative methods and therefore illustrated the fallacy of paradigmatic exclusivity.

8.3.3 NDM vs. CDM

This thesis also holds implications for the conceptualisation of NDM and CDM. As outlined in the above section, CDM has been operationalised as a platform to pitch the rationale for the NDM approach. The theoretical arguments of the inappropriateness of antitheticality as
outlined in Chapter Two, is supported by the findings of this thesis. At a broad level, the application of NDM to the arena of investment professionals’ decision-making (that is considered to be the epitome of rational decision-making) questions the discreteness of the two approaches.

Study II (Chapter Six) outlined how processes of concentrated reflection and deliberation matched the management of risk and Fund Managers’ decision behaviour. The use of technical and fundamental analysis as tools for determining valuations as represented in participants ‘convince me’ models, suggested a CDM basis to decision-making. The IPA also suggested that the concept of ‘idealist rationality’ forms a backdrop for understanding Fund Managers’ conceptualisations of their information environments.

Fund Managers’ however, also contrasted the notion of ‘idealist rationality’ against ‘realistic implementation,’ in an attempt to emphasise the unattainable nature of CDM’s gold standard. This was further emphasised by participants’ re-conceptualisation of fund management as an art as opposed to a science. Moreover, the relative success of ‘convince me’ as a method not based on Bayesian probabilities, but on judgements of coherence, emphasises the potential for other modes of decision-making to exist besides probabilistic methods.

This was echoed in Study III (Chapter Seven), where the issue of optimisation was addressed directly. The ‘reality of optimisation’ was a sub-theme that emerged during the IPA that was used to denote the practices of Day Traders. Whilst, optimisation was hailed as the ‘holy grail’ in a way analogous to Fund Managers, a number of factors were highlighted as impeding the achievement. These included: the inability to buy or sell in markets, tendencies to become wedded to views, the uncertainty of future performance, data overload, the imperfect nature of information environments and finally, difficulties associated with prediction and the recognition of patterns in real-world environments. Indeed, this was echoed in ACTA with respect to the difficulty of predicting the point at which to close positions during bull market turns. Day Traders did however, ‘play the percentage game’ which like the findings reviewed above from Study II, emphasise the interface that exists between CDM and NDM. As argued in Chapter Two, optimisation is an unattainable truth for both CDM and NDM and thus an inappropriate criterion of their antitheticality.
This is not to say that *all* conditions denoting CDM approaches were not met. The pre-
conditions for optimal choice as outlined in Chapter Two are summarised below in order to
form a framework from which this argument may be progressed.

(i) Goals must be quantitatively well defined, to enable the creation of unambiguous
judgements of whether particular course of actions were effective in meeting goal
states
(ii) Decision makers’ values must remain stable, whilst stability should also be evidenced
in the environment
(iii) The task should be restricted to selection between options and specifies
exhaustiveness as a criterion for alternatives generated to ensure selection of the best

The first necessitates quantitatively well-defined goals to be one of the preconditions for
optimal choice. The goals facing Day Traders are denoted at a broad level by profit and loss
calculations (P&L). Similarly, Fund Managers’ decisions are typically benchmarked against
indices. Therefore, certainly in the case of investment professionals’ decision-making,
judgements of the degree to which goal states are met may be made. Second, the stability of
the environment is a characteristic that is not met in investment professionals’ decision
worlds. In fact on the contrary, the environments inhabited by Fund Managers and
particularly, Day Traders are dynamic. The question of stability in values is a condition of
CDM that is upheld in the decision-making of investment professionals.

The third point requires selection between options and exhaustiveness of alternatives. The
time-constraints of Day Traders’ expertise, precludes the exhaustive comparison of options,
pre-action. In the fast-moving environments in which Day Traders operate, the
implementation of a course of action is at times marked simply by the decision to minimise
losses e.g. following unanticipated change in supply / demand due to storage facility
explosion.

Arguably, the conceptualisation of decision-making as choice among options could be
viewed as dependent upon context. For instance, for Day Traders’ decision-making is
typically characterised by decisions surrounding the placing of long or short positions and
beliefs surrounding the direction of the market. Indeed, for FX spot transactions, decisions
may be made pertaining to the choice in currency pair from the pre-ordained five majors.
Whilst, options are clearly defined in this latter instance, the process of comparison is not
exhaustive and is in actual fact often pre-empted by news releases or market movements.
However, exhaustiveness may be more appropriate for the work of Portfolio and Fund Managers who use software to screen stocks.

The fact that NDM and CDM can be studied together (as implicit throughout this thesis) would suggest that NDM is not a truly separate paradigm, but ought to be conceptualised as a useful, insightful and complementary perspective to traditional decision-making research. In brief, this thesis has suggested that the naturalistic study of investment professionals’ decision-making to be boundedly rational and as such sits at the interface of NDM and CDM approaches. The degree to which decision-making within this industry is denoted by NDM and CDM is dependent upon the type of activity being undertaken, be it day trading, fund management or portfolio management. Thus, whilst CDM strategies used in Studies II and III are not exacting methods, they provide rudimentary rules of thumb, from which decision-makers can situate their action. Therefore, the overlap of NDM and CDM ought not to be considered a difference of paradigm but a different lens through which to view decision-making.

8.3.4 Individual differences

As alluded to in the preceding section, this thesis has also highlighted the significant degree of variability that exists within the Portfolio Managers, Fund Managers and Day Traders decision-making. The main distinctions are reviewed.

First, Study I (Chapter Five) focused upon the decision-making of Portfolio Managers. This type of investment professional exhibited the least amount of variation in terms of investment activity. Typically decisions were characterised as pertaining to the construction of portfolios for new clients with or without existing investments. It also required decisions regarding the degree of risk and whether investments should take the form of individual shares or collectives. Finally, whether a bespoke portfolio should be composed, or whether one of the firms’ guide portfolios would be appropriate. Decisional activities were either advisory only or execution, or a combination of both.

Study II (Chapter Six) was concerned with the decision-making of Fund Managers and it is here that significant variation appeared. There appeared to be three distinct types of Fund Managers, those concerned with investments in individual stocks, those concerned with collective investment vehicles and those concerned with management buy-outs. The latter differed the most significantly. The investment in collectives generally required more
qualitative judgements than the valuation-driven approaches characterising long-term stock investments.

Finally, Study III (Chapter Seven) focused upon the decision-making of Day Traders. Again, variation was exhibited in terms of the duration of positions. For example those investing in FX, typically were in and out within day. Those, trading the power markets, was much more variable from intra-day to 12 months ahead. Moreover, as evidenced in the ‘cognitive demands’ table, variation was therefore associated with the types of activities encountered. For example, supply / demand was a real focus for the power markets, especially action following interruptions to this equilibrium. For FX traders, their decision-making tended to be more heavily recognition-primed. For Day Traders, individual differences were also found for investment style, some preferring more qualitatively driven approaches that are driven by market sentiment, and others preferring more technical analyses. The difference not only operates as a function of product traded, or investment style, but also the characteristics marking the decision environment.

8.3.5 Interactional expertise
The notion of interactional expertise operates in line with a situated perspective in that it emphasises the interaction between task and context. This is concurrent with the theoretical work of Schatzki (2001) and Collins (2001) reviewed earlier (See: Chapters Six and Seven pages 133 and 172-173 respectively). This has been demonstrated not only through the use of IPA’s in Chapters Six and Seven, but has also been instrumental in informing the argument of the paradigmatic interdependence of NDM and CDM on the understanding of the role that the social environment plays in shaping decision thought and action.

It is somewhat surprising that the study of NDM with the primacy it places upon the characteristics of decision environments, has principally concerned itself with features of the task and not given more weight to the socially constructed aspects of expertise. This is an issue that might form part of an agenda for future research.

8.3.6 Mixed-methods approach
The adoption of a mixed-methods approach throughout this thesis has been useful in providing a more complete understanding of investment professionals’ decision-making. As suggested in Chapter Four, it is only through the adoption of mixed-methods that one can come close to capturing the real nature of cognitive phenomena. This thesis has demonstrated how the meaningful combination of qualitative and quantitative methods can
each contribute towards answering the research question. To elaborate, by using different methods for different inquiry components i.e. ACTA's task-focus of expertise, the computational contributions of 'convince me' and the socially situated nature of cognition afforded through IPA, the range of inquiry has been extended.

As addressed in section 8.3.2, this mixed-methods approach to inquiry has been instrumental in informing quantitative-qualitative debates within the field of NDM, by suggesting both forms of research to be informative in understanding decision-making. Consequently, the research design employed within this thesis has also been useful in highlighting the inappropriateness of existing NDM-CDM paradigm debates (See section 8.3.3). The adoption of mixed-methods has also been useful in informing computational-interpretative debates within the field of managerial cognition through the combinatorial use of ACTA, 'convince me' and IPA.

Whilst the utility of mixed-methods research is one that is inherently insightful, the practicality of completing research of this nature is that it is time-intensive. This was particularly true for Study III that used two qualitative methods in combination. Reconciling the findings derived from each method in theoretical and empirical terms was particularly labour-intensive. However, the author would argue that the insights generated far outweigh the time invested. Further limitations associated with this research more generally, are discussed below.

8.3.7 Limitations

Although the limitations associated with the methods used within this thesis have been addressed in section 8.3.1, a number of general limitations of this research are considered here. First, one shortcoming of this work relates to the study of a variety of investment professionals e.g. Portfolio Managers, Fund Managers and Day Traders. Whilst commonalities exist between their respective domains of expertise, comparative review of the methodological contributions of this thesis might have been aided by the situating the research within a single domain. The reality of completing research of this type within the investment industry (i.e. the difficulties associated with the negotiation of access and in-depth interviews), is used however as a justification for the choice in a variety or investment professionals.

A second limitation of this work builds upon the aforementioned shortcoming and is concerned with the limited sample sizes within this thesis. This was largely shaped by the
difficulty of accessing key players within the UK investment industry. Despite sample size restrictions, a wealth of data was generated within each of the three studies. Therefore, the practical feasibility of reconciling data across further participants would have been met with difficulty. Although limited, the eight Day Traders comprising Study III, exceed Militello and Hutton's (1998) suggestion that when using ACTA three to five SME's exhaust the domain of analysis. Likewise the insights gained by developing further 'convince me' simulations in Study II (beyond the eleven models produced), is at best debatable given the time-intensive nature of this method. The utility of integrating further perspectives into the IPA within the studies outlined in this thesis is also questionable, given the abundance of data created.

A third limitation concerns the generalisability of the findings within this thesis. Although justified above on the basis of the practicalities of completing mixed-methods research, the limited sample sizes used to explore each method make it questionable of the degree to which these findings will extend to (i) the decision activities of other investment professionals and (ii) beyond this domain of expertise.

A final limitation concerns the degree to which the findings of this study operate as a simple function of method. For instance, the degree to which the concept of explanatory coherence is evident in the task-focused study of expertise and is not merely a function of the 'convince me' method. To some degree this has been circumvented through the adoption of a mixed-methods approach, from which the validity of concepts were qualitatively verified. Whilst this is not an issue unique to the research contained within this thesis, it is one that necessitates further study.

8.3.8 Further research
A number of future avenues exist that build upon this research are outlined as follows:

Methodological developments
Given the methodological focus of this research, it may be advantageous to examine in more detail the decision-making of Fund Managers using ACTA and Day Traders using 'convince me.' It would also be interesting to consider the potential of 'convince me' to predict decision outcomes on the basis of coherence. Finally, there may also be utility in incorporating social dimensions into ACTA as proposed earlier in this discussion.
Interaction of emotion and rationality

The intersection of emotion with rationality was a theme that emerged throughout the three studies comprising this thesis. The potential for research is two-fold. First, it may be of value to explore in more detail the effect of psychological attachment to positions upon decision action, as a means of exploring the conflict that exists between emotion and rationality. Second, it may be of interest to examine the role of emotion in direct relation to action. For example, understanding how positive emotional states inform subsequent decisions and conversely, how negative emotional states impact decision behaviour.

Role of RPD

The intuitive nature of investment professionals’ decision-making was another key theme to emerge from this work. From a theoretical standpoint, it may be useful to explore components of the RPD model as a means for understanding the experience-based components of their expertise. Future research might also consider the environmental pre-conditions for the use of intuition and those characteristics of the task and / or environment that necessitate more deliberating decision-making strategies.

Social influence and decision-making

A final point is that this thesis highlighted the interactional and highly situated nature of investment professionals’ decision-making. It may therefore be useful to understand the social basis of investment professionals’ expertise. Not only during the acquisition of domain knowledge, but also the influence of the social environment during decision-making i.e. the role of others’ beliefs. This is particularly interesting given the role of contrarian traders. For fund management it may also be interesting to examine the role of the team, given the existence of multi-manager funds.

8.3.9 Recommendations for improving decision thinking

A number of recommendations exist for the disciplines of day trading and fund management. Due to the dynamic and fast-paced characteristics of these decision environments it may be worthwhile developing a number of scenario-based training mechanisms. One such trader interviewed used scenario building as an important decision-making exercise. However, this was not a prevalent practice within the industry. This may help prepare less experienced traders for unexpected events e.g. explosion at storage facility. Using Day Trader (F)’s terms, this would help aid the preservation of mental and financial capital. This thesis has also suggested that during training, it might be of utility to address some of the socially nested aspects of investment professionals’ expertise.
8.4 Concluding Remarks

In conclusion, this chapter has summarised the principal conclusions drawn from the three studies comprising this thesis. It has also considered the degree to which the objectives of this thesis have been met and considered the implications of this work in informing epistemological-methodological debates across the fields of NDM and managerial cognition. A number of avenues for future research that build upon this thesis have been outlined as have some suggestions for the development of investment professionals’ decision thinking.
CHAPTER NINE

Conclusion

This chapter provides a summary of the key conclusions derived from this research, located within the wider organisational debates of the social and management sciences, as reviewed in Chapter One. It also reviews the central theoretical and methodological contributions of this thesis and discusses the implications of this work for the study of an interactional expertise. The chapter closes with a call for increased inter-disciplinary collaborations.

This research was situated in response to repeated calls for exchange in thought across the social and management sciences (Hodgkinson and Healey, 2008; Hodgkinson and Starbuck, 2008b; Hodgkinson and Thomas, 1997; Huff, 1997; Starbuck, 2001; Walsh, 1995). Despite requests for inter-disciplinary cooperation in the study of cognition, collaboration across the decision sciences has been minimal. This thesis sought to rectify this anomaly, and in so doing has demonstrated theoretical and methodological value to exist in such exchanges.

As documented in Chapter One, collaborations to date had been situated at the intersection of BDM and managerial cognition research (Hodgkinson et al., 1999; Hodgkinson and Sparrow, 2002; Markóczy and Goldberg, 1999). However, recent research had started to call into question the appropriateness of BDM’s normative framework and methodological approach for the study of ‘real-world’ decision-making (Beach and Lipshitz, 1993; Lipshitz, Klein and Carroll, 2006; Lipshitz and Strauss, 1997; Zsambok, 1997). Despite rising concern, alternative areas of collaboration had not been exploited. In addressing the concerns of BDM, this thesis explored the boundaries of useful cross-fertilisation between the fields of NDM and managerial cognition (See Chapter Two for a full exposition of the benefits of a naturalistic approach).

Whilst the focus of this work was inherently methodological (these contributions are reviewed in detail in Chapter Eight), this thesis also made a number of contributions to broader debates operating within the social and management sciences. For instance, it has been useful in addressing the tensions facing organisational researchers completing inter-
disciplinary research between useful abstraction across domains and the retention of domain-specific phenomena. As Hodgkinson and Healey (2008) highlight:

"... it would be unfortunate if the field were to degenerate into a series of internecine struggles for cross-domain theoretical supremacy. On the contrary, the plurality of perspectives augers well for the long-term health and vibrancy of research on managerial and organizational cognition and the I/O psychology field in general."

(Hodgkinson and Healey, 2008: p.19-20)

The research documented within this thesis has demonstrated the practical possibility of retaining intricate descriptions of domain-specific phenomena, whilst also drawing upon methodological parallels that exist across multiple fields. The method 'convince me' provides an illustration of this proposition, which although making significant contributions via managerial cognition's concept of causal belief maps and in application to the study of NDM, retains a strong allegiance to its connectionist roots in cognitive psychology.

This thesis has also contributed towards the legitimisation of mixed-methods research designs within cognitive psychological research. The appropriateness and practical feasibility of obtaining philosophical convergence is a topic of significance within the research methods literature (Ball and Ormerod, 2000a, 2000b; Bryman, 2006a, 2006b, 2007; Coyle, 2007; Johnson and Onwuegbuzie, 2004; Ormerod and Ball, 2008; Tashakkori and Teddlie, 2003). This research has added to contemporary debate by demonstrating how mixed-methods can be useful in elaborating the results obtained and extending the range of inquiry by complementing task-focused studies of expertise with understanding of the socially situated nature of cognition. It has also brought the recognition that in the psychological analysis of cognition each of the approaches documented within this thesis ought to be considered as complementary, representing a different lens through which the whole might be viewed.

In contributing towards the legitimisation of mixed-methods research, this thesis has also by implication informed debate regarding the paradigmatic divides that exist within the social sciences. As reviewed in Chapter Four, the antithetical pitching of quantitative and qualitative paradigms has ultimately led to a view of incompatibility (Howe, 1988), resulting in an inappropriate consolidation of paradigm with method. The three studies documented attest to the fallacy of consolidating paradigm and method, through the exchange of quantitative and qualitative methods in the study of NDM and in the reconciliation of computational-interpretative perspectives during the study of managerial cognition.
A final contribution at this broad level of analysis is the suggestion that paradigmatic interdependence exists between perspectives within the decision sciences. This is a point that had been examined in response to the NDM community’s absolute rejection and henceforth antithetical positioning against the CDM perspective. Certainly for understanding the cognition of professionals working within the investment industry, the intersection of both NDM and CDM has been vital. (Note that this thesis has therefore also made a topical contribution by demonstrating the value of applying a ‘naturalistic’ mode of enquiry to the study of investment professionals). This is also a conclusion that can be drawn from the collaboration between NDM and managerial cognition, which can be seen as both a useful and valuable approach in complementing the BDM research that already exists at this juncture.

Although informing a number of broader debates, the focus of this research was inherently methodological and as such has demonstrated the utility of better equipping our toolkit by borrowing from the fields of NDM and managerial cognition. The exchange of methods was shaped by the existence of a number of challenges facing these research communities. A number of specific conclusions drawn from this work are presented below (a more in-depth discussion of the contributions of this research is contained in Chapter Eight).

In methodological terms, this thesis suggests that the ACTA techniques offer a useful structured approach for the elicitation and representation of task-based expertise. This research has also advocated this method as a useful addition to the managerial cognition researchers toolbox. Application has been particularly useful in addressing the methodological challenge that currently faces the managerial cognition community of combining structured approaches whilst also permitting cognitive heterogeneity.

It is also possible to conclude from the research documented that there is value to be drawn by using connectionist architectures to model cognition. The application of the connectionist architecture ‘convince me’ has been demonstrated as a fruitful means for capturing and modelling the intersection of computational-interpretative thought. This was a proposition that although employed metaphorically (Fiol, 2002), had not been applied within the field of managerial cognition in practice. ‘Convince me’ was also deemed an appropriate method for integrating the strengths of causal beliefs into maps and for enabling the representation and comparison of causal belief maps without proximal measures of similarity / dissimilarity, thereby addressing some of the central challenges facing the managerial cognition research community.
The use of connectionist architectures to model cognition have been equally informative within the field of NDM. The proposition that NDM’s methods need not exclude quantitative methodologies and might draw value from formal modelling applications (Todd and Gigerenzer, 2001) is a proposition supported by the findings of this thesis. The research studies using ‘convince me’ have been instrumental in providing (within this thesis at least), NDM with a useful basis for theoretical refutation. A drawback of this method however, is that ‘convince me’ in itself cannot provide a direct test of NDM models, and was only feasible in this thesis by virtue of the parallels that exist between the concepts of coherence and sense-making as denoted by TEC and NDM generally.

The conclusions drawn from this thesis also suggest that the study of NDM and managerial cognition can draw value from understanding the situated nature of cognition. Building upon emerging narrative approaches to the study of decision-making in NDM, this research used IPA as a means of understanding the social worlds in which investment professionals operate. This more complete understanding of investment professionals’ expertise is testament to the adoption of this interpretative approach.

A final point upon which to close this chapter concerns the implications of this work for the study of interactional expertise (Collins, 2001; Schatzki, 2001) i.e. one that occurs between decision-maker, task and the social environment. To elaborate, as a by-product of the mixed-methods approach adopted, a more holistic understanding of investment professionals’ decision-making has been achieved that encompasses both task and organisational levels of analysis. This research not only proposes that mixed-methods designs might be an appropriate means for encapsulating these finite interactions, but that the future study of NDM and managerial cognition might benefit from the notion of interactional expertise.

In conclusion, this thesis has displayed the value in cross-fertilising fields within the social and management sciences. In doing so, it has argued relentlessly for a science in which paradigmatic barriers are broken down and considered as complementary, in order that a fuller description of decision-making may be obtained. As such, this research poses as a starting point from which future collaborations between NDM and managerial cognition can spring.


Borg, I. and J. Lingoes (1978). ‘What weight should weights have in individual differences scaling?’ Quality and Quantity, 12, pp. 223-237.


Ratnesar, N.P. (2005). ‘The quantitative-qualitative divide and the Bayesian view,’ 
Australia.


Management Journal, 14(2), pp. 103-123

back in the lab!’ Journal of Behavioral Decision Making, 14, pp. 353-384.


naturalistic decision making in organisations: Mechanisms of effective decision 
making.’ In: G.P. Hodgkinson and W.H. Starbuck (eds.), The Oxford Handbook of 

Rossman, G.B. and B.L. Wilson (1985). ‘Numbers and words: Combining quantitative and 
qualitative methods in a single large-scale evaluation study,’ Evaluation Review, 
9(5), pp. 627-643.

2007).

reasoning in complex environments.’ In: H.P. Sims Jr., D.A. Gioia and Associates 
(eds.), The Thinking Organization: Dynamics of Organizational and Social 

Lawrence Erlbaum: Mahwah, NJ.

In: E. Salas and G. Klein (eds.), Linking expertise and Naturalistic Decision Making, 
pp. 3-8. Lawrence Erlbaum: Mahwah, NJ.

in the Sociology of Organizations, 5, pp. 135-162.


Saunders, M., P. Lewis, and A. Thornhill (2007). ‘Understanding research philosophies and 
approaches.’ In: M. Saunders, P. Lewis and A. Thornhill (eds.), Research Methods 


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Interpretative Phenomenological Analysis (IPA)

Outlined below is a summary of the process for completing an interpretative phenomenological analysis (IPA). Whilst this is based upon the procedure of Smith, Jarman and Osborn (1999), the authors state …

"... this is not a prescriptive methodology. However, systematically a qualitative method is presented, the crucial part of the analysis remains the particular interpretative analysis the investigator brings to the text."

(Smith, Jarman and Osborn, 1999: p.239)

Note also that this Appendix documents the ‘analytical’ component of completing an IPA. As outlined in Chapter Four, the IPA was based upon the emergent discourse that could not be feasibly included within existing analyses - as such this thesis did not employ explicit interview protocols. See Smith (1995) for a comprehensive overview of the process of constructing interview protocols.

Initial Coding

During this stage, each interview transcript is analysed in turn, with the purpose of identifying shared themes that exist across participants’ accounts. The first transcript is selected and initial thoughts, potential codes and points of interest are noted in the left-hand margin. The transcript may be read a number of times in order to ensure comprehensiveness and a deepening of understanding. The transcript is then re-read, with the researcher noting broader themes as they emerge in the right-hand margin. Codes within the transcript are then examined in order to assess whether they might be meaningfully grouped together and any changes are actioned as necessary. The identification of loose groupings within this first transcript is envisaged to help organise thought during subsequent analyses. This process is then completed for the remaining transcripts.

Analysing Shared Themes

This second stage is concerned with developing a set of ‘higher-order’ themes based upon the initial coding. The process of coding will have led to the emergence of a number of salient themes identified as important. This may simply be one key theme, or may embrace
several different themes. Each general theme to emerge is systematically selected and subjected to an intensive analysis.

The first stage of this process requires the researcher to select a theme and return to the transcripts to ensure there exists adequate data for further analysis. Transcripts are examined again through a more 'focused lens' ensuring no extracts have been overlooked. Computer-aided search functions may be used to identify extracts relating to the theme with the researcher 'copying' and 'pasting' them into a new composite file. Those extracts identified are then meticulously compared to those selected through the previous coding process to ensure completeness. The remaining text is then examined to identify further theme-related extracts not previously identified. Once all transcripts have been checked in this way, this new, highly focused set of data is ready for analysis.

This stage of the analysis seeks to determine the shared aspects of participants' experiences within the selected theme. The first step involves the coding of extracts in more detail. The text is divided into individual extracts, each labelled with name of participant. Each extract is then examined in turn and a provisional code attached. A list of provisional codes is then produced from which the codes are grouped together in more meaningful ways. The second step then groups the extracts according to the new coding categories to produce collections of conceptually similar extracts. This process is completed for each general theme.

Searching for Patterns, Connections and Tensions

The analysis outlined above makes it possible to produce an account of the separate clusters of themes and sub-themes composing them. Alternatively, the analysis may be taken a step further by exploring the patterns of relationships both within and between the conceptual groups. This necessitates consideration about how different themes combine in order to better understand participants' experiences.

A number of techniques can assist the process of acquiring a more holistic perspective of the data. For example, it might be useful to employ diagrams to capture the relationships that exist between emergent themes. These are useful as a means of moving away from the fragmented extracts of text that have shaped previous analyses towards more abstract thought. This process might facilitate the identification of new, implicit or undeveloped relationships that can be incorporated into the write-up stage.
Domain Specific Knowledge: Portfolio Management

The acquirement of domain specific knowledge was framed by the 'initial groundwork phase' of Crandall, Klein and Hoffman (2006). This is a framework that is also used throughout Studies II and III of this thesis (See Appendices Seven and Eleven), on the premise that it would increase the quality and depth of the interviews (Crandall, Klein and Hoffman, 2006).

The starting point of this process required the completion of a 'documentation analysis.' This was important as a means of framing subsequent interviews. At a broad level, the guiding focus was in understanding the main tasks completed by Portfolio Managers and the types of decisions they typically encounter. This was achieved by drawing upon Internet and book resources in order to complement the researcher's existing knowledge. Books used included Chincarini's (2006) Quantitative Equity Portfolio Management, Hagin's (2004) Investment Management: Portfolio Diversification: Risk, Timing: Fact and Fiction and Jacob and Levy’s (2000) Equity Management: Quantitative Analysis for Stock Selection. The latter was instrumental in forming an understanding of the complexity of the stock market and for comprehending some of the less-acknowledged effects within the industry such as calendar effects and forecasting size effects. It also aided the researcher in developing a critical understanding of the utility of value estimations.

Time was also spent understanding modern portfolio theory in particular the concept of diversification on expected investment portfolio returns, by drawing upon the work of Markowitz (1952). Finally, this process also involved close scrutiny of the participating firms’ websites in order that an understanding of the firm and its investment approach may be appreciated. The main areas of understanding generated by this process are outlined below:

(i) Investment terminology (including acronyms)
(ii) Identification of core UK portfolio management firms
(iii) Variations in portfolio management style
(iv) Nature of investments i.e. individual or collective
(v) Distinction between bespoke and firms’ guide portfolios
(vi) Portfolio Manager autonomy in stock selection vs. pre-determined list
(vii) Awareness of key tenets of ‘efficient market hypothesis’
(viii) Familiarisation with Markowitz and the concept of portfolio diversification and its implications for asset allocation
(ix) Understanding of the concepts of valuation and the means by which it is assessed

This ‘initial groundwork phase’ was also useful in identifying potential experts and other informants as potential contacts during the stage of recruitment for this preliminary work. Although there was a great deal of interest generated for the research underway (and interest in the associated results), gaining Portfolio Managers’ commitment to conduct an interview of two hours proved an incredibly difficult task. Given the trade-off between depth of interview and sample size, the decision was therefore made that for the purposes of this preliminary investigation that fewer, albeit more in depth interviews would be more advantageous than multiple superficial ones.
APPENDIX THREE

Instructional Guidelines: ACTA© (Adapted from: Militello, Hutton and Miller, 1997)

Stage 1: ‘Task diagram’

- Write task at top of paper.
- Can you break this task down into between three and six steps? (Map out in guide)
- Of these steps, which ones require cognitive skills? By cognitive skills I mean complex thinking skills such as judgements, assessments or problem solving (circle accordingly).

Getting the call → Pre-assessment of situation → On scene assessment → Assign tasks

Example: Fire-Fighter Commander’s Arrival at Scene of a Fire

Tips:
Re-frame the question if subject matter expert (SME) lists things to consider rather than tasks or if SME says “I don’t understand” i.e. “I’m just looking for a general overview of what is involved in x.”

If SME talks at a fine level of detail redirect him/ her to get broad steps i.e. “Okay, this is great, I am interested in all these details, but for the moment these could be grouped into one activity, I am concerned here with forming a broad understanding of the task.”

“Think back to the last time you did x. What was the first thing you did?”

“What happens after you have done x?”

For the question of “Which require cognitive skills?” responses may take the form of: “I guess I’m always thinking.” An appropriate response could be: “Which of these steps call into play your ability as an experienced x to solve judgements, i.e. the thinking part of your job?”

Give the SME time to think. You may need to repeat or re-phrase the question.
Stage 2: 'Knowledge audit'

Now we are going to look at one particular component of this task to understand the different aspects of your expertise using examples from your experience.

Past and Future:
(Experts know how the situation developed and know where the situation is going)

(i) Is there a time when you walked into the middle of a situation and knew exactly how things got there and where they were headed?
(ii) In this situation, how would you know this? / What cues and strategies are you relying on?
(iii) In what ways would this be difficult for a less-experienced person? What makes it hard to do?

Big Picture:
(Experts understand the whole situation and understand how elements fit together)

(i) Can you give me an example of the big picture for this task? What are the major elements you have to know and keep track of?
(ii) In this situation, how would you know this? / What cues and strategies are you relying on?
(iii) In what ways would this be difficult for a less-experienced person? What makes it hard to do?

Noticing:
(Experts can detect cues and see meaningful patterns)

(i) Have you had experiences where part of a situation just ‘popped’ out at you; where you noticed things going on that others didn’t catch? What is an example?
(ii) In this situation, how would you know this? / What cues and strategies are you relying on?
(iii) In what ways would this be difficult for a less-experienced person? What makes it hard to do?
Tricks of the Trade:
(Experts can combine procedures and do not waste time and resources)

(i) When you do this task, are there ways of working smart or accomplishing more with less i.e. tricks of the trade – that you have found particularly useful?

(ii) In this situation, how would you know this? / What cues and strategies are you relying on?

(iii) In what ways would this be difficult for a less-experienced person? What makes it hard to do?

Improvising / Opportunities:
(Experts can see beyond standard operating procedures and take advantage of opportunities)

(i) Can you think of an example when you have improvised in this task or noticed an opportunity to do something better?

(ii) In this situation, how would you know this? / What cues and strategies are you relying on?

(iii) In what ways would this be difficult for a less-experienced person? What makes it hard to do?

Self-monitoring:
(Experts are aware of their own performance and notice when performance is not what it should be and adjust to get the job done)

(i) Can you think of a time when you realised that you would need to change the way you were performing in order to get a job done?

(ii) In this situation, how would you know this? / What cues and strategies are you relying on?

(iii) In what ways would this be difficult for a less-experienced person? What makes it hard to do?
Anomalies (Optional):
(Experts can spot the unusual and detect deviations from the norm)

(i) Can you describe an instance where you spotted a deviation from the norm, or knew something was amiss?

(ii) In this situation, how would you know this? / What cues and strategies are you relying on?

(iii) In what ways would this be difficult for a less-experienced person? What makes it hard to do?

Equipment Difficulties (Optional):
(Experts know equipment can mislead and do not implicitly trust equipment)

(i) Have there been times when the equipment pointed in one direction, but your own judgement told you to do something else? Or when you had to rely on experience to avoid being led astray by the equipment?

(ii) In this situation, how would you know this? / What cues and strategies are you relying on?

(iii) In what ways would this be difficult for a less-experienced person? What makes it hard to do?

Tips:

Use an example from a familiar domain to help the SME understand.

Sometimes the SME starts with generalities; get specific by asking for examples.

Prompt the SME’s to talk about the tough parts of their job and the cognitive tasks required to do a task.

"It's really hard to explain what I do." As experts gain skill, it becomes second nature. So experts often have difficulty describing their thinking processes i.e. "Can you think of an example when ...”

Throughout take stock and re-focus the interview if necessary.

If the SME is getting drawn into a discussion of aspects of the task not relevant to your goals, redirect the SME so that he or she knows what you are after.

The goal is not to find out simply whether each component is present in the task, but to find out the nature of these skills, specific events were they were required, strategies that have been used and so forth.
Instructional Guidelines: ‘Convince Me’ (Developed by author: McAndrew, 2006)

Causal belief map
The interview will involve the discussion and breaking-down of a complex decision that you have recently experienced within your role as a Fund Manager. This will be achieved through the construction of a ‘causal belief map’ (a visual representation of your decision process).

Specifically, it will involve mapping out your process of reasoning by considering specific hypotheses generated and statements of evidence that existed during that time. It will also permit the documentation of any explanatory or contradictory relations.

Ratings task
A follow-up task will require completion. This will be based upon your causal belief map and will simply require the rating of the believability and reliability of the hypotheses and statements of evidence that you used. This will be completed by email and should take no more than 10 minutes to complete.

Use of interview data
The information will be used for the purposes of producing a cognitive model of your decision in a computational architecture called ‘convince me.’ The purpose of this is to enable a comparison of the coherence of your arguments to that generated by the computer programme on the basis of your hypotheses / evidence and the explanatory / contradictory relationships you described. This method informs research in this area by mapping decision process in a way that allows the (i) strength of beliefs to be incorporated into maps and (ii) comparisons to be made across individuals.

Whilst it is not the objective of the interviews to elicit confidential information, any information disclosed during this process would of course be treated confidentially and remain anonymous within any subsequent reports or publications - as will your identity and organisational affiliation.

Introduction
I would like you to select a second decision-making task from which we are going to map your reasoning process. The purpose of this activity is to understand how your beliefs shape the implementation of a particular decision.

Causal Belief Map: Elicitation

In your own time, I would like you to map out your reasoning when you made a decision about this task. I would like you to map it out in terms of:
- Any hypotheses / expectancies generated
- Any evidence used

This may include their use in assessing the situation and in arriving at an appropriate decision or course of action. Please document any explanatory (bold line) or contradictory (dashed lines) relations that may exist.
Ratings Task

For each node comprising the causal belief map, please circle any hypotheses in yellow and statements of evidence in green labelling them a, b, c, etc. Please categorise / rate each node as below:

Hypotheses:
- Please select whether the hypothesis is:
  - 'Acknowledged fact or statistic’
  - 'Observation or memory’
  - 'One possible inference, opinion or view’
  - 'Some reasonable people might disagree’
  (Note that more than one of the above may apply)
- Rate the believability of the hypothesis on a scale of 1 (low) – 9 (High)

Statements of Evidence:
- Please select whether the statement of evidence is:
  - 'Acknowledged fact or statistic,’
  - 'Observation or memory,’
  - 'One possible inference, opinion or view’
  - 'Some reasonable people might disagree.’
- Rate the believability of the statement of evidence on a scale of 1 (low) – 9 (High)
- Rate the perceived reliability of the statement of evidence on a scale of 1(low) – 3 (High)
APPENDIX FIVE

Preliminary Study: Illustrative Extract From Transcript -Portfolio Manager (A)

Interviewer: Is there one task in particular that does involve you making a lot of judgements, or decisions or assessments ... drawing upon political environments, these types of things?

Interviewee: Probably when a new client comes in with cash.

Interviewer: Okay.

Interviewee: At that stage they have no investments and they are asking for it to be invested. So you really have to start from scratch and I have to work out what a suitable investment scheme would look like for that client.

Interviewer: Okay. For the moment, could you break it down into between three and six major components? So, say a new client comes in.

Interviewee: Okay, so the first thing is that we need to have some background for the client. So, just knowing what the financial position of that client is, is going to be a significant one. This is legislation called ‘know your client!’ Part of that ‘know your client’ will then move on to what their risk profile is. How much risk do they want to take? And so that might be your second one. Your third one is what do they want the investments to do for them? Capital growth? Income? Or somewhere in between? So, that is probably your third one. That is largely coming from the client, and I have got to elicit that from the client. Having done that I have then got the basic framework to work within. I have now got to work out a scheme for that particular amount of money based on that. So, the loose framework, how much I have got to put in the secure area? How much income I have got to get and how much is left over for growth is largely constructed – that part of it. Then you come down to the nitty gritty of actual stocks and the format for that will come out probably of just each day you have if you like an enthusiasm for a particular set of stocks that you are watching. So that ... I don’t know, each of us here probably watch no more than about a 100 different stocks. So, if we feel that they are too high in price, they will be off the buying list. If out of those 100 they come down, that may put them on the buying list. Or if they are in a trend, that says even if they happened to be at a high level but the trend looks to be stable and going forward and can continue for sometime, they may still be on. It’s then really pulling out from that basic knowledge. We’ve got a number of portfolios that are pre-set, so that if we wanted to have some ideas, we have a number of guide portfolios prepared by our research folk. And in this particular firm, [company’s name] put their own money into those. They are run by committee. They don’t move frequently, but they give a pattern to either an international portfolio, an income portfolio, a growth portfolio. So, we can pick up some ideas from there. And just between us around in this office there are five of us, we all sit on one desk. So, one of the processes that works, is by not being locked away in a little room where you work on your own. You are working in a community. You’re interacting, you’re hearing what somebody else says. And the particular style that we have here out of the folk that we have got...

[Reaches for business cards]
This is the mix (I haven't got Andrew's) but, just to show you how it provides a little diversity with it. Patrick and I look after clients on what's called an advisory basis. Our time is taken up with somebody coming in and agreeing with them directly over the phone, in letter, or in an interview, this is what we will do. You are chatting it through with them, so you are taking them with you. Matthew and Alex do discretionary - client comes in and says here's my portfolio, here's my amount of money, get on with it. They're given this remit and then they just have to work within it. They tend to work on block, so that out of say 30 clients they may decide to invest all of those clients into that one particular company at that moment when they have seen the shares at a reasonable price or on the back of a recent announcement or their prospects are just good enough to make them do it. Or the converse, they have seen something that makes them worried. All of those clients would be out instantaneously. The clients would then even if it was discretionary would the next morning get a note to say why it's been done. So, there is a slight difference, and Andrew who has just joined us has a bit of both. They tend to have much more time to do the stock-brokering work, so when we are all sat on a desk together, Alex has a lot more to do with the collectives - the ones where the money has been brought together in a pot and is managed by a fund of some sort and he concentrates a lot on those. Matthew does individual stocks more, and so while we are all talking and listening, Patrick and I will pick up on things that we hear them say and pick and choose which, so we have our job done for us by them. But, Matthew is having to generate it from a fresh, and he has got the time to do that and he'll spend quite a lot of time listening to these Fund Managers and what they're buying and why they're buying, reading the FT, reading magazines like Forbes – fairly straightforward stuff, and he'll know the sorts of journals that are giving better quality advice and the ones that are giving poorer quality advice. And over 30-odd years he has got to know a lot of the companies and the individuals. So, he'll go by how honest the company management is, he will have visited them, eye-balled them if we can do it. We had one in a local life-science fund come in on Friday. And three main people: Finance Director, Chief Executive and Chairman all came in, and we'll talk to them and you can pick up what they are like. And you have to begin to detect whether you can trust them or not because you are actually looking into their eyes and you can begin to detect things that don't come out on paper. And Alex went away and put I think, about £30,000 ... no £30,000,000 into that stock to add to a position he had already got. He liked what he had heard. And this morning they are up 10%, so all of those clients have got a nice gain, you know. But that has come from doing something like that. So, we pick up quite a lot from them, they have much more time because they do it on a discretionary basis and they are closer to these Fund Managers that exist out there and we're not.

Interviewer: I think that this is picking up a lot of the things that I am probably going to come on to ask you actually about in the next 10 minutes. But, it is really interesting, sussing people out and ...

Interviewer: Well, you look on a website and if they have hair on their face as males, then that company is probably much lower down ... I mean what has he got to cover up? He will look on the website of the picture of the individuals and you know try and judge from what he sees. And you can sometimes pick up quite well some of the things that are there in people's faces. It is easier if you go and meet them and he likes to go and visit the companies he knows well, so he builds up a rapport. So that if there is a problem, some of the companies will phone up here and at least alert us. And also try and settle our nerves, you know, if something nasty is going to come out then you know, don't be too worried by this all this means is ... and you know we are kept onboard. If they don't do that ...

Interviewer: Oh, that is a bit worrying.
Interviewee: Yes, if they don’t do that, or if they won’t take your call, you know that is much more difficult and you learn quite a lot about them at that stage.

Interviewer: I bet you do. Can I just regress back through this just slightly? How would we describe what you have just chatted about in broad terms?

Interviewee: Portfolio construction.

Interviewer: Portfolio construction. Okay.

Interviewee: We are starting off with this lot of money from an individual who wants to invest it, so you are trying to look at the best way to construct it. Most often that isn’t how it comes in. It comes in with somebody who has a portfolio already. There used to be only about 600,000 people in this country who had investment portfolios, which is quite a small number out of 50-60 million. That may now have grown, although the portfolios that many have got if they … is property more than shares. So, we are often vying against people who don’t do things in property. Which is something people, most people feel they know well in this country. So, they will often come in with a portfolio. But, the methodology if you like, is still not that dissimilar. So, the client who just came in, she came in with some existing holdings and some cash, so it is a mix of the two. And I have got to pick up on the ones that she has already got and work them in to that portfolio construction to meet her requirements. So, portfolio construction is what we …

Interviewer: Okay, so, that is probably the one that you mainly involves all the judgements and assessments?

Interviewee: Yes.

Interviewer: Okay, we probably might end up covering a bit of what we have chatted about.

Interviewee: Oh, that’s alright, that’s fine, no problem.

Interviewer: Thinking about the portfolio construction I have six to eight areas that I would like to question you about, I guess if that is okay? It is basically drawing upon your knowledge as an expert, and how people with less experience would have difficulty with that. Okay, so sorry they are a bit abstract the questions...

Interviewee: It’s okay, I can probably cope with them!

Interviewer: Is there a time when you walked into the middle of a situation and knew exactly how things got there and where they were headed? In the context of constructing a portfolio?

Interviewee: Most of us have an ability to pick up very quickly anyone’s portfolio at any point and then drive it forward. You can almost read a portfolio if you look at somebody’s existing portfolio. You can read how they have got to that position. So, there’s not … most of us wouldn’t have any trouble picking up where somebody else has left off. But, we each have our own individual likes and dislikes. Each time you have a fresh face come in and look at it, it’s almost always going to involve over time substantial changes, to match what they are familiar with, what their particular angle is that they have in the market.

Interviewer: What kinds of cues and strategies would you use when you were looking at a particular portfolio? A new client has come in with an existing portfolio what would you …
Interviewee: Going back to the portfolio construction you are still coming forward with their basic requirements. And you have got to look at the existing stocks to see whether they match what the client is telling you they want. Simplistically, you may find ones that we don't know very well. Therefore, there would be a requirement just to go and research something like that. We had someone come in last year with some shares in something called [company name], and I didn't know about [company name]. But, I said give me a moment and I will go away and I will do some research just to find out what [company name] is about. And we ended up retaining it. We might not. This particular client who was leaving as you came has a holding in [company name]. I have been trying to suggest she sells it. She's saying no. I agree to differ. But at least she knows that I don't think that is a sensible one for her to hold. So, you know I can look through her list and I can ... she says you know, to her, these are the ones that she thinks are the weak ones. And I've got slightly different ideas on which ones I think are her weaker ones. But, we are getting there. So, in part over time, I hope to train the client to see it in the way that I see it. Which is unfair because I have a very limited view. I don't have a terribly wide view, I can't know everything. But, I know what I feel comfortable with on their behalf, and I can take them with me, because I do this on an advisory basis - I hope to train the client to see it how I see it. And all being well it works hopefully, and you get happy clients if they see it works. But, there's no guarantees, so you know these things still come on risk and sometimes it doesn't always go well. And this may come up later, but we have some clients who we will exchange between us because for whatever reason it is not the clients fault but the portfolio somehow doesn't work. And we have other portfolios that just work. And at times it means giving it over to somebody else to see whether they can do better. So, we have to sometimes do that. And it is a peculiarity and it will always be so, I'm sure but each of us has one that just doesn't work. We try this methodology of a fresh pair of eyes, another direction, it can often make a big difference.

Interviewer: What kind of difficulties ... Why would the things that you have just spoken about be difficult for someone with less experience?

Interviewee: It is a technical area that you are entering that has a lot of knowledge behind it which they won't have. But, experientially people don't live, eat, breathe and drink investment. Whereas, once you have done something for 10 hours a day for 30-odd years ... you're used to seeing ... you know if someone presents you with a bowl of cornflakes and it hasn't got the milk or the sugar on it - I know that for me that doesn't look right. It might be for somebody who comes from Africa and has never seen it - that looks fine and they will quite happily eat dry cornflakes. Nobody has told them any different, but there is a completeness to it when you have added the milk and the sugar that I think we naturally see having done it for so long. There are some simple clues as well in terms of portfolio construction. Straightforwardly, the balance between risk and reward, with no other conditions imposed by the client. Broadly, you would expect to retain a portion in safe area so they always have something liquid, and often you see that that does not happen, they don't have that. After a market that has run up for a long period of time, from 1975-2000 it had a good run, most portfolios had too much in the way of shares and less in the way of safe. And this included some of the biggest ones in the land and some of the most respected ones in the land - people like [fund management firm] were still running something like 90% in shares and only 10% in securities. The market then halves and they are undone. But, they didn't know that after 25 years that when that was going to happen. But it did. It halved and they were in trouble. If they'd retained that longer view, that said all the time you must have a significant proportion in the safe area, their performance over the 25 years would have been poorer, but they wouldn't have got into the trouble they were in when it halved. And you know ... some of them got into significant difficulties, the companies were at risk of failing through capital inadequacy. And a lot of these companies run pensions for folk and the performance of those pension funds has been seriously undermined because of poor portfolio construction. And I mean, that decision making process went array and it went
array because they got caught up in the moment ... it happened to be a 25 year moment! Where shares went up very well, but that’s why it might be difficult for an outsider to come in to some fairly straightforward things for us but for them I think they won’t be straightforward.

Interviewer: Okay, thank you. That was very clear. That was fine thank you. Any other areas where it might be difficult?

Interviewee: We have some clients who simply don’t appear to understand investment at all and will treat what we do more like horse racing and they lose money. And you tell them that what they are doing isn’t investment and that they are going to lose money. And so it can be difficult if you are approached by somebody who is determined to lose their money, but we meet these sorts of folk and some of them want to gamble, not invest and so it can be difficult where you want to advise them in a way that is more investing whereas they want to gamble. We cope less well with gamblers.

Interviewer: I can understand that. So, I guess that if somebody with less experience ...

Interviewee: Well, these people can be quite experienced ... they have lost money for a long number of years! And they don’t appear to learn! And it is not about intellect. Some of the poor investors are often the academics here in Oxford.

Interviewer: I can imagine.

Interviewee: Not someone like [client name] at [firm name] who has a natural ability to see markets. Some of our farmers around have a better feel for how the markets work, whereas academics want to drill into the detail of everything, and sometimes they miss the obvious.

Interviewer: Very true ... tunnel vision. Very, very true! Okay, so if we move onto the next one -- still on the same task. Can you give me an example of the big picture for this task? What are the major elements that you have to know of and keep track of?

Interviewee: Fundamentally, because it is going to come down to individual investment into either a share or a collective, you are going to have to look very carefully at those individual companies. Over and above that you might want to look at the economic background and the geo-political background. But, the important thing is getting the investment right.

Interviewer: Okay, and what kind of ... what cues and strategies would you use? How would you know that? I think we talked about this earlier talking about the right kind of journals for example.

Interviewee: It is going to come from quite a lot of that. The other thing ... coming back to that thing that I told you. Most of us can know about 100 stocks, quite well. So, whether its our collectives lady Patricia – she has 120 stocks that she tracks very hard out of a total arena of something like about 4,000 - 8,000, so she has drilled it down already to about 120. So, anyone who presents in front of her for investment is going to, she is going to pick from that 120. When she has drilled it down further, her current selection is 14 of which she is losing I think she is going to lose 1. So, it is about 13. So, that is some of the cues that you are going to use. In your further note you have 13 that you are very keen on currently based on that. Somebody faced with investing is probably going to be offered from that selection. Erm and although that is for collectives, it is very similar for individual shares. So, Patrick and I will look at a portfolio if it is an existing one we may look to see whether it has any holes as we perceive in the way of coverage for things we think will do well. And if we think they are going to do well for income, Patrick has a particular bent where he has worked in our
London office on dividend tracking. So, if you wanted a good income, an income that rises year by year he used to seek out companies where the income increased year by year by year by year by year and if that happens capital gains usually follow but it helps those clients who want a good income to have that income rising. So, he would have in his furtherment a number of stocks at any one time ... he would see as buying. And so it would come to him from that sort of process. So, while there may be I think there’s about 5,000 stocks in our market – and we are not limited to our market we buy from all around the world. Which makes life a little tougher because I don’t know so many of the companies in Morocco or I’m not familiar with them in [?] or South Island New Zealand. Wherever it may be, I mean we would cover them and nowadays with the Internet we can find out about them. But it ... we will have a small number that we probably do know about and the clients will be investing in those.

Interviewer: Okay, sure. So, I guess that really links on obviously to why that would be difficult for a less-experienced person?

Interviewee: Yeah ... well it is quite a process to go through. So, there is a lot of information to assimilate and therefore it is time. If you’re ... I had an anaesthetist who unfortunately died a couple of months ago, but he used to take calls in the theatre. Now, if he was concentrating on you - you had gone in for your operation - you know, if most of his attention was given over to this you might just feel a little cheated on the table particularly if something went wrong. But, he was concentrating on this. So, it can be difficult for them because of the way their lives are. For many people in this particular office, 2/3rds of our clients are probably widows who traditionally hadn’t grown up with money. It is likely that you will grow up controlling your own finances, learning about them and so on. In the case of a widow, the husband did it while he was alive and she has no idea, other than that it sounds like a horse race. And so they have no inclination and some of them aren’t numerate ... literate ... and so couldn’t possibly handle it. Their own abilities are limited, even if they were to do it, but we have a number of clients who are probably more adept than we are and they can give more time to it as they have no work. As many of them don’t. They can read just as widely as we can. They can take information in, their judgements can be as good or better than ours. And we often work with those clients, some of them produce us some very good ideas. So we are not against using our own clients. There is a lot of expertise out in Oxford. And it is finding the ones that know what they are doing, and not the ones that don’t know! But you quickly, it is not difficult to see competent people, particularly in our world where it is measured by to some extent a monetary reserve. You can track it.

Interviewer: So, I guess the key point there is the assimilation of information?

Interviewee: It is a huge... I mean I would probably... all of us take in vast amounts of information and then we have to process it down. There is too much out there for most people.

Interviewer: I guess knowing what are the key aspects to take onboard ...

Interviewee: Yes ... and often you are coming down to that process to reduce it to a manageable number.
APPENDIX SIX

‘Convince Me’ Log Output - Portfolio Manager (A)

Loading argument: C:\Documents and Settings\My Documents\UniS PhD\Study\Convince Me\Convince Me – Portfolio Manager A /Final Model

Running simulation with parameters:
excitation = 0.03, inhibition = 0.06, data excitation = 0.055, decay = 0.04
proposition H1 Top shares in developing world have good growth prospects
proposition H2 Growth in developing world may be happening by chance
proposition H3 Stock will provide capital gains
proposition H4 Stock will provide income gains
proposition H5 Growth in Company A stocks is likely
proposition H6 Growth in Company A stocks is unlikely
proposition H7 Company A stocks are unlikely to substantially drop in value
proposition H8 Political stability is likely to remain
proposition H9 Corporate responsibility is well managed
proposition H10 Brazilian demographics are amenable to growth
proposition H11 Brazilian demographics are not amenable to growth
proposition H12 Developed world suffers from a lack of top line growth
proposition H13 Porterage and lighterage is a business likely to grow in revenue
proposition H14 In developing world the young people will create economic value
proposition H15 There’s the potential for a larger market in the future with business expansion
proposition H16 Global view: 3-5% economic growth in market place is likely
proposition H17 The global environment fits in with the micro view of the stock
proposition E1 P/E equals a yield of 7%
proposition E2 Corporate responsibility is successfully managed in the UK
proposition E3 Net asset value of Company A is greater than share price
proposition E4 Benjamin Graham principle: if net asset value > share price then buy
proposition E5 Brazil is geographically close to US
proposition E6 Stock reached low (to date) of 60p
proposition E7 Stock tracked for 20 years
proposition E8 Performance ahead of other comparable companies
proposition E9 Political stability likely: President Lula’s speeches on world stage
proposition E10 Brazil used to be a ‘banana republic,’ now a passably well-managed economy
proposition E11 UK banking industry profits total 30-odd billion
proposition E12 UK banking industry has grown profits but not earnings
proposition E13 Demographics: young people available in Brazil
proposition E14 Company B and South African breweries have already moved business into developing areas
proposition E15 Company A shares decreasing in value because of a seller
proposition E16 Share price is about half the price of the rest of the market
proposition E17 Porterage and lighterage company is a service industry
proposition E18 Past experience: Chinese need for iron ore - links to Western Australia in order to meet demands of market place

data E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12 E13 E14 E15 E16 E17 E18 explains H12 H1
explains E11 E12 H12
explains H12 H17
explains H1 H17
explains H8 H17
explains E9 H8
explains H16 H17
explains H5 H17
explains E10 H17
explains H10 H17
explains E13 H10
explains E13 E14 H14
explains H9 H17
explains E2 H9
explains E1 E2 E3 H5
explains H5 H16
explains E13 H5
explains E15 H5
explains E16 H5
explains H4 H5
explains E6 H5
explains H3 H5
explains E6 H4
explains E6 H3
explains H7 H5
explains E7 H5
explains E8 H5
explains E18 H5
explains E4 H5
explains E3 E4
explains E17 E4
explains E8 H13
explains E17 H13
explains E5 H13
explains E8 H15
explains E5 H15
explains E18 E17
contradicts H2 H17
contradicts H1 H2
contradicts H11 H10
contradicts E13 H11
contradicts H6 H5

Simulation weights: Simulation finished. Iterations = 71 (max iterations = 200)

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Correlation between ratings and activations: 0.5
Domain Specific Knowledge: Fund Management

The ‘initial groundwork phase’ (Crandall, Klein and Hoffman, 2006) that shaped the acquisition of domain specific knowledge in the Preliminary Study (as outlined in Appendix Two), was also integral in familiarising the researcher with the domain of Fund Managers’ expertise. In a similar vein, early work was marked by a ‘documentation analysis’ approach that drew upon journal articles, technical publications i.e. Investors Chronicle, books, research documents, and Internet searches available within the public domain. Information obtained was used to inform understanding across the following areas:

(i) Categories of investment houses that exist i.e. fund-of-funds
(ii) Key leaders within the fund management industry
(iii) Types of investment products that are generated i.e. equity-based products
(iv) Variety of activities characterising Fund Managers’ decision-making
(v) Investment and valuation approaches utilised within the industry
(vi) Macro-level investment trends in fund management

This process facilitated the development of a generic understanding of the structure of the industry and how the variation of fund management activities that exist within it were inextricably linked to micro-structural variations e.g. type of investment product, type of investment house, levels of accepted risk and valuation / investment approach.

The extensive correspondence involved during the negotiation of access with one of the industry’s leading fund management houses in the UK provided a further opportunity to acquire domain specific knowledge. Meetings organised with the Head of Product Development with the purpose of discussing this study and enlisting his help in recruiting from within the organisation, also provided a platform upon which knowledge of the domain could be progressed. This occurred in a number of ways. First, it provided informal ‘question and answer’ sessions within which technical concepts and jargon exclusive to the domain could be deciphered. Second, the Head of Product Development was able to recommend and provide introductory reading material such as Bell’s (2003) book Start with the Map the Right Way Up! - An Introduction to Investment. Gaining an overview of the historical background to the organisation also provided the impetus for arranging to partake in an introductory presentation that had been prepared for a leading Japanese Bank, outlining the
historical basis of the organisation, their products and investment approach. Correspondence also provided access to individual biographies for the UK, European and International Equities Teams. This rapport also led to a number of informally structured episodes following the interviews, which provided an opportunity to reflect with the Head of Product Development and clarify any areas of uncertainty. This set the approach (i.e. the use of Fund Manager biographies, fund profiles and company documentation where available) for the rest of the interviews conducted within this study.

Within this meeting the Head of Product Development also raised some interesting questions regarding the impact of diametrically opposing beliefs from a member of the investment team upon the coherence of Fund Managers’ decisions. It was also suggested that the more cognitively complex component of Fund Managers’ decision-making was judging the optimal time to sell. A final suggestion pertained to the ‘efficient market hypothesis’ (i.e. the assumption that within financial markets the prices of traded assets represent all ‘known information’ including the ‘collective beliefs’ of all investors regarding future prospects) and its implications for valuation. Consequently, the efficient market hypothesis deems it impossible to outperform the market by using information that the market has already incorporated into valuation. On this basis, the Head of Product Development suggested that it may be interesting to consider decision-making instances whereby research exposed informational voids in market valuation which may be used to add value and consider their implications for the coherence of beliefs. Whilst, the objective of this study was to understand whether Fund Managers’ decisions were denoted by the concept of coherence, it was felt that it would be more advantageous to leave open the types of decisions mapped during the interviews. However, in the instances that decisions were not forthcoming, these were proffered as potential avenues for focus.
APPENDIX EIGHT

Study II: Illustrative Extract From Transcript – Fund Manager (K)

850 Interviewee: ... Erm, in terms of a change in the strategy in the company. And we felt that the company wasn’t likely to be able to execute.

Interviewer: Okay.

855 Interviewee: And so therefore, the reasons why we had bought the stock in the first place were changing.

Interviewer: Okay.

860 Interviewee: Therefore, we spent a lot of time talking about it. It was one where the timing was right in terms of this was a proper recommendation of I feel, you know, we should ... you should not be holding this stock within the portfolio. Not quite forever, but you know, it was a long-term recommendation.

865 Interviewer: Yeah.

Interviewer: It wasn’t one whereby ‘oh, I just think there is going to be two months of nastiness and then you, you know, you should probably continue to hold it.’

Interviewer: Yeah, okay.

Interviewee: Have very high confidence in the Analyst based on past recommendations.

Interviewer: Uh huh.

875 Interviewee: Based upon the way in which he answers questions, the information that you are given. They have to provide you with the information that forms the basis of their recommendation.

Interviewer: Yeah.

Interviewee: So, you always get something that is very detailed with numbers that you can look through.

880 Interviewer: Okay, okay.

Interviewee: So, you’re pulling – you are in this case pulling together enough information to say ‘yes, the recommendation that’s come from the Analyst to sell is the correct one.’

885 Interviewer: Uh huh, okay.

Interviewer: So, all of that works back to going ‘yes’ this stock will be sold from the portfolio. The next question is when do you sell it?

890 Interviewer: Yeah, sure.

895
Interviewee: So, having decided that this is a stock that you don’t want to hold. Erm, then, it was a case of looking at what had happened erm, in terms of what was happening in the marketplace to the stock price.

Interviewer: Uh huh.

Interviewee: And in this particular instance, erm, the stock price was falling rather rapidly. Now, sorry we have an automatic fire alarm. This is not a part of the decision-making process! Right, so the share price was falling rapidly. Basically, because effectively the company had come out with bad results.

Interviewer: Oh, okay.

Interviewee: People felt that the company wasn’t doing what it had said it was going to do.

Interviewer: Right.

Interviewee: … and therefore, you know, this is part and parcel of why the Analyst changed his recommendation.

Interviewer: Uh huh.

Interviewee: But, if the share price is falling rapidly, you then have to think, ‘well am I going to get a better opportunity to exit the stock?’

Interviewer: Yeah.

Interviewee: You’ve already taken the decision that you want to exit. But, are you going to get a better opportunity to exit the stock?

[Fire Alarm Interruption]

Interviewee: Sorry, I forgot about that!

Interviewer: It’s okay, you gave me warning!

Interviewee: Okay, so the share price has been falling rapidly, so as a result of that you’re like ‘will there be a better exist opportunity?’

Interviewer: Uh huh.

Interviewee: This is when you realise like most people I now do not spend that much time hand-writing! Apologies.

Interviewer: No, no, no, no!

Interviewee: And that … the answer to that question is really unscientific …

Interviewer: Mm.

Interviewee: … and effectively is really based, on well, it’s investor psychology …

Interviewer: Yeah.
Interviewee: ... and market psychology in terms of do you believe that it's ... Do you believe that basically people have panicked out, or have been forced or have become forced sellers? And therefore the price has been marked down too much? And that given a bit more time the price will recover? Erm, and what drives your belief in the answer that, will there be a better opportunity to sell of 'yes' which is what we did, well, what I did in this case, was I decided not to sell immediately because I felt that too much value had just been destroyed.

Interviewer: Yeah.

Interviewee: Erm, it's such a combination of as I said, psychological factors.

Interviewer: Sure.

Interviewee: But, I'm not quite sure how to sort of define them.

Interviewer: Yeah, that's fine.

Interviewee: So, the answer to that was yes. So, I'll wait. So, you wait and then sort of, sold probably one month later.

Interviewer: Okay. Had it dropped, I'm guessing it ... Had it dropped below the level you'd kind of bought in at? Or ... To what degree had the price...

Interviewee: It was one where ... I'm just trying to remember ...

Interviewer: Sorry! Testing you Knowledge!

Interviewee: Probably had, but it had done that a long time before hand.

Interviewer: Oh, okay.

Interviewee: So, it effectively the err ... and also given that it's a dollar dominated stock and the dollar has weakened over sort of the past year. So, the currency move itself for, had actually for the Sterling investor meant that you ...

[Fire Alarm Interruption]

Interviewee: Right.

Interviewer: Okay.

Interviewee: Now, hopefully it's all done. So yes, you do have the great sort of err, err, cases of you know, are you doing sort of regret? I've forgotten what all the technical terminology is for looking at sort of the psychology of financial investing. Erm, yes, it was below the erm, the market value was below the ... the purchase price and the sort of in-costs.

Interviewer: Mm.

Interviewee: Erm, but, very much you try and take that emotional aspect away ...

Interviewer: Yeah.
Interviewee: ... from the action that you’re taking. Erm, and to be frank, when you’re investing in a fund that is just a lot easier than when you’re investing for a private client because nobody gets a contract note.

Interviewer: Okay, right.

Interviewee: I know, that it’s fallen in value ...

Interviewer: Yeah.

Interviewee: ... erm, it’s not as if you’re selling it, you’re sending a contract note to a client, so the client can phone you up and say but you’ve lost me money!

Interviewer: Yeah.

Interviewee: So, in that regard, you’re in slightly less pressure to be looking at it and sort of saying ‘oh, maybe it will recover.’ You know, perhaps we’ll get above the in-price and then I’ll sell it. Erm, but ... so it really was a feeling of yes, I felt that there would be a better opportunity to sell. More in the case of the ... I felt the market price would bounce back.

Interviewer: Mm.

Interviewee: Which is what happened and then we did... I did then sort of sell it.

Interviewer: Okay.

Interviewee: Probably at about 10% higher than it had been.

Interviewer: Okay.

Interviewee: So, it wasn’t a level at which after it had fallen I was saying it has to get back up to a price.

Interviewer: Yeah, sure.

Interviewee: It was more, lets wait, lets see it recover.

Interviewer: Yeah.

Interviewee: When, when you then ... so, we sold it one month later. So, what happened ... What happened during that one month? Erm, so, the sector rose. So, the whole Telecoms sector went up.

Interviewer: Mm.

Interviewee: So, you are looking at stocks always against obviously what they say themselves are doing.

Interviewer: Yeah.

Interviewee: But, in relative terms, what is happening. Erm, but ... So, the sector rose, but [share A] rose by more. So, it did actually outperform.

Interviewer: Okay.
Interviewee: Erm, therefore, that was, that combined with when you ... we ... we switched the proceeds into ... I don’t know whether or not it. Yes, it did actually feature on that one page! Erm so, you’ve got ... right, so you’ve got one side of it in terms of erm, a decision to sell has been made. Frequently when you’re running a fund, you don’t just necessarily... When you sell it’s a case of well, if I sell, I’m going to sell into cash. Is there something out there that will give me a better return than just being within cash?

Interviewer: Okay.

Interviewee: And with the way that these funds are run you don’t necessarily run very, very high cash balances.

Interviewer: Mm.

Interviewee: So, normally if you have ... the other side of something to sell, is what do you replace it with?

Interviewer: Mm.

Interviewee: Erm, so we had, had a recommendation from the Analyst erm, to purchase a stock called [share B]. Which is an Australian Telecoms company.

Interviewer: Uh huh.

Interviewee: So, therefore that makes it a lot ... therefore its made a lot easier when you’re like I can maintain my sector weighting which is what you want to do because we like the sector.

Interviewer: Uh huh.

Interviewee: Right, we’re not quite sure where this is going to go! Where it is going to fit into! What to replace with? Right, we like the sector. We wanted to maintain sector weighting.

Interviewer: Uh huh.

Interviewee: That very conveniently coupled with the erm, recommendation to purchase a new stock [share B], which is a little bit of time after we’d had the sell recommendation ...

Interviewer: Sure.

Interviewee: ... on [share A] erm, means that it ... And it was one whereby, the relative performance, [share A] had performed over a short period, over a short period from when the first one ... when the recommendation to sell had come through, to when I had actually sold, [share A] had outperformed [share B]. So, it was a good time to make a switch.

Interviewer: Oh, okay. Yeah.

Interviewee: Erm, right ... so there you go. You have got a double-mapping!

Interviewer: I have!
Interviewee: I mean, what I haven’t talked through is any of the sort of fundamentals-side. But, that’s because it is basically done by the Analyst.

Interviewer: Sure.

Interviewee: And so yes, you look at it, erm, in terms of as I said when you’re doing the reasonableness test, erm, you will look at that.

Interviewer: Mm.

Interviewee: But, you’re not the one crunching the numbers …

Interviewer: Yeah.

Interviewee: … and actually trying to work out where the company can create value. Whether or not … where the value opportunities actually are? You know, we pay those guys to do it. I’m not going to re-create the wheel.

Interviewer: Yeah, sure.

Interviewee: Erm, right, so making the switch. We have maintained sector weighting. We also are erm, on relative grounds. [Share A] recovery was greater than the sector movement …

Interviewer: Uh huh.

Interviewee: … and the replacement movement. And [share B] has greater upside, or greater expected upside!

Interviewer: Yeah!

Interviewee: So that’s … therefore that was why the switch was made at that point in time.

Interviewer: Yeah.

Interviewee: So, that’s having gone through a sale of a stock, very much looking at where the impetus to sell is driven by the Analyst.
'Convince Me' Log Output - Fund Manager (F)

Loading argument: C:\Documents and Settings\My Documents\UniS PhD\Study II\Convince Me – Fund Manager F /Final model

Running simulation with parameters:
  excitation = 0.0, inhibition = 0.03, data excitation = 0.025, decay = 0.07
proposition H1 Future legacy revenues from potential investor (Company B) will have a positive impact upon valuation and stock price
proposition H2 Company A would be valuable to those with significant business in the states to off-set the tax assets against
proposition H3 Identified theme: Investment in telecom infrastructure at a global level will be profitable
proposition H4 Company A was expected to be the provider for Company B's contract
proposition H5 Company A appeared to have potential for generating value
proposition H6 Action to invest in Company A will bring value: Expected upside in vicinity of 700p
proposition H7 Company A suspected that Companies C and D had back-bitten them and did not have the technology to fulfill the order
proposition H8 We knew there was a large contract up for grabs, but we didn't expect Company A to get all of it
proposition H10 A fair value of Company A still looks to be circa 500p although it stopped trading at 250p
proposition H11 Weighting of Company A in Portfolio is positioned on the expectation that the share price will double
proposition H12 There is a clear value opportunity here in terms of the future valuation of the business (i.e. to double up)
proposition H13 Resolution: Exiting from the stock will produce a net zero effect upon the portfolio
proposition H14 Price: It doesn't matter how much value you have got, there is always someone in China who is prepared to do it cheaper
proposition H16 It is expected that there will be a 200p impairment between the current projected valuations of Company A (500p) and the original expected upside (700p) of this asset
proposition H17 Company C had precipitated this fall by outbidding Company A and would probably be able to take business on the cheap on the way back through
proposition E1 Company A provides network equipment and services in the Telecommunications industry
proposition E2 Clients of Company A include large companies such as Company B
proposition E3 Company A is an established company
proposition E4 Company A has been re-floated (Refinanced)
proposition E5 Company A had previously been insolvent
proposition E6 Reasonable valuations of cash assets were compiled through discussions with Analysts: Company A had a large cash position
proposition E7 Company A failed to win any business with Company B and were deleted from the contract
proposition E8 Company A's stock falls by approximately 50% (Share price move of approximately 500p - 250p)
proposition E9 Biggest, long-standing client (Company B) has walked away

286
proposition E10 Reasonable valuations of pension liabilities and what the tax assets were worth were compiled following discussions with Analysts

proposition E12 The remaining assets and businesses on the balance sheet (Assuming the division involving contract is dead) value at a higher level than the closed trading price

proposition E13 Invested in Company A (Share price = 500p) and took a position at 3% of FUM (Fund Under Management)

proposition E14 A large proportion of Company A's tax assets were in the States

proposition E15 Company C had outbid Company A for contract

proposition E16 A number of Analysts suggested the price at which Company A closed to be lower than 'true' worth of the stocks

proposition E17 Circa 6 months later Company C bids for 1/2 of Company A

proposition E18 Remaining half of Company A is re-floated and re-named

proposition E19 Finance Representatives and Chief Executive of Company A suggested the closed trading price to be unreflective of Company A's real value

proposition E20 Investment in Company A's stock had a roughly zero net effect on portfolio over the 18 month period

proposition E21 Company B was testing equipment within the labs

proposition E22 Weighting of Company A in portfolio is built back to 3%

proposition E23 Vulnerability to corporate activity i.e. potential to buy the assets - further expressed as an aim by management

proposition E24 Company A had the technology to fulfil the order

proposition E25 Company A were in close talks with Company B about the contract

explains E13 H6
explains E14 H2
explains E14 E10
explains E12 E16
explains E19 E12
explains E17 E16
explains E9 E7
explains E9 H7
explains H17 H7
explains E15 H17
explains H14 H17
explains E24 H14
explains E24 H7
explains E25 H4
explains E21 H4
explains H12 H13
explains E17 H12
explains E18 H12
contradicts H6 E8
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contradicts H6 H10
contradicts E9 H8
contradicts H8 E7

Simulation weights: Simulation finished. Iterations = 61 (max iterations = 200)

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Correlation between ratings and activations: 0.67
Study II – Interpretative Phenomenological Analysis (IPA)

The emergent master themes and constituent sub-themes derived from content analysis of the eleven Fund Managers’ transcripts are displayed in Table A.1:

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<td>Bounded Rationality</td>
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<td>Emotion and Action</td>
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<td>2: Order in the Fund Managers’ World</td>
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<td>Dynamic and Embedded Nature of Decision-Making</td>
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<td>Structural Components of Investment House</td>
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<td>3: Exploiting the Market: Practices in Fund Management</td>
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<td>Valuation and the Adoption of Contrarian Positions</td>
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<td>Performance Paradoxes: Past, Present and Future</td>
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<td>4: Making Sense of Complex Information Environments</td>
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<td>Knowledge and Experience</td>
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Table A.1: Thematic Composition of Interpretative Phenomenological Analysis (IPA)

The un-structured interview approach adopted in this study produced master themes loosely focused upon four areas of concern. These themes assist in creating an understanding of the Fund Managers’ decision world. The four themes of: (i) ‘the art of fund management’ (ii) ‘order in the Fund Managers’ world,’ (iii) ‘exploiting the market: practices in fund management’ and (iv) ‘making sense of complex information environments’ are described in more detail below.

**Master Theme 1: The Art of Fund Management**

This master theme uses the concept of ‘idealist rationality’ as a backdrop for the construction of participants’ views surrounding Fund Managers’ decision-making. Contra to pure implementations of rationality, particular attention was drawn to the bounded nature of rationality through the existence of bias and prejudices, re-definition of fund management as an art as opposed to a science and the inextricable link between emotion and action.

**Idealist Rationality**

This first component is rooted in the conventional wisdom of fund management as an inherently rational set of activities. Indeed, for the task of populating a new fund, the decision-making process was explicitly grounded in the concepts of ‘rationality’ and ‘credibility.’
"So, actually how do you populate that blank sheet with stocks that are credible, that have a rational construct...is a very interesting challenge!"

(Fund Manager G, 39-41)

The connotation associated with Fund Manager G's use of the term 'challenge' would suggest that whilst desirable, rationality and credibility are not readily achieved. Fund Manager G later declared "...I really don't know how to help you in terms of trying to rationalise all of this" (66-68), suggesting the existence of what may be termed more tacit components of her thought process. What is worthy of note is her desire to form and recount a 'rational story' of her decision, which suggests the reality of practice to be denoted by less rational processes. This inability to attain entirely rational decisions, is underpinned by the bounded nature of Fund Managers' cognition:

"...the world has become too complex. And from my perspective – I don't believe that I have the ability to process it. It is configural. It is not logical."

(Fund Manager D, 69-71)

The sheer scale of the task of stock-selection is emphasised by the fact that "There are literally 1,000's of stocks that you could invest in. So, how do you narrow that down? What rational construction do you establish?" (Fund Manager G, 83-86). It can be seen that participants used the acknowledgement of the rational ideal as a foundation for exposing the hidden idiosyncrasies of their decision-making process.

A final component relating to the dichotomous nature (rational vs. irrational) of Fund Manager decision-making, concerned the stances adopted by brokers:

"But, what I've found is that there is a huge amount of irrationality in terms of the stance taken, and one of the reasons is because the brokers want to be heard above the noise. So, they will take extreme stances in order to catch your airtime."

(Fund Manager D, 405-410)

The decision environment of the Fund Manager is often infiltrated by the distinct agendas held by alternative broking houses and investment banks, thereby promoting seemingly 'irrational' or inappropriate courses of action. A number of interjectory modes of irrationality that emerged during this analysis continue to be explored under the sub-themes: 'bounded rationality,' 'fund management: science or art?' and 'emotion and action.'

**Bounded Rationality**

This second sub-theme builds upon the platform of idealist 'rationality' vs. a realist implementation of a more curtailed form of 'rationality' outlined in the previous section. On the issue of the adoption of contrarian positions, it was suggested that the mainstream whilst acknowledging the difficulties of maintaining objective views, hold the innate belief that they can counter any emergent subjectivity:

"...I mean any individual Fund Manager would assert that they are not a member of the stampeding herd and that they are able to be objective and it might be a part of your research to prove that actually that's not really possible because we are all human-beings."

(Fund Manager G, 415-420)

Situating 'the self' against 'the other' is a part of the elitist strategy prevalent within Fund Managers' discourses. This can also be seen in the following quotation whereby participants' conceptualisations of decision-making as a boundedly rational process was specifically related to biases:
"But for one reason or another, there is a tendency for biases to appear. So, it’s not a rational process to the extent that people would like."

(Fund Manager D, 57-59)

In many ways the reality of Fund Managers’ decision-making is benchmarked against a gold standard defined by ‘idealist rationality,’ despite an appreciation that it cannot be obtained. Biases discussed by participants adopted strong sociological and psychological forms and appeared to be a prevailing topic within the industry:

“...that’s what we were actually doing next door. Just...what do we like when we meet Fund Managers as individuals? Do we have any inherent bias towards...you know the age old thing is do we have an inherent bias towards US Managers because US people are so self-confident and give you the whole marketing presentation...and mesmerise you with the facts and figures. Whereas, a Japanese Manager – you can’t even communicate.”

(Fund Manager C, 19-29)

Whilst the type of biases and prejudices impacting Fund Managers’ decision-making varied depending upon the type of investment house, they were generally united by negative undertones:

“....when I mean biases, I mean that there’s language in the marketplace to describe the ‘baggage’ and I use that phrase advisedly, and again that’s the language that we use to describe the baggage that one acquires when you are affected by decisions that go against yourself.”

(Fund Manager D, 48-53)

The use of the term “baggage” denotes the unconstructive manner in which such biases disrupt the attainment of pure form of ‘rational’ decision. In relation to these biases and prejudices, participants spent time elaborating upon methods utilised to circumvent these issues. For example, Fund Manager D stated, “...if I have any biases, I am trying to eliminate them by screening” (45-47). Other methods commonly used within the industry included the formation of inter-disciplinary teams:

“...I think that is quite interesting as to how the two prejudices then impact on the overall decision that is made. And actually it is probably quite healthy to have within a team somebody that is looking at one particular...or has a bias towards one particular aspect and somebody who has a bias towards...”

(Fund Manager J, 329-334)

For those investment houses implementing more qualitatively driven decision approaches (e.g. fund-of-funds or corporate finance), there appeared a more positive reading of the role of biases and prejudices in broadening their understanding and providing a more holistic overview of particular investment opportunities.

Fund Management: Science or Art?

Building upon the inappropriateness of an idealistic form of rationality, this sub-theme re-defines the activities of fund management as an art as opposed to a science:

“A lot of people view this as a very mathematical industry and a sciencey industry. But, actually it’s not. There is a lot of judgement here. So, it’s like an art in a way."

(Fund Manager E, 90-93)

Fund Manager E uses the prominence of judgements to emphasise the difficulty of forming unequivocal decisions:
“There is no definitive answer. There is no mathematical judgement that you can definitely come to and say the shares look too expensive or too cheap. You can do as much work as you want and you could still be wrong.”

(Fund Manager E, 340-344)

This inappropriateness of the existence of absolute rationality and pure objective environments dominates participants’ discussions of decision-making thus. Moreover, in the words of Fund Manager E “And this [valuation] for us is key. This really is where the decisions are made – and this is very subjective” (88-90). A second form of this view surfaced from the conceptualisation of physics envy:

“Economics suffers from physics envy. It wants to be a natural science and it’s not. Nothing that we do is particularly objective as far as I’m concerned.”

(Fund Manager D, 62-64)

Participants believed that due to the subjective nature of Fund Managers’ decision environments, and in spite of the use of fundamental analyses it cannot attain the ultimate precision of physics. Whilst, mainstream literature displays tendencies to view this subjectivity as mere ‘noise,’ Fund Manager D views it as an interesting dynamic of fund management in its own right:

“...the majority of us work in a logical fashion and what we need to do in our industry is to...which is where this misconception of physics envy is so interesting, is that you have loads of sensitivities a, b, c, d. And if d changes then the sensitivity of other functions changes as well. I can’t process that.”

(Fund Manager D, 85-91)

So, whilst there is a degree of bounded rationality at work (which is implicated in the subjective element of fund management and the misconception of physics envy), Fund Managers’ decision-making is nevertheless manifest by a deeply engrained logic.

Emotion and Action

Substantiating the notion of fund management as both an art and as a subjective enterprise, the final component of this master theme highlights the emotive role of Fund Managers’ decision-making:

“So, all the way along you have got to be able to change your mind. Really tough bit. Because you have fallen in love with the deal and you have ownership over it and I’m working with one other guy and it is really exciting, and I’m pushing the deal through. It’s a really high-octane thing and I have got to be able to say honestly should we do this deal...now...today? Every single day and that is really hard.”

(Fund Manager B, 214-220)

The language used by Fund Manager B such as ‘fallen in love’ and ‘high-octane’ demonstrates the distinction between ‘idealist rationality’ of absolute objectivity and the reality of Fund Managers’ decision-making. Furthermore, there appears to be active attempts to counter emotional tendencies:

“I mean I use that as a case study of my investment process to clients. Because it does sort of highlight what we do here...try and be a little dispassionate in terms of how we view things.”

(Fund Manager F, 163-166)

Use of the investment process to separate emotion from action was also related to personal accountability:
“But, very much you try and take that emotional aspect away from the action that you’re taking and to be frank when you’re investing in a fund that is just a lot easier than when you’re investing for a private client because nobody gets a contract note.”

(Fund Manager K, 1000-1006)

This theme of emotion and its inextricable link to accountability and action is highlighted further in Fund Manager F’s account:

“The decision of what to do now, is the point at which it became a particularly bad day. I had 45 European clients flying in that night for dinner and a presentation the following day, and one of my key pitches in my presentation was indeed Company A. So, first thing I did was go and rip this page out of my presentation. It’s one of the few times, I mean occasionally it is quite an emotional industry, you know, if things are going your way you feel great. And other times, if things are going bad – you can actually feel physically sick – or at least I do! Actually this is one of those times.”

(Fund Manager F, 40-52)

This physical manifestation of emotion is related not only to action, but also to the high-pressured decision environment of Fund Managers. There is an emergent realisation however, that by becoming emotionally immersed in highly pressured situations, there is a risk of error:

“It is quite an emotional industry – you get angry, you get fired up by things. And it is very easy to throw the baby out of the bathwater ... in a sort of pressured environment.”

(Fund Manager F, 17-19)

The final point on the theme of emotion pertains to the emotional difference according to the type of activity being undertaken:

“Well, I mean, psychologically, buying is an awful lot easier.”

(Fund Manager K, 1266)

Fund Manager K emphasises the ease at which the purchase of securities can be executed as opposed to their sale. As elaborated via discussion, when deciding on an appropriate point to execute a purchase there is no associated loss. Rather, the transaction is conceptualised as a gain as it is rooted on the expectancy of an increase in future value. However, sales often operate as a reaction either to under or over performance. Consequently, the objective is to sell at a point in time that minimises loses / maximise gains, thus creating psychological pressure.

**Master Theme 2: Order in the Fund Management World**

This master theme describes the orders that define the Fund Managers’ world. Orders clustered around three broad themes: (i) ‘organisational rules and norms,’ (ii) ‘dynamic and embedded nature of decision-making’ and (iii) ‘structural components of investment house.’ Orders and the way in which they impact Fund Managers’ decision processes are discussed in turn:

**Organisational Rules and Norms**

Participants communicated the highly regulatory nature of this industry through a number of rules and norms:

“So, the other thing to realise is that the objectives as they are written for the fund, are very much written in technical language as deemed by the FSA.”

(Fund Manager K, 224-226)
For instance, rules defining the types of securities invested within funds, is a pre-determined strategy based upon expected risk and return profiles:

“Initially I have some guidelines and parameters on the kind of investment that I will do and we as a team want to make.”

(Fund Manager B, 67-68)

The extent to which Fund Managers work within constraints as determined by the organisation also extends to the manner in which their decision-making process is governed:

“Sales can be very interesting in terms of how they are driven. You can have some of our funds that we run very much...have what I call a very mechanical aspect to selling, in terms of...for example we have what is known as a Higher Income Fund whereby we are always aiming for a yield in excess of the yield on the All Share...therefore if the yield on an individual stock falls to the All Share yield that is an automatic fail.”

(Fund Manager K, 337-349)

It is important to emphasise that this more mechanical approach of benchmarking stocks is only one of many, but serves to simplify the decision-making process and detract some of the associated emotionality:

“So that’s quite a mechanical rule – quite nice for a Fund Manager to have a rule like that actually that you adhere to! And that is certain types...it is more of a stylistic approach.”

(Fund Manager K, 371-377)

Other investment houses adopt an unconstrained approach that draws upon the high conviction of their Fund Managers:

“We are very much like either I like it and I’ll own it or I don’t like it and I won’t own it. So, in many ways its perception to the market and to other people is its riskier to do that because you are not tied to a benchmark. Whereas our perception is that actually it is not riskier because you’re spending more time buying companies that you do like and that you think are cheap.”

(Fund Manager E, 15-22)

There exist constraints not only as explicitly imposed by the FSA or at the level of the organisation, but also in terms of norms that guide elements of participants’ decision-making. Norms regarding valuation state that:

“There are rules in the venture capital world about how you value your companies. The rules generally are that you have got to be very conservative.”

(Fund Manager I, 149-152)

An inability to appreciate this implicit rule could lead to erroneous judgements of the potential returns from funds. Rules defining diversification and its dampening effect upon risk are also prevalent within the industry:

“I think that the world of investment has changed in that for me anyway – If I see absolute return upside...If I see something is cheap on an absolute basis, the structure of the portfolio is not really a problem. I do believe Markowitz to a certain extent, I do think that a degree of diversification is healthy. But, I also think that it is something again that has been dogmatised. In the academic community it was dogmatised and it was dogmatised in the industry as well.”

(Fund Manager D, 334-343)

This ties in with Fund Manager E’s comments concerning unconstrained funds and the idea that a high degree of conviction in your investments creates less of a need for diversification.
Participants also communicated a number of 'sayings' that had emerged as norms within the industry:

"There's a phrase in the UK stock market which is "never re-visit an old girlfriend" which gives you an insight into the male domination of the industry over time."

(Fund Manager D, 53-56)

This not only provides an insight into the male domination of the industry but also the tendency to avoid re-investing in securities that had under-performed in the past. Note that this psychological tie lies at odds with the familiar disclaimer that 'past performance is not an indicator of future performance' as is discussed in master theme 3.

Dynamic and Embedded Nature of Decision-Making

Drawing together participants’ expressions of the difficulty in mapping one particular decision emphasised the inter-woven character of their decision-making which can make it difficult to establish order:

"As you can see there is a ... just myriads of decisions that are just absolutely fluid."

(Fund Manager G, 56-58)

Fund Manager G also drew attention to the embedded nature of decision processes:

"... none of the decisions that you make about a stock exist in isolation, nor is one a eureka moment. There is no eureka moment about this at all. It is a very long-term, long-standing deep-rooted set of decisions that are based on knowledge."

(Fund Manager G, 378-382)

There is a fluidity and embedded-ness to Fund Managers’ decisions, that makes it inconceivable to consider them in isolation or to conceptualise them as ‘eureka moments.’ To elaborate, Fund Manager G discusses how a stock level decision holds ramifications across multiple levels:

"And all those stock level decisions at this level have implications for the whole portfolio, for the regional portfolio, for the sectoral allocation and for various other levels of consideration in the portfolio. So in putting a stock into a whole portfolio you are affecting the balance of the whole. So, that single stock decision doesn’t exist in isolation and nor can you extract it and say I did this alone because actually well, not only does it have implications for the balance of the portfolio but also how you came to that decision in the first place you start off with a sort of sense of the whole portfolio. So where did that come from? There is a very complex continuum here of which the final buy / sell decision is really only a very small element. It’s not a decision that exists in isolation in any sense. It’s a part of a very vital whole – it’s a part of an organism really."

(Fund Manager G, 2-16)

There are two central points to emphasise. First, is the notion of there existing a wider ‘whole’ of which lower level decisions feed into and naturally cohere. Second is the use of the term ‘organism’ to denote the dynamic nature the portfolio adopts. The continuity and dynamic nature of such investment decisions is described below:

"I make it clear that any stock decisions are vital and part of a continuous pattern...formation. So, having even bought the stock it’s still an alive decision every moment that it exists in the portfolio. You’re continually re-assessing whether it should be there, whether it shouldn’t be there, whether it should be there in relation to other things and how they’re moving. The whole thing is very dynamic."

(Fund Manager G, 17-25)
In line with this, Fund Manager H describes what he terms a “...dynamic approach to investment” (32) that uses a core-satellite approach to investment that has the aim of circumventing the fact that “...our industry is continually seeing change” (Fund Manager H, 160).

Structural Components of Investment House

This sub-theme presents the differences that emerged in the content of Fund Managers’ decision process according to the type of investment house to which they belong. Fund Manager B, who specialises in funds of a corporate finance nature, outlines the implications of their team-based approach to investment:

“A lot of the thinking and strategy behind building the team it is to get people from slightly different backgrounds so that the input, I mean, ultimately what we are focusing upon is the best quality investment decision-making process that we can build.”

(Fund Manager B, 12-15)

Here, the emphasis is upon achieving diversity in decision content through the construction of an inter-disciplinary investment team. Fund Manager B also contrasted the effect of their investment structure with that of more ‘traditional’ fund management processes:

“If the hedge fund trader feels like he has made the wrong decision, he just sells the stock... Once you have done the deal and it’s not going so well. We have a seat on the board. So, one of us who has done the deal will be on the board of the company. So we’re in there to some extent and what we can actually do – provide help and advice.”

(Fund Manager B, 411-418)

Fund Managers of this type adopt a more ‘hands-on’ approach and are therefore able actively manage the investment, as opposed to equity investors whereby the investor and security have no interaction. Differences also exist at the level of performance review:

“I think in our industry the decision-making process comes under much closer scrutiny than other parts of the investment world. For instance, your guy that manages public equities they won’t talk to him about how he makes an investment decision they look at his track record.”

(Fund Manager B, 336-344)

This suggests that for Fund Managers whose investments are in more traditional types of securities, evaluation is principally performance-driven. For corporate finance teams the emergent focus seemed to be more qualitatively based. This concentration on the qualitative elements of decision-making process is one that is shared within fund-of-funds:

“So, we spend a lot of time meeting the managers. We find out what they do, and how they do it. What is the nature of their decision-making process? What goes into it? How they structure the portfolio? What the performance has been like? What they do when times are bad? What they do when times are good.”

(Fund Manager C, 16-20)

These qualitative judgements are used to establish the degree of consistency in investment style and focus is appropriate:

“So, we do have a lot of diversity – but we also have a lot of similarities in the style of management we look for tends to be similar. We have a preference for managers that have a long-term view. That do their own research – proper deep research. That don’t rely on the sales guys who have bought it from the investment banks / broking houses. They are prepared to be contrarian. The stocks that they like to buy or favour are with the rest of the market. All Cap. Not necessarily large cap, but small / mid cap.”

(Fund Manager C, 52-60)
Decisions here are also intricately grounded in the establishment and maintenance of relationships within the industry:

“...we might have 30-core relationships with groups and let’s say 5 of those are no-brainers. You know we are always going to do. And that leaves 20-25, that there is a decision to be made. And there is a continuum of you know, more of a decision to be made to more confirmatory due diligence.”

(Fund Manager J, 27-32)

Here, Fund Manager J draws attention to the difference in process that occurs according to the degree that a fund is deemed to be established and well renowned. For those more reputable funds the decision actually becomes a search for a reason not to invest:

“...and it was more looking to make sure that you know, these guys haven’t got two heads, they haven’t got...haven’t done anything dodgy, they’re not crooks. And rather than actually going in and being really thorough on what’s happening here because you know, we felt that it was something that was interesting and you know, we weren’t looking for a reason to invest, we were looking for a reason not to invest on this one.”

(Fund Manager J, 180-188)

For those more traditional investment houses, the general structure appeared to be more hierarchical as opposed to the team-based approaches discussed so far. That is, the fund would be led by the lead Fund Manager who oversaw the management of regional portfolios:

“...I as one Fund Manager responsible for this whole fund cannot - It’s physically impossible to have that level of control over all those elements of a decision. So, you have to lean into other peoples’ judgements. To what extent do you accept other peoples’ judgements or challenge it? That in itself is a decision.”

(Fund Manager G, 50-56)

These more hierarchical organisations were also driven by more quantitative approaches to decision-making (See: ‘exploiting the market: practices in fund management’ and its associated discussion of ‘individual differences in investment style’). There is one notable exception whereby the task of analysing and managing the portfolio were desegregated:

“The other thing that you have to understand is the way that we operate – is that we have a separate group of Analysts and Fund Managers. So, we’ve split the research for the portfolio and the management elements are quite different.”

(Fund Manager K, 401-411)

This approach therefore necessitated an explicit confirmatory style of judgement of the Analysts proposals (See master theme 4: ‘making sense of complex information environments’ for further elaboration on the issue of ‘sense-making through conviction’).

Master Theme 3: Exploiting the Market: Practices in Fund Management

This third master theme delineates some of the practices in fund management that emerged from participants’ discourses. The elements denoting Fund Managers’ practices are: (i) ‘individual differences in investment style,’ (ii) ‘market efficiency,’ (iii) ‘valuation and the adoption of contrarian positions’ and (iv) ‘performance paradoxes: past, present and future.’

Individual Differences in Investment Style

One element underpinning the fund management practices of participants centred upon investment style. This varied according to both individual differences and according to the type of investment house. For fund-of-funds investment houses, variations in investment style were positioned on a qualitative vs. quantitative dichotomy:
"Well, I think that you could say that different team members focus on different things. So, I'm more of a qualitative man. I'm not an accountant. I'm not inclined to spend lots of time on spreadsheets."

(Fund Manager I, 162-165)

Investment houses that focused upon investment in individual securities appeared to display a shift on this continuum, and were largely defined by quantitative styles. Fund Manager D declares: "...I focus on valuation primarily. The reason for a focus on valuation is that the world has become too complex." (66-69). Thus, from an information-processing perspective Fund Managers investing in equity based securities simply do not have the cognitive capacity necessary to process all of the available information. Further still, Fund Manager D circumvents any qualitative judgements by using more mechanistic screening methods for valuation.

"[The marketplace] is obviously composed of people with different types of people with different agendas. All of whom are trying to get their ideas to the fore. So I mean...we all deal with these things in different ways. But, I kind of circumvent the whole process."

(Fund Manager D, 19-24)

In comparison, the weight attributed to more qualitative judgements in fund-of-funds is considerably higher. This is in part attributed to the difference in scale of investments (i.e. the pool of potential funds to invest in is significantly smaller than the worldwide pool of stocks) and by implication different decision-making requirements (i.e. judgements of overall performance as measured by fund growth and qualitative review of fund suitability vs. the task of narrowing down the available pool of stocks from which under-valued securities are identified).

A final point to emerge from participants’ dialogue was the adoption of contrarian positions. This only appeared as a characteristic of investment styles within the more traditional investment houses that made equity based investments:

"We like to, I mean any individual Fund Manager would assert that they are not a member of the stampeding herd and that they are able to be objective and it might be a part of your research to prove that actually that’s not really possible because we are all human-beings."

(Fund Manager G, 414-420)

This quotation emphasises the link between investment style, the adoption of contrarian positions, and the notion that rationality is an inappropriate ideal. The sub-theme ‘valuation and the adoption of contrarian positions’ discusses this point in more detail.

Market Efficiency

Beliefs denoting the efficiency of markets emerged as integral to Fund Managers’ investment practices. Participants’ practices were characterised by the belief the markets are not always entirely efficient NB:

"The efficient market hypothesis is wrong in as much as it’s being maintained to being a golden rule - But it’s not because it breaks down.”

(Fund Manager D, 156-159)

NB The efficient market hypothesis asserts that financial markets are informationally efficient. On this basis, prices of securities reflect all information and as such are unbiased as they are reflective of the collective belief of all investors. The hypothesis supposes that (besides by chance) it is not possible to outperform the market by using information that the market has already factored into the price of an asset.
The idea that the efficiency of markets is held as a golden standard is congruent with the notion of 'idealistic rationality' as a backdrop for the more pervasive view of inefficient modes of thought. Beliefs in market inefficiency also set the stage for the use of fundamental analysis as opposed to technical analysis (which maintains that all information is reflected in the price of the security) and valuation-driven investment strategies:

"And the market is supposed to be efficient. Maybe it is over time, but in the short-term there can be enormous anomalies in efficiencies and in the way shares are priced. So, it is up to ... it is our job to identify those anomalies by using various valuation methodologies."
(Fund Manager G, 221-227)

This weak-form view of market efficiency denoted participants' beliefs most generally. Whilst, portfolio out-performance was the main criterion of review for fund-of-funds investors, reference was made to the notion of market inefficiency:

"Basically the market = alpha + beta ... So, what we look for is people who managers who are able to generate that alpha. It's about out-performance I guess of the portfolio."
(Fund Manager C, 338-348)

Thus, whilst valuation methods were not integral to fund-of-funds decision-making processes directly, the general notion of market inefficiency operated in the background.

Valuation and the Adoption of Contrarian Positions

Fund Managers' outlined their use of screening as a mechanism for identifying under-valued companies:

"So, the screening allows me to eradicate, a bias, a prejudice that I might have and the valuation allows me to cut out the need to try and think configurally."
(Fund Manager D, 91-94)

Specifically, screening was used as a means of reducing the bias inherent in their decision-making process whilst allowing participants to reduce cognitive overload. The Fund Managers’ discourses also suggested a belief that as the elite players in the industry the derivation of value came from their adoption of contrarian positions:

"...you know, how do you react to certain situations – when everybody is selling something are you following the herd or are you saying well no, I don't want to do that – I want to do something different."
(Fund Manager J, 292-296)

Indeed, Fund Manager D states:

"These sorts of ideas are always full of arguments against them. If there weren't arguments against this sort of idea – then the valuation would be higher. So, what you learn to do is to use them to your advantage. Ultimately if they are exceptionally compelling then it might stop you from taking any investment."
(Fund Manager D, 399 – 405)

The adoption of more risky contrarian positions is concomitant with lower valuations and thus creates the potential to yield higher returns. What is interesting is that the basis of the adoption of a contrarian position is rooted in their expertise in identifying factors that have not been included in valuation, for instance:

"So, what I think other Analysts have failed to appreciate is that this company will make acquisitions."
(Fund Manager E, 228-229)
Fund Manager E goes further to state “I thought well, other people are looking at this in the wrong way” (Fund Manager E, 238-239). This approach to identifying investment opportunities is widespread among the investment community:

“I see a pattern...of assets being taken out and a restructuring within a low expectation company occurring, and it tends to give a benign environment to invest into.”

(Fund Manager D, 434-437)

The use of the term “pattern” connotes a degree of recognition that one can assume is driven by experience. What unites Fund Managers’ investment approaches is their common preference to complement fundamental analyses with information from the wider operating environment as a basis for valuation.

Performance Paradoxes: Past, Present and Future

The final sub-theme on the front of ‘exploiting the market: practices in fund management’ pertains to a paradox that exists regarding the role of past performance as a basis for future performance. It is here that variation exists in the way in which past performance is utilised. Fund Manager F displays a pure focus upon future activity:

“And the key thing to always bear in mind at this point is that as a Retail Fund Manager my funds value everyday at midday, therefore I effectively buy my portfolio – well not manually, but clearly my portfolio values everyday. There is a crystallisation of the value of the loss as far as I’m concerned in my unit price and in my performance. So, at that point it doesn’t matter what happened yesterday – or the day before, or before that. What matters is that, what is going to be going on in the future.”

(Fund Manager F, lines 72-81)

In contrast, as a means of dealing with the difficulty surrounding the uncertainty of future performance, past performance is used as a foundation for judgement:

“Obviously the risk and returns are unknowns in terms of you don’t actually physically know what the return is going to be over a certain time period. All you can do is base it on the past and just sort of ignore the fact that, the fantastic disclaimer that past performance is not a guide to the future. That does make me laugh when everything you do, when you talk about a fund is based on what has been done in the past. And so you can use your knowledge of what has happened in the past to create forecasts.”

(Fund Manager K, 256-276)

What is interesting is that for Fund Manager K at least, this acts in direct conflict with the disclaimer communicated to investors that past performance should not be used as a basis for future performance. This pattern is viewed throughout fund management practice whereby participants expressed a search for performance replication - the basis of which was rooted in previous performance:

“So, for me, what I’m looking to with all of this, to what extent are...is what they’re doing repeatable?

(Fund Manager J, 319-321)

Master Theme 4: Making Sense of Complex Information Environments

This final master theme focuses upon the manner in which participants’ are able to make sense of the complex information environments in which they operate. Four sub-themes emerged from which Fund Managers’ discourses are elaborated: (i) ‘cloud in industry,’ (ii) ‘sense-making through conviction,’ (iii) ‘knowledge and experience’ and (iv) ‘intuition and trust.’
Cloud in Industry

This sub-theme denotes participants’ perceptions of information within the investment industry. As Fund Manager D outlined in the earlier sub-theme ‘idealist rationality,’ there can exist a large degree of irrationality in the stance adopted by brokers as they are driven by alternative agendas. Indeed, Fund Manager I states that within corporate finance “Bullshit is a big problem” (225). This is an issue that also extends to conventional investment funds and fund-of-funds. This opinion is sustained by Fund Manager E, a private equities investor:

“I think, a lot of companies tend to sort of...not in a fraudulent way but they just try and muddy the water a bit. Try and make things look better than they are.”

(Fund Manager E, 300-303)

The acknowledgment that there exists an opacity in information, impacts the decision-making process:

“Yeah, so in a sense what I’m trying to do is to put a reality check on some of the deals that they’re doing. You’d be surprised at some of the shit that gets through in this industry.”

(Fund Manager J, 364-367)

This appreciation leads to a requirement for Fund Managers to use ‘reality checks’ in order to make sense of the accuracy of information. The clouded nature of investments into Chinese markets was also presented as an illustrative example of the issue of informational inefficiencies:

“But, it is important too that it gives diversified exposure, because investing in China is still a pretty...it is pretty clouded. It’s an inefficient market and at the stock specific level and when you’re making direct investments into your...China there are very inefficient levels of information.”

(Fund Manager G, 390-396)

The use of ‘reality checks,’ diversified portfolios and other mechanisms for dealing with issues of reliability, uncertainty and the opaque nature and superfluous amount of information are outlined in the remainder of this analysis.

Sense-Making Through Conviction

This second sub-theme outlines mechanisms used by Fund Managers to deal with conflicting agendas. Fund Manager A describes the ambiguity experienced during decision-making as a “half full, half empty syndrome:”

“You often get the half full, half empty syndrome all the way along. You can look at it one way or look at it another way and that is where the decision-making process is difficult. Because you always have someone on the other side of the fence saying that it won’t work.”

(Fund Manager A, 246-250)

The concepts of ‘sense-making’ and ‘comfort’ were utilised by participants as a means of dealing with this source of conflict:

“So, it’s all those sorts of things which give us a level of comfort, but it is not perfect. And I think you get that with each of these and then I guess, it’s a case of saying well, have I got a sufficient level of comfort, with sufficient of these to feel that it justifies us going forward?”

(Fund Manager J, 156-162)
Fund Manager J’s point that establishing a degree of comfort that “is not perfect” operates in line with principles of satisficing. Establishing a degree of comfort is also achieved by passing judgements of reasonability:

“…you should be able to look at what has been said and think does this sound reasonable? (Fund Manager K, 738-739)

More specifically, processes used to counter conflicting agendas during sense-making included the use of analogy:

“…is what they’re saying – does it make sense? And this is where sometimes it can be quite useful because we are very much generalists and you’re always taking an overview. It means that you can actually sometimes see what’s happened in one industry and you can apply it elsewhere. So, you can actually make linkages.” (Fund Manager K, 745-760)

At times participants’ sense-making processes were also complemented by assessments of believability:

“What do I believe...? Do I believe what the Analyst is saying? Which in itself is quite an important...because sometimes Analysts can become very focused.” (Fund Manager K, 699-700)

This had the effect of considering recommendations within Fund Managers’ established knowledge base. Finally, Fund Manager K describes how these ‘sense checks’ can not only be used to establish belief in Analysts reports, but can also be used in establishing the validity of actions:

“…from the point of view of what is happening in the marketplace, if a stock is moving rapidly, in one direction or another, you…it’s about forming a sense-check and making sure that the action you are about to under-take – Is it a valid action to do? Will there be a better opportunity?” (Fund Manager K, 1229-1236)

Knowledge and Experience

This third sub-theme was manifest in participants’ discourses surrounding the role of experience within their decision-making. Specifically, it builds upon the embedded nature of decision making elaborated in master theme 2: ‘order in the fund management world.’ This theme develops this further by stating that it is not only decisions that do exist in isolation, but also the knowledge associated with them:

“…it’s all part and parcel of the...big melting pot of information that gets put in.” (Fund Manager K, 294-298)

Fund Manager G describes the information drawn upon as deeply rooted and tacit in nature:

“There’s a deep bedrock of experience if you like that you are tapping into.” (Fund Manager G, 187-188)

Conversely, Fund Manager D draws attention to the sheer scale of information used to inform decisions and the risk Fund Managers’ run of losing knowledge in the wealth of information that exists:
“I have plenty of concerns... There is too much noise... emails you know is a terrible thing. You know communication is completely overdone. We get like... I’m as Fischer Black called it “black noise”... Elliot called it “where is the wisdom that has been lost in knowledge, where is the knowledge that has been lost in information?” Completely right. It’s nonsense. We think we have moved into this new remarkable era whereby we can judge things that much better because we have much more information...”

(Fund Manager D, 454-464)

Intuition and Trust

This final sub-theme suggests that for Fund Managers operating with corporate finance and fund-of-funds investment houses, a strong sense of trust underpinned their decisions:

“...difficult in this industry because a lot of it, is there is qualitative decisions in data you can look at, but at the same time it’s....[colleague’s name] right to some extent it is about you know, do you trust these guys?”

(Fund Manager J, 164-168)

Concomitant with trust is the idea that there may also be a gut feeling surrounding decisions:

“So, a lot of it is trust. I suppose at the end of the day – you know it’s trust. Is it gut?”

(Fund Manager I, 134-135)

This gut feel also emerged through discussion with Fund Manager J, who attributed it as a deep-routed result of their experience:

“...because I have spent 6 or 7 years everyday analysing companies, you kind of get a feel for what a successful company looks like. You know, what you have to do in certain markets to be successful. What are the key indicators that you are moving towards?”

(Fund Manager J, 395-400)

In line with this reasoning, there is a sense that emerged from participants’ discourses that their experience and corresponding intuition leads them to draw upon more unconventional sources of judgement:

“No-one will tell you that they make a decision based upon how well the information is presented but actually it does make an impact.”

(Fund Manager B, 127-130)

For example, here Fund Manager B emphasises the role of information in aiding the sense-making process by considering the way that it is presented in the investment memorandum as providing informal clues as to the honesty of the investment house.
Domain Specific Knowledge: Day Trading

The acquisition of domain specific expertise largely echoes the process sketched in Appendices Two and Seven (Preliminary Study and Study II respectively), progressing in accordance with the ‘initial groundwork phase’ of Crandall, Klein and Hoffman (2006). As outlined previously, the first step in orientating the researcher within the domain was to conduct a ‘documentation analysis.’ This had the objective of developing an appreciation of the ‘world’ Day Traders inhabit and progressing the researcher’s technical knowledge of the day trading industry. The development of this knowledge informed a number of thematic contents, as below:

(i) Focus of expertise i.e. FX, bullion (gold, silver precious metals), power (oil, natural gas, wind) and commodities

(ii) Terminology used by Day Traders (both technical and slang)

(iii) Types of contracts traded i.e. forward, spot and options transactions

(iv) Distinction between fundamental vs. technical analysis

(v) Technical software and trading platforms utilised within the industry

(vi) Identification of key trading institutions i.e. energy providers and investment banks, commodities, financial futures and options brokers with proprietary trading desk

(vii) Nature of day trading environments i.e. pit trading vs. electronic platforms

A number of resources were used to inform the researcher’s understanding across these areas. Books such as Zaloom’s (2006) anthropological account entitled Out of the Pits: Traders and Technology from Chicago to London were used to understand the effects of technological change that has been witnessed in recent years upon financial exchanges and its impact upon Day Traders’ techniques and their culture. This was complemented by Schatzki’s (2002) The Site of the Social, within which the social practices and orders surrounding day trading are examined. In addition to the anthropological approach of Zaloom and the philosophical insights proffered by Schatzki, a number of sources offering a psychological lens through which to view Day Traders and their practices were utilised. These included Fenton-O’Creevy et al.’s (2005) book that documented a three-year study that explored the relationships that exist between Day Traders, institutions and the wider financial environment. Elder’s (1993) book Trading for a living was also integral during the
'documentation analysis' phase in bridging the psychological aspect of trading with technical analysis i.e. charts and risk management.

These resources were instrumental in developing the researcher's understanding of the social environment within which Day Traders operate and the more technical aspects of their expertise. They also facilitated the development of an appreciation for the differences that exist in trading styles. In addition, the Internet provided a means of ensuring familiarity with software and platforms used within the industry. It also served as an invaluable point of reference for acquainting the researcher with the more informal expressions used by Day Traders. This was important in providing a more holistic understanding of both the formal and more colloquial language used within the industry and would be instrumental in enabling fluency within subsequent interviews. A number of other resources were used to supplement this acquisition of domain knowledge including journal articles to gain an understanding of the type of research usually conducted within the field, technical publications, journal articles, and research documents. Prior to each interview each firms' website was viewed in order to glean as much background information to the nature of their work i.e. FX, commodities, bullion etc as feasible.

The nature of Day Traders' work activities meant that unlike in Study II (Chapter Six) where extensive time was spent with domain experts during the negotiation of access and data collection, contact with Day Traders was somewhat more restricted. However, in addition to the scheduled interviews, a number of opportunities did arise that aided the acquisition of domain knowledge. These are outlined as follows: (i) the process of negotiating access provided a gateway to interested parties (that although often unable to participate) provided an informal point for knowledge exchange, (ii) preliminary discussions with Head of Gas Desk and FX and Bullion Desk Manager prior to interviewing, (iii) access to observe trading desks at a leading US Bank and Energy Trading firm and finally, (iv) informal discussions outside of the assigned interview regarding trading practices and processes. Whilst, access to the trading desks was limited, it provided an invaluable opportunity to contextualise the researcher's knowledge of technical charting and observe Day Traders' decision-making in action.
Study III: Illustrative Transcript – Day Trader (C)

**Interviewer:** So what I’m looking at really is to use different methods to map cognition and understand your expertise. So, I’ve basically, I have a method here called applied cognitive task analysis. And basically what I want to do is to kind of talk about some of the decisions that you make. Erm, and then kind of map one out quite broadly into like key stages. So, like a fire fighter is I arrive at the scene, I make a judgement, I ...  

**Interviewee:** Yeah.

**Interviewer:** So just kind of broad. There’s eight areas ... questions. It will involve going through and just tapping into different aspects of your expertise. You know, what cues and strategies did you use, why is that difficult for a novice? So, it’s just so that I can kind of get an understanding erm, of the nature of your expertise.

**Interviewee:** Okay.

**Interviewer:** Does that kind of sound okay?

**Interviewee:** Yeah, that I’m with you! I’m with you.

**Interviewer:** Good. Okay, so I actually in all honesty, have a very basic understanding of the kind of decisions that you would ... are likely to make.

**Interviewee:** Yeah.

**Interviewer:** Okay. Okay, so actually I’m at the very early stage in my career as you can probably guess. I’ve been, I’ve had administrative experience for three years in this company before I ...  

**Interviewer:** Oh right ...

**Interviewee:** ... moved to the trading desks. Which I’ve now been doing for three ... just over three years.

**Interviewer:** Okay.

**Interviewee:** So, yeah ... basically half of our, half of our income is client based which is probably not where you’re coming from ...  

**Interviewer:** No.

**Interviewee:** It’s, it’s purely execution and there’s no risk involved in that.
Interviewee: You’re locking it in and ...

Interviewer: Yeah.

Interviewee: ... and then there isn’t really any sort of decision-making to be made.

Interviewer: No.

Interviewee: They want to sell there, you say yeah, you can sell there and you’ve made the mark up. You, you’ve covered that. So, we’ll go no further with that. As for proprietary trading ...

Interviewer: Mm.

Interviewee: ... which is probably 50% of the desk income.

Interviewer: Okay.

Interviewee: But, I mean there is risk involved, as you know ...

Interviewer: Yeah.

Interviewee: ... it is not guaranteed money.

Interviewer: Sure.

Interviewee: Err, we have a target which basically needs, needs to be met. Individually and as, as a desk. That’s, that’s the nature of the business.

Interviewer: Yeah.

Interviewee: Err, putting on a trade, I would ... there’s different methods that are used basically. That you ... you have got some teams that look purely at the fundamentals, the ...

Interviewer: Mm.

Interviewee: ... the strength of the economy a lot of the, a lot of the data that comes out like, like the GDP and the ...

Interviewer: Yeah.

Interviewee: ... trade balance and there’s I don’t know whether ... how much you’ve researched into this, but there’s many bits of data that comes out with every single currency every single day.

Interviewer: Yeah.

Interviewee: So, they are the driving factors behind the market...

Interviewer: Uh huh.

Interviewee: ... moves. But, you have also got technical analysis which is a look at past history and ...
Interviewer: Yeah.

Interviewee: ... how markets have performed in the past. And you have got ... You have got certain ... certain little tips which I suppose ... I suppose it's you could say it's, it's a bit like playing poker. Because you, what, what you want to do is play the percentage game.

Interviewer: Okay.

Interviewee: You're not. No-one's sure where the market's going, but if you think that with the data that we've had recently ... the reports that have been in the press, press are quite hawkish ...

Interviewer: Mm.

Interviewee: ... in fact they say hawkish or dovish.

Interviewer: Okay.

Interviewee: If they are talking the currency up, they will say that they are hawkish their currency.

Interviewer: Oh, okay.

Interviewee: If they are talking it down they say dovish. So, you'll, you'll look at that and you'll probably have a, have a gut feeling of where you think that market's going to go.

Interviewer: Yeah.

Interviewee: But, it's not a case ... this is where the risk management and the decision-making comes in ...

Interviewer: Yeah.

Interviewee: ... it's not always a case of coming in and thinking that's going up I'll buy.

Interviewer: Yeah.

Interviewee: However, much you, you decide yourself, how much you want to buy.

Interviewer: Yeah.

Interviewee: Everyone has got limits of how much ...

Interviewer: Yeah ...

Interviewee: ... of how much they can, can buy. But, it's not a case of it's going up I'll buy it. You have to then decide how much you want to buy ... €500,000, €2 million ...

Interviewer: So, are those ... Are those types of decisions like the same type then that you're generally making? Because I've spoken to people that err ... like working in energy and they're like, they're futures and they're doing all sorts of different types of trades. What are you kind of ... are yours literally ...

Interviewee: We're all spot transactions.

Interviewer: Okay.
Interviewee: Yeah, spot is two days forward say, so the transaction’s made two days later it will either go to delivery if you haven’t traded out of it.

Interviewer: Okay.

Interviewee: So, if you have got $2 million against the pound. In two days you’ll need to provide the sterling and you’ll receive that in dollars. We, we don’t do that. We don’t take, take delivery because we’re, we’re in and out job in the market.

Interviewer: Yeah.

Interviewee: So, we’re, we’re not looking in that to receive the dollars, it’s not, it’s not like you’re an exporter or importer …

Interviewer: Yeah.

Interviewee: … where you need to do the transactions. So …

Interviewer: Okay. So, talking about … that’s really useful because it has kind of given me quite a good overview.

Interviewee: Yes.

Interviewer: Erm, if you were to kind of break down those transactions into between like three or … three or six like key stages. How would you do that? Just to kind of … The person, say if you were giving me a brief overview how would …

Interviewee: Yeah. Erm … I suppose, I suppose your first decision is what currency pair you want to look at.

Interviewer: Okay.

Interviewee: What, what has been going on in the … in the news recently. You’ve got, you’ve gotta decide what currency pairs, pairs you’re looking at and there is millions of them!

Interviewer: Yeah.

Interviewee: You can go as far as the [?] exotics which is Indonesia or wherever, Barbaria.

Interviewer: Okay.

Interviewee: Not really well know for prop traders to …

Interviewer: No!

Interviewee: … Swedish … Swedish krona is one which is actually one, one of the ones that a lot of prop traders use because it’s, it’s trended.

Interviewer: Okay.

Interviewee: Over the last few years it’s, it’s been quite nice to pick levels technically. But generally, you’ve got, you’ve got your majors, which is dollar – yen, sterling – dollar, euro - dollar, euro – sterling … they’re … and dollar - swiss. They’re you’re five majors …
Interviewer: Yeah, okay.

Interviewee: ... in that [?]

Interviewer: And that’s usually where you’d kind of ...

Interviewee: Yeah, that’s generally the ones you’d be looking at.

Interviewer: Okay.

Interviewee: So, yeah you decide what, what currency pair you’re looking at and then you have to decide what currency you think is going to perform. And what currency isn’t going to perform. And then again sometimes that’s depending upon how the market is performing. And on the last week, sometimes, it’s, it’s things ... a data release that you’ve seen that you think oh well, that ...

Interviewer: Yeah.

Interviewee: And also you have got other factors such as the price of oil ...

Interviewer: Mm.

Interviewee: ... which if you have a look at where the price of oil is, you know that Japan is a big importer of oil ...

Interviewer: Okay.

Interviewee: So, if the oil price is high that’s gonna hurt the Japanese currency ...

Interviewer: Yeah.

Interviewee: ... because ...

Interviewer: Yeah, okay.

Interviewee: So, you’ve, you’ve got that, you’ve got that linking in.

Interviewer: Indirectly.

Interviewee: Yeah. But, it’s, it’s all, all things that you’ll look at, while you’re making ... before ...

Interviewer: Yeah.

Interviewee: ... to help you make your decision. Err ...

Interviewer: Okay, and then what about after ...

Interviewee: You’ve decided what you want to do. You’ve decided what currency pair you’re trading. You just need to think which way it is going to go?

Interviewer: Yeah.
Interviewee: Then you need to decide. What size you are going to trade?

Interviewer: Okay.

Interviewee: What, what you’re comfortable with. Err, the factors involved in that I would say are … along with that you have also got to decide your size and you have got to decide what level you are going to enter the market at.

Interviewer: Okay, what does that mean?

Interviewee: You could either go into the market where it is, say it is 1166870 …

Interviewer: Oh, okay.

Interviewee: … or you could say I’m going to buy that if it breaks higher if it goes 16890, I’m going to buy that at 90 …

Interviewer: Yeah.

Interviewee: Or, you could look for a dip in the market to go, to buy it there.

Interviewer: Okay.

Interviewee: So you have got to try and decide what kind of level you want to enter the market at. With that you would. That’s where the technical analysis comes in.

Interviewer: Okay.

Interviewee: So, you’d look at chart points, erm, there’s a, there’s a saying that you know, previous, you’ve got resistance and support levels. Are you familiar with that?

Interviewer: Not really, but I am intrigued to find out!

Interviewee: Yeah. Err, a, a resistance level is … there’s, there’s many resistance levels. Some people look at Fibonacci re-tracements. Which, are you … are you familiar with, with Fibonacci?

Interviewer: No, no I don’t have any financial background at all …

Interviewee: Fibonacci, the mathematics behind Fibonacci …

Interviewer: Okay … okay.

Interviewee: Err, it, you know, it relates to nature and it’s … it relates to so many millions of things, that … that this number also relates to err, technical levels on, on chart points and people look … if there’s a move of 3 big figures on euro – dollar over the last 2 weeks from here to here.

Interviewer: Mm.

Interviewee: What people look at is the Fibonacci retracement levels at 31.8%, 50% and 72%.

Interviewer: Oh, okay.
Interviewee: So, if, if it had retraced to 38% then that sometimes is an opportunity to buy it. You have seen it move up.

Interviewer: Oh okay.

Interviewee: That is called a correction in the market.

Interviewer: Oh, okay.

Interviewee: It’s, it’s moving up, it’s trending up, but it never moves just in one way ... 

Interviewer: Yeah, yeah, yeah ...

Interviewee: So, so you’ll see, you’ll see that.

Interviewer: Okay.

Interviewee: There’s also Elliott wave theory which is ... There’s five ways, you have got the initial move up with just a small correction, quite often it’s a Fibonacci ...

Interviewer: Okay.

Interviewee: ... and then you’ve got that, a second wave correction.

Interviewer: Okay.

Interviewee: And then you have got the third wave which is the main driver. It is always the longest wave.

Interviewer: Oh, okay.

Interviewee: So, if you can see one of these building and you can get on it ...

Interviewer: Yeah ...

Interviewee: ... then you’re looking for that. And then, and then it tops out. Corrects again and then you have got the fifth wave where it picks up ... and this is, that is generally where people say oh that looks good, look how well this has performed.

Interviewer: Mm.

Interviewee: So, that will push it up a little bit more.

Interviewer: Yeah.

Interviewee: They’ll be wanting to get involved and then it normally cuts out again.

Interviewer: Okay.

Interviewee: So, that’s another [...] ...

Interviewer: Okay, so that’s kind of all in ... that’s all really ... I [...] you are really helping me. Erm, is there any ... anything after this bit here?
Interviewee: Err, yeah, your exit levels.

Interviewer: Okay.

Interviewee: Because you have put your trade on ... you’re not going to keep it forever. You can, can keep it for an indefinite time period.

Interviewer: Yeah.

Interviewee: If, if you wanted ...

Interviewer: Yeah.

Interviewee: … and it was, it would revalue overnight at where it closed, you’d take that money in and you do what is know as the swap trade. Which is selling yesterday and buying tomorrow.

Interviewer: Yeah.

Interviewee: So, it’s just, it keeps … doing that everyday. But err, really, you want to lock your money in if you have made money.

Interviewer: Yeah.

Interviewee: Or if it is going against you, you don’t want to lose no more. You stop it out. So you need to decide at what levels you’re prepared to see so much pain. If it’s going against you, how much pain can you wear?

Interviewer: Yeah, okay.

Interviewee: At what point are you gonna say right … this is gone wrong. I’m out.

Interviewer: Yeah.

Interviewee: And you also wanna know, at what point, do you think that is a maximum profit …?

Interviewer: [?].

Interviewee: Yeah, I’m happy.

Interviewer: Yeah.

Interviewee: You know, I want to take my profit here. So, these are your exit levels.

Interviewer: So, which out of these is the most kind of cognitively complex. Which is the real one that demands ...

Interviewee: It would be the size of the trade and the levels, the entry levels.

Interviewer: Okay. Yep ... okay. Can we focus on them … on those, because I know we kind of, we stared diverging and talking about other kind of bits kind of related to this. Can we focus on this area then for the rest of the, the interview? If that’s okay?
Interviewee: Yep, sure.

Interviewer: I’ve got some incredibly abstract questions to ask you, so please don’t laugh! I’ll pull that off so we can look at it. Okay, so if we just kind of focus on …

Interviewee: What, what, what have I actually put? I’ve put, so got to decide what currency pair to look at, what currency …

Interviewer: Perform.

Interviewee: …what currency pair is going to perform out of the two yeah … And yeah, this is …

Interviewer: That’s probably the…

Interviewee: The most important. That, that is a real decision-making. They’re all decisions but that’s the make or break I would probably say.

Interviewer: Yeah. Erm, okay, so on with the questions! Okay, so focusing upon this area here, is there a time when you walked into the middle of a situation and knew exactly how things got there and where they were headed?

Interviewee: Can you err, repeat the question please?

Interviewer: Is there a time when you walked into the middle of a situation and knew exactly how things got there and where they were headed?

Interviewee: I’m trying to put that into … into … this …

Interviewer: Have you …

Interviewee: If that’s where you wanna …

Interviewer: Yeah. Have you … kind of …

Interviewee: Err, this is quite a tough question really. I mean, yeah, there are times, I’m not sure if this is, this is where, where you’re going with it but, there are times when you walk, you walk in and you, you’ve seen, you’ve seen the market perform in such a way which you expected, you’re comfortable with it and you know that …

Interviewer: Yeah.

Interviewee: … even though you never know, because you never know …

Interviewer: Yeah, yeah, yeah.

Interviewee: And you know that it is going to continue in that way. Yeah, there are times like that.

Interviewer: Have you got an example of a time like that?
Interviewee: Yeah, I would say, end of last year with euro – dollar. It was, it was ... higher every single day for about 3 weeks. I came... well probably not 3 weeks ... for a week and a half I came in and it was high again. I thought that is going to go higher. And it did!

Interviewer: Yeah.

Interviewee: There, erm ...

Interviewer: Okay. Erm ...

Interviewee: And that’s, that’s an example of a trend in market you’ll hear. You’ll hear a lot about that.

Interviewer: Trend in market.

Interviewee: Trend in market. The trend is your friend. Is the, is the saying.

Interviewer: I’ve heard that before!

Interviewee: Yes.

Interviewer: Okay. Okay, so and what cues and strategies did you rely on to kind of know that? What were you looking for? What was telling you that it kept on increasing?

Interviewee: Trend.

Interviewer: The basic trend.

Interviewee: Yeah.

Interviewer: Any other kind of ...

Interviewee: Again, technical, technical analysis, would tell you that. That’s ... that’s just re-iterating that it, that it, has been trending on a daily basis. Higher highs, higher lows is what defines the trending up. Up trend, lower highs and lower lows. And the high of the day and the low of the day of ... of yesterday say was there and there.

Interviewer: Uh huh.

Interviewee: The next day if it was there and there ...

Interviewer: Oh, okay.

Interviewee: ... and there and there, higher highs and higher lows.

Interviewer: Okay, so that would be like that then.

Interviewee: Yep.

Interviewer: So, ... it would be like ... okay.

Interviewee: So, it’s just sort of like staying in that channel.

Interviewer: You learn lots everyday!
Interviewee: I don’t actually think it’s massively difficult really!

Interviewer: No? It’s just, I mean I have no ...

Interviewee: It’s quite simple.

Interviewer: So, ... any other cues? Did you look into, kind of, I mean more at the fundamentals, or kind of macro environment stuff that was going on or did you ... literally just go on kind of the trend.

Interviewee: Yeah, yeah in that example, that was just purely on trend.

Interviewer: Okay. Cool. Erm, and why would that be difficult for someone with less-experience?

Interviewee: Probably because they don’t know what a trend is! I guess. I don’t know.

Interviewer: Okay.

Interviewee: As I said, it is quite basic if, if you know.


Interviewee: Can I just say how difficult it was and your, you next question oh...

Interviewer: Yeah, why difficult!

Interviewee: Why difficult!

Interviewer: ... Erm, okay erm ... Can you give me an example of the big picture for this task? So, what are the major elements that you have to know of and keep track of? So kind of looking back at this again.

Interviewee: That ... that. The, major ... the big picture is the fundamentals behind the currency which is the monetary policy of the bank of that country. Inflation targets, interest rates, there’s, there’s so many there that I could go on and on. Retail sales ...

Interviewer: What was it, fundamentals, foreign currency, erm ... you said something about bank ....?

Interviewee: Sorry.

Interviewer: You said something about bank?

Interviewee: Interest, interest rate. Erm, monetary policy.

Interviewer: That was it! I couldn’t write quick enough!

Interviewee: Sorry.

Interviewer: It’s alright, no, no ... Erm ...

Interviewee: That’s, that’s probably the main fundamental ... a lot that drives the market.
Interviewer: Okay.

Interviewee: It sort of makes monetary policy.

Interviewer: And can you think of an ... have you got an example where you’ve kind of drawn upon these? When you’re making a decision is this area?

Interviewee: Near enough every day.

Interviewer: Yeah ... can you give me one?

Interviewee: Erm ... okay. Yesterday I expected the FYMC to leave interest rates on hold.

Interviewer: Uh huh.

Interviewee: But, I still ... and the market had priced that in, so it wasn’t going to be. So it wasn’t going to be a shock. But, I still fancied the dollar to be sold off after that, which it did.

Interviewer: Okay. I’ll write this down later. Excuse me. Erm ... and what cues and strategies, I’m guessing ... did you use in kind of identifying that decision? I’m guessing was these kind of things here?

Interviewee: Yeah, reading reports, looking at data, reacting to data as it comes out ...

Interviewer: Was there any ... anything. Was there anything specifically that you did react to? In terms of data?

Interviewee: I wasn’t actually there when it came out, because it was 7:15.

Interviewer: Oh, okay.

Interviewee: But, I had ... I had orders in the market and I had a position at the time so ... it’s kind of ... sort of proactive in front of it.

Interviewer: Erm ... okay, is there any strategies that you kind of, we’ve kind of talked about cues. Any strategies?

Interviewee: Err ... there are. Again, I’m not sure if this is where, where you’re going with your question, but there are strategies which we put in and we, we can put ... an order in which is known as a strategy for, if you’re not at the desk ...

Interviewer: Okay.

Interviewee: ... or even if, if you’re there you, you know, you’ve picked your level your strategy being that if a certain level’s broke you wanna buy it ...

Interviewer: Okay.

Interviewee: ... and then the order system does take that. They called “if – done orders” or “market if touched.”

Interviewer: What are they called? If done ...?
Interviewee: “If done” ... orders. Or, “market if touched” ... MIT’s. That’s the strategy of your trade, but ...

Interviewer: Okay. And do you have an example ... for that?

Interviewee: Erm ... yeah, err ... Overnight in the Asian, Asian (?) when I’m asleep, that ... you get quite a lot of movement then.

Interviewer: Okay.

Interviewee: And what you do, is leave your order in the market, if you think... If you think it is going to touch, or get the pound ... the yen is going to be bought over night. And you want to get long on dollar – yen. Then you think oh, I’m gonna have a chance to buy it down here in Asia ...

Interviewer: Yeah.

Interviewee: So, you leave a resting order in ...

Interviewer: Okay.

Interviewee: And if trades down there in Asia then it’s back up where it was in London time, then you’ve got, you’ve got the fill in, even without being ...

Interviewer: Okay. That’s really interesting. Sorry, I don’t really know about these things! So, that’s pretty good. Erm okay ... and why would these kind of things that we’re talked about ... why would they be difficult for someone with less experience?

Interviewee: Erm ...

Interviewer: Why would ...

Interviewee: Sorry, which bit are we talking about?

Interviewer: We kind of talked about this bit here ...

Interviewee: Oh.

Interviewer: And then also ...

Interviewee: Like, like ... fundamentally looking at data, because without experience, when I first joined the fact that the Bank of England were putting Sterling rates up 0.25%, meant absolutely nothing to me.

Interviewer: Yeah.

Interviewee: But, how that effects the market is ... it’s inexperience I suppose.

Interviewer: Yeah.

Interviewee: You learn, you learn with experience the market reactions to certain ... certain data reports.
Interviewer: Sorry, you thought you were probably coming in here for a quick chat about your work!

Interviewee: Nah ... nah ... I was prepared!

Interviewer: And now I'm quizzing you!

Interviewee: No, no it’s alright, it’s not a problem.

Interviewer: Erm ... that’s kind of interesting that you said about market reactions to data releases. I guess that’s the kind of ... the kind of things that I’m kind of looking for ...

Interviewee: Yeah. And another example being that say retail sales actually came out weak ... erm ... sorry ... strong for the pound.

Interviewer: Mm.

Interviewee: And you would initially expect that to be great for the pound, but then strong retail sales might make them, might make the Bank of England consider a rate cut.

Interviewer: Mm.

Interviewee: Just to keep it ... just to keep it kind of in line. So, even though the initial buy up of pound because the retail sales were so strong and was in. If you look deeper into that, that might be a reason to price in a great cut which would be detrimental to sterling...

Interviewer: Okay, yeah.

Interviewee: ... in a price in the market, so ... it’s, it’s looking behind everything as well.

Interviewer: Okay.

Interviewee: Which is again, for someone just coming in, would be almost impossible.

Interviewer: Yeah. Yeah, I’m sure, I’m guessing it’s probably so overwhelmed with everything not at a superficial level, but at the surface level I guess.

Interviewee: Yeah.

Interviewer: That it’s to kind of look at I guess the repercussions of ...

Interviewee: Yeah ...

Interviewer: ... further a field is quite difficult.

Interviewee: I’ve got another quick example as well ... for example [...] payrolls for the dollar. What, people ... what you have on your ... you know like Reuters and the Banks all say that for example, 116,000 would ... is already priced into the market. That is what the market is expecting.

Interviewer: Yeah.

Interviewee: So, if it comes out at 124, you might think, well, that’s good ... that’s good for the dollar ... it’s, it’s more than what I was expecting.
Interviewer: Mm.

Interviewee: So, you do have a, have a little surge up. But, then looking, looking at it again 124 in history when a few months ago it was getting 336, 350. It’s still in fact an awful number.

Interviewer: Yeah.

Interviewee: It’s more than the market expected, but in the long-term …

Interviewer: Okay.

Interviewee: …it is still an awful number. So, it’s … that’s why you have choppiness around, around the figure. Some people look at that as, it’s better than the market expected, that’s, that’s good.

Interviewer: Yeah.

Interviewee: Other people look at it as, it’s only slightly better, it’s still an awful number. It’s bad.

Interviewer: Yeah.

Interviewee: So, you often have choppy markets around, after a day’s release.

Interviewer: Okay.

Interviewee: Sort of people, taking different views on what the data actually means.

[Interruption]

Interviewee: So is this the only research you’re involved in?

Interviewer: Well, I’m also doing another study at the moment which is to do with Fund Managers.

Interviewee: Oh right.

Interviewer: And that was the one that I started with, so that’s kind of …

Interviewee: Oh, that’s interesting.

Interviewer: A lot more. Yes, yes. Quite different though in terms of decision-making. Well …

Interviewee: Fund Managers, funds are looking more longer term where, we’re day traders here.

Interviewer: Yeah, yeah. But, kind of …

Interviewee: It’s a reaction to an initial data rather than looking at the fundamentals behind it…
Interviewer: Do you kind of ... your kind of work fits more into like the sort of naturalistic
decision-making stuff that I'm looking at ...

Interviewer: ... quite neatly. Their kind of does, but and although there is kind of overlap
with your work, it is also quite different in other respects. If that makes sense?

Interviewee: Yeah.

Interviewer: Waffling around it! But erm, so I've spoken ... that one's kind of under way, I
have spoken to heaps of people. So far, with my day traders I've spoken to one investment
bank and one energy trading organisation. Well, organisation, they trade in ...

Interviewee: What ones?

Interviewer: I'm not ... I can't say!

Interviewer: Why can't you say?!

Interviewee: Why can't you say?!

Interviewer: I can't say ... it's confidential!

Interviewee: That doesn't matter does it? Ah, well, I, I might know a few of the guys there.

Interviewer: So, it's been quite difficult getting people, to speak to me with the day traders
- the fund management ones are a lot easier to...

Interviewee: Yeah, day traders are probably busier ... yeah.

Interviewer: Yeah, exactly. I think that is probably ...

Interviewee: You know, to come off the desk and to spend an hour is ...

Interviewer: It is a lot to ask, you know.

Interviewee: You're lucky here, because we are only a small place, we can spare.

Interviewer: Yeah, no I really appreciate it!

Interviewee: I can't imagine Edward is going to say anything different to me, though to be
honest.

Interviewer: Ah.

Interviewee: It is going to be very, very similar.

Interviewer: That's fine though. I don't know. We'll see ... we'll see! Shall I carry on?

Interviewee: I'm not in a rush to get back in there!

Interviewer: Are you not?! Erm, okay, have you had any experiences where part of a
situation just "popped" out at you, where you noticed things going on that others didn't catch
onto?
Interviewer: Erm, yeah. You’ve got ... like I said you’ve got a million and one currency pairs.

Interviewee: Yeah.

Interviewer: So, I quite often look at more than just the majors.

Interviewee: Yeah.

Interviewer: Whereas, the others tend to look purely at the majors. So there’ll be a, be a big move in New Zealand, which I might look at and I shout it, I shout it to the other guys or ... whatever. But it’s not always obvious. You can, for example, the Thai baht might collapse one day ...

Interviewee: ... and a few people myself included in that if I didn’t have it up on my screen, so I wasn’t, I wasn’t looking ...

Interviewer: Mm.

Interviewee: ... at it, I wouldn’t even have had a clue about it.

Interviewer: Yeah. Okay.

Interviewee: So, there you’ve got that.

Interviewer: Okay. Erm, okay, so an example would be ... Like what, that New Zealand example, what kind of things did you draw upon? What, how did you know that ...?

Interviewee: I just saw the price moving rapidly.

Interviewer: Okay, price moving rapidly.

Interviewee: And reacting to that is a case of ... just jumping on board. Sometimes! It doesn’t always work but, but when it moves like that it, it’s generally because of either err, well someone, someone from, from New Zealand, maybe someone that runs their MP – Monetary Policy coming out with a comment saying that they expect a weakening in New Zealand [?].

Interviewer: Oh, okay.

Interviewee: Or a shock wave type or maybe a bomb going off in New Zealand. It could, it could be anything. But, when the currency suddenly starts going, that’s again, the trend is your friend.

Interviewer: Yeah.

Interviewee: You jump on, all the bids are gone. And you quite often see a big move.

Interviewer: Okay, so what was it ... how was it moving rapidly? Increasing, decreasing or just like ...

Interviewee: Erm, this was a New Zealand decrease.
Interviewer: Decreasing. I wouldn’t know! I wouldn’t know …

Interviewee: But, that … that’s irrelevant. Whether it is increasing or decreasing.

Interviewer: Yeah.

Interviewee: It could be either way.

Interviewer: Okay. Erm, what do you, kind of … the price is moving rapidly, but what, do you just literally go on … kind of on that analysis, it’s moving rapidly and …

Interviewee: … something must have happened.

Interviewer: Do you find out what it is? Or, just go?

Interviewee: If you look to find out you’ve missed it.

Interviewer: Yeah, okay. Okay. Erm, and why would that be difficult for someone with like less experience?

Interviewee: Err, you probably … it could be difficult because you might find that you, you’ve jumped onboard and then you find that it starts to bounce. It’s, it’s how you deal with, with that position once you have got it. You, you don’t know why it’s going down, … down, You don’t know where it’s going to. You haven’t had a chance to look at it.

Interviewer: Okay.

Interviewee: So, to then pick your exit levels and where are you going to stop it out? Is, is quite difficult. It, I mean it is difficult for experienced traders in that circumstance. But, I’d say it is more of a case of putting the … putting the trade on …

Interviewer: Mm.

Interviewee: … then trying to find out …

Interviewer: Okay.

Interviewee: … what’s happening, rather than find out what’s happening, realise what’s happening. So’s the rest of the world. The market’s already 40 … 50 points lower than where you could have sold it.

Interviewer: Yeah.

Interviewee: And you’ve kind of missed it.

Interviewer: Yeah, okay. I’m guessing, that if you’re … just like put the trade on and then just kind of work out what’s going on. If someone with less experience would maybe be trying to piece it together, I’m guessing and …

Interviewee: Yeah. Maybe …

Interviewer: And like you say just miss the boat.
Interviewee: Yeah, miss it, yeah.

Interviewer: Okay. When you do this task, so erm, getting back to kind of looking at the size of the trade and level of market.

Interviewee: Yeah.

Interviewer: Erm, are there ways of working smart – it’s an American ...

Interviewee: Yeah ... working smart!

Interviewer: or accomplishing more with less

Interviewee: Yeah, that is playing the percentage game I’d say.

Interviewer: Okay. You talked about that I think when we started?

Interviewee: Yeah.

Interviewer: Yeah.

Interviewee: Err ...

Interviewer: Okay, so could you tell me about that, because I can’t really remember, back to the ...

Interviewee: Yeah. Basically, as I say no one really knows what’s going on. All ... all you’re doing is giving yourself the best opportunity you can of making money. Err, when you put a deal on, what you want to do is, limit your risks and run your profits.

Interviewer: Yep.

Interviewee: So, if you was ... if you was to buy £1million at 197 you want your, and you, you’re putting your stop at 19650, you’re risking 50 points on it.

Interviewer: Okay.

Interviewee: If it was to go to 19710, do you take 10 points? I would say no. You’ve put that deal on at 197 you think it’s going up ...

Interviewer: Yeah.

Interviewee: ... you, you run it further on the top side than you were prepared to do on the downside.

Interviewer: Yeah, okay.

Interviewee: Because if you keep only looking for 10 pips and losing 50 over the course of time ...

Interviewer: Yeah.

Interviewee: I don’t ... I don’t think you’re going to make money.
Interviewer: Okay.

Interviewee: But, if you’re risking 50 each time and making the odd 250, you only need to have. If you’re looking for 300 points and you’re risking 50, only one of them six needs to come in ...

Interviewer: Okay.

Interviewee: And you’re making money.

Interviewer: Yeah, okay.

Interviewee: Do ... do you know what I mean?

Interviewer: Yeah, I think I get ... I’m getting it.

Interviewee: Alright.

Interviewer: It’s a lot. Yeah, okay.

Interviewee: You, you could have 5 losers, losing 50 points and then one, the next one comes in and you’ve made your 300, which is what you was looking for.

Interviewer: Okay.

Interviewee: And you’ve flat, you’ve covered your, your 5 loses.

Interviewer: Yeah, yeah, okay. Cool.

Interviewee: But, if you were only to be looking for 10 points you would need to be in profit ... take your profit 10, like 5 times and only get it wrong once and you’re in the same boat.

Interviewer: So, what, what determines how much you are looking for?

Interviewee: That again, would be technical and fundamental analysis.

Interviewer: Okay.

Interviewee: It’s how much ... how much you think is in there. How much you ... you think it ... the market is going to move that way. On the downside what determines our stops, quite often is we’ve got daily stop loss limits. So, we can’t lose ...

Interviewer: Oh okay.

Interviewee: Each trader is different. But we can’t lose. I mean for me it is ... I can’t lose $13,000.

Interviewer: Okay.

Interviewee: Once I’ve lost $13,000 I have to stop.

Interviewer: Yeah.
Interviewee: So, it’s not a case of, generally it is a case of me picking where it is, but once I’m down ... if I’m down 10 then ...

Interviewer: Yeah.

Interviewee: ... then my next trade I might, rather than pick where I want to stop it at technically, that’s where I think the market will support it. It, it’s a case of I’ve got to stop this out ...

Interviewer: Yeah.

Interviewee: ... because I’ll be further ... thirteen grand down

Interviewer: Yeah.

Interviewee: ... if it goes to it.

Interviewer: Yeah, okay. Okay, so ... and kind of you’ve talked about the technical and fundamental analysis of how much you think the market will move which is like positively. How ... what ... can you talk about that in any more detail for me?

Interviewee: Without going into the actual technical ... You ... you ... don’t want me to go into the actual technical it’s more the decision?

Interviewer: Erm ...

Interviewee: I don’t really know how to, how to expand on that. You’ve looked at the technical. You’ve picked your levels that you want.

Interviewer: Yeah.

Interviewee: Again, they need to be ... I think in the long run to make money, your exist levels need to be generally more of a profit than what your stop levels were going to be. That’s your playing the percentage game. Err, but ... you know, I’m not really sure how...

Interviewer: Yeah. No, that’s cool.

Interviewee: How to, how to expand on that. There’s ... there’s different ... different ways of technical analysis. Which I could go into but I’m not sure if you want ...

Interviewer: Yeah. That’s probably fine.

Interviewee: If you want that ...

Interviewer: I’m probably looking a bit puzzled now anyway! Erm, and why would that be difficult, so playing the percentage game, why would that be difficult for someone with less experience?

Interviewee: Err, one because you often find to start with it’s a bit overawing and if you see 10 points on something, in your head, you’re thinking oh that’s 1,000 a 1,000 quid!

Interviewer: Yeah.
Interviewee: I might take that, but over time you need to blank that out and ... and not even think about it that way really. Don’t think ... almost think of it as monopoly money because ...

Interviewer: Okay.

Interviewee: ... because that, that is quite difficult, to ... to not take your profit too early.

Interviewer: Yeah.

Interviewee: If you know what I mean.

Interviewer: Okay.

Interviewee: And you, you see this ... this amount of money and you’re, you’re like woah! I’ll have that. But then quite often you’re prepared to lose a lot more because you’re waiting for it to go all of the time.

Interviewer: Yeah.

Interviewee: And also, the technical analysis, without ... without knowing what you’re looking at you’re just looking at charts with figures and lines is meaningless. I mean if you don’t know what you’re looking at.

Interviewer: Yeah, yeah. I do know what you mean about kind of it being a bit overwhelming and stuff, because like when I’ve like spoken to like, even like you know, even you, you reeled off some numbers and I was like woah! And, I guess you, you ...

Interviewee: To start with, to start with it was, massive.

Interviewer: But, at first, I can imagine like when you start, you were just like oh!

Interviewee: Yeah, I started really small. On like €100,000.

Interviewer: And that’s really small?!

Interviewee: Yeah, and I went home a couple of times and I was telling me mates I’m trading €100,000 and now that is absolute ... it’s peanuts.

Interviewer: Pocket money.

Interviewee: Yeah, it is, it is really tiny, when you, you’ve got ten’s of millions going through.

Interviewer: Yeah.

Interviewee: Which I’m comfortable with now.

Interviewer: Yeah.

Interviewee: To start with, I wasn’t comfortable with that sort of size.

Interviewer: Comfort as well.
Interviewee: Yeah.

Interviewer: Yeah, I guess it is almost like a bit of distancing there as well. I suppose.

Interviewee: Yeah, you do have to distance yourself from the ... how much, how much the money really is.

Interviewer: Yeah, yeah, yeah, yeah. No, that’s interesting. Okay, erm ... can you think of an example when you have improvised in this task or noticed an opportunity to do something better?

Interviewee: Err, I hate these questions!

Interviewer: I know! Sorry ...

Interviewee: Err ... improvising.

Interviewer: Well, maybe not even improvising, maybe an opportunity to do something better? Improvise ... I’m not sure that improvise is going to work ...

Interviewee: Err, I mean, I, I suppose you, you look at this expansion wise of move ... of moving not only from spot trading to option trading. But, again, that would ... that would be moving the desk forward. I don’t really think that’s ... you’re looking at opportunities as far as the market is concerned...

Interviewer: Yeah.

Interviewee: Err, I don’t think I can really help you with that one. You can’t improvise.

Interviewer: No, I know, that one was a really ... it might work for fire fighters! But, I don’t think it really applies...

Interviewee: Yes, yes. Yeah, erm, I’m not going to be help there really. I can’t think of any ...

Interviewer: ... opportunities ... Have you erm ... maybe erm ... kind of been in the middle of a situation and you’ve you know remembered something from you know, a past experience or a previous trade or something and used that?

Interviewee: Well ... again that’s ... that’s again looking at technicals. You, you don’t even have to look at it sometimes, you know that the low from 3 days ago was 38 ...

Interviewer: Okay.

Interviewee: And you’ve seen the market at 38 and you’re like oh it should be supported here, and it stopped there last Thursday ...

Interviewer: Yeah.

Interviewee: ... and, and you buy your euros in or you buy ...

Interviewer: Okay.

Interviewee: Or whatever, whatever currency pair you’re looking at. There’s, there’s that.
Interviewer: Erm ...

1235 Interviewee: I suppose, I suppose opportunities as well, you could say that a dip in the market, could be looked at as an opportunity.

Interviewer: Yeah, okay.

1240 Interviewee: Buy in dips, sell in rallies!

Interviewer: You have all the terms don’t you! It’s like ...

Interviewee: Yeah, sorry ... I ...

1245 Interviewer: No, no, no ... it’s cool, it’s cool.

Interviewee: A, a rally is a move up, which you could see as an opportunity to sell. A dip is a, is you know a move down in whatever currency pair. Which might be seen as an opportunity to buy. But, not all dips bounce. It might, it might not be a dip, it might be a collapse. And you’ve bought into a collapse. And ...

Interviewer: Yeah. Okay. Erm, do you have any ... an example of that?

1255 Interviewee: Erm, yeah. There was one a few days ago ...

Interviewer: Okay.

Interviewee: ... which was a Fibonacci retracement level on euros. I wasn’t in at the time, but it was up at 13340. It didn’t look like it was ever going to come down to this level, but I just left an order in buying €2,500,000 at 130140. While I was asleep it got filled in and that was an opportunity that was taken.

Interviewer: Yeah.

1265 Interviewee: ‘Cos when I came in the next day it was 132. I’ve still got it actually, I’m still sitting with it ... looking.

Interviewer: Okay.

1270 Interviewee: But, that’s it there. That was the correction. Like an Elliot wave ....

Interviewer: Yeah.

1275 Interviewee: Looked as if it’d done that, come back corrected ready for another surge.

Interviewer: Oh, okay.

1280 Interviewee: Which is why I’m sitting. Sitting with the position now. And yeah ...

Interviewer: Okay.

Interviewee: ... that was an opportunity. That, that level ...

1285 Interviewer: Oh, is it this bit?
Interviewee: It starts here.

Interviewer: Uh huh.

Interviewee: Or in fact it’s not starting at zero ...

Interviewer: Yeah.

Interviewee: ... but, it’s gone up, you’re thinking that’s great. You haven’t done anything but you think ...

Interviewer: Yeah.

Interviewee: It’s probably going to correct. So, if it does get down to this level here.

Interviewer: Uh huh.

Interviewee: You wanna buy ... it does you’ve bought it, you, you were right and it bounces back up and you sit with it and you’re looking for a ...

Interviewer: Okay.

Interviewee: Up ‘til about there.

Interviewer: Thank you!

Interviewee: But that’s, that’s the buy opportunity there ...

Interviewer: Mm.

Interviewee: ... which looks obvious, but it ...

Interviewer: Yeah, but before ...

Interviewee: But, while it’s sitting there you’re thinking, why, why ... Where’s the buy opportunity? But ...

Interviewer: And what cues and strategies would you have used to ... to have identify that opportunity?

Interviewee: That was Fibonacci.

Interviewer: How do you spell that?

Interviewee: F-i-b-o-n-a-c-c-i.

Interviewer: o -n -a-

Interviewee: c-c-i ... Fibonacci re-tracement levels. 38%, 50% and 73%.

Interviewer: And 73%?

Interviewee: Err, no sorry, 33%, 50% and 68%! I’ve got ...
Interviewer: No, I think it was me! I just write down random! I’ll just get it on tape ...

Interviewee: No, no, no, I said that wrong! Sorry. Apologies tape! 33%, 50% and 68%.

Interviewer: 50 ...

Interviewee: Yeah, yeah, so they’re the ... so, so ... if that move was 100 points then the 33% retracement would be, say well if it went from 0 to 100. 33% retracement ...

Interviewer: Mm ...

Interviewee: ... would be 67. You’d be looking to buy at 50% would be 50 and 68% would be 32.

Interviewer: Cool. Okay. Was that the kind of, was that literally what you used there?

Interviewee: Yeah.

Interviewer: In that opportunity. And why would that be difficult for someone with less experience?

Interviewee: Because they wouldn’t know what it was.

Interviewer: Okay.

Interviewee: And it ... the market doesn’t always perform like that so if you’ve got a ...

Interviewer: How would you know if the market was performing like that? Or it wasn’t? How would you be able to pick up on that?

Interviewee: That is ... that is more gut feeling that it, it needs a correction that it is going to correct to here. Sometimes, you get what is known as an impulse high I think they call it, which is a spooked market up. Which comes crashing back down again. That, that doesn’t move up.

Interviewer: Oh, okay.

Interviewee: But, that normally happens when there’s a fundamental behind the move.

Interviewer: Okay.

Interviewee: And it’s ... and it’s gradually moved up and the whole market is long. So, when it does correct it stops a lot of people out. It just, it just, clears out the market basically.

Interviewer: Yeah.

Interviewee: And then fundamentally again, it’s still going up. So, I think you still need to have the fundamentals behind the market for it to happen.

Interviewer: Okay.

Interviewee: Just, to, it’s a reaction high. I just remembered what it’s called!
Interviewer: Ah ...

Interviewee: Just a reaction high could just be a little spoof comment by someone, or a ...

Interviewer: Okay.

Interviewee: ... or a bit of data which doesn’t really change the fundamentals.

Interviewer: Sure.

Interviewee: But, it’s ... its moved the market ...

Interviewer: Yeah.

Interviewee: It has made it react in such a way. I wouldn’t say that Fibonacci retracements work on them sort of moves.

Interviewer: Okay.

Interviewee: [?] the fundamental behind it. But, I’ll end this by saying on the long - short no-one knows really where the markets are going because ...

Interviewer: Well, yeah ...

Interviewee: If you did you’d be a millionaire!

Interviewer: Yeah, exactly! I know. Okay, erm, there’s not too many of these to go now-sorry! I’ve got three more, three.

Interviewee: How many have we done?

Interviewer: Erm ...

Interviewee: Three?!

Interviewer: No we’ve done loads! One ... two ... three ... five.

Interviewee: We’re 5/8 ths of the way through!

Interviewer: I know!

Interviewee: Just over half way!

Interviewer: We’re nearly there! We’re nearly on the last page! Erm ... can you think of a time when you realised that you would need to change the way you were performing in order to get a job done?

Interviewer: Okay. Do you have an example?

Interviewee: Yes. Err, probably middle of last year. The ... our job is to make money.
Interviewee: The middle of last year, I wasn’t making money. I was losing money.

Interviewer: Okay.

Interviewee: And it’s at times like that, that you do. Every, every trader has it. And you do need to take a step back and think about what you’re doing. The market conditions change.

Interviewer: Okay.

Interviewee: Sometimes you have trending markets, sometimes you have range-bound markets. And you do need to react to, how markets are performing. Sometimes it might be a case of just sitting back, saying I haven’t got a clue where this is going.

Interviewer: Yeah.

Interviewee: And not doing anything.

Interviewer: Okay.

Interviewee: It’s not a problem not to have a trade on.

Interviewer: Okay.

Interviewee: If, if you’re not confident, don’t ... don’t trade.

Interviewer: Okay erm ... I’m not really sure how cues and strategies would link in ... How would you? Okay, so in this situation how did you know that? Well, I guess losing money!

Interviewee: My P and L was awful!

Interviewer: You’re what ...?

Interviewee: Err, profit and loss.

Interviewer: Oh, okay.

Interviewee: P and L – what every trader’s judged on.

Interviewer: Oh, okay. I’m guessing that is probably it isn’t it?

Interviewee: Yeah ... yeah. That’s how ... that’s how I knew it wasn’t working because I wasn’t making money!

Interviewer: That’s good ... that would be a good giveaway wouldn’t it?

Interviewee: Yeah!

Interviewer: Erm okay ... and I guess why difficult, well ...

Interviewee: Erm ... it’s quite ...

Interviewer: It’s probably wasn’t difficult to identify that but ...
Interviewee: Well, it’s a bit like gamblers. You’ve gotta know when to stop.

Interviewer: Yeah.

Interviewee: That is the difficulty. Not always stop but, sit back or … or cut down your positions or … Every trader in the world has had a bad period.

Interviewer: Yeah, yeah, yeah, exactly.

Interviewee: How you pick yourself up from it?

Interviewer: Yeah. And what kind of … What did you do? Kind of just out of interest?

Interviewee: In that I … I changed my market view from I thought the euro was going up, which it so obviously wasn’t looking back, but that’s hindsight trading! And I did, I sat back and started trading ranges, which is what the market has been doing for, for god knows how long and I thought it … it’s not going to go up until it’s run out of this level or this level …

Interviewer: Yeah.

Interviewee: … I’m just gonna …

Interviewer: Yeah, okay.

Interviewee: … sell around about here. Buy around about here everyday and see how long that lasts on that. [?] back on track.

Interviewer: What were you doing before?

Interviewee: Always buying euros.

Interviewer: Okay.

Interviewee: Everyday, come in buy euros. It didn’t matter where that market was.

Interviewer: Okay. … I think that’s kind of …

Interviewee: We’ve got quite a bit on there considering … I didn’t think we was going to …

Interviewer: I know exactly … it’s surprising though sometimes once you start talking!

Interviewee: Mm.

Interviewer: No, it’s interesting though like … just saying like how you just changed like I guess your strategy...

Interviewee: Yeah, you, you have to adapt.

Interviewer: Yeah.

Interviewee: It’s the nature of the business.

Interviewer: Okay, two more to go. Can you describe an instance when you spotted a deviation from the norm, or knew that something was amiss?
Interviewee: Err ... there’s two ways of looking at this. When you first said that the answer I was going to give you was quite often you do get anomalies in markets.

Interviewer: Okay.

Interviewee: You’ve got, providers ... different banks, [Bank A], [Bank B], that all provide a platform.

Interviewer: Okay.

Interviewee: Err ... they might be ... their spread on the euro might be 68 / 69.

Interviewer: Uh huh.

Interviewee: They’re buying it at 68 selling it at 69. And you can buy it for 69 from [Bank B] for example might be 70 / 71.

Interviewer: Okay, okay.

Interviewee: So, that, that is an anomaly...

Interviewer: Okay.

Interviewee: ... and all day long you’d be buying at 69 from [Bank A] and selling 70 to [Bank B].

Interviewer: Okay.

Interviewee: You don’t get that so much now, but ... but going back, going back 10 years, before, before my time even. Before it was all electronic and when quite a lot of people never really knew where the price was because it was pit trading.

Interviewer: Yeah.

Interviewee: You’d get that quite a lot.

Interviewer: Yeah, okay ... oh. Why ... yeah ... okay ...

Interviewee: This isn’t always ... this isn’t FX, but for example in coffee ...

Interviewer: Mm.

Interviewee: It’s ... it’s called arbitrage. You’ve got the New York coffee and you’ve got London coffee ...

Interviewer: Okay.

Interviewee: ... and that should always be the difference in price between them should always be because it is still coffee ...

Interviewer: Yeah ...
Interviewee: It is still the same contract. The difference between them should always be the difference in the exchange rate: sterling to dollar.

Interviewer: Yeah.

Interviewee: And sometimes because for example New York have ... someone has come in and bought a load of coffee, they needed to buy coffee and they push that price up ... 

Interviewer: Mm.

Interviewee: ... and in London, no one’s done anything. All of a sudden you have got an anomaly.

Interviewer: Oh, okay.

Interviewee: Which is, it doesn’t normally stay like that because you have got people sitting there looking for times like this ...

Interviewer: Yeah, yeah, yeah ...

Interviewee: ... where they’ll sell, sell err, New York coffee and buy London coffee – they’re called arbitrage traders.

Interviewer: Okay.

Interviewee: But, the more and more arbitrage traders there are, the less it happens ...

Interviewer: Yeah.

Interviewee: ... and the less amount of time it stays out of ...

Interviewer: Does it still happen now...?

Interviewee: Yeah. Electronic trading it still ...

Interviewer: Yeah. Okay. Erm ... Have you got an example of where it happened now?

Interviewee: Yes, yeah, there’s examples of it happen on the Foreign Exchange. We had, it was in an, an exotic Maltese Lira, going back a year and a half. One Bank was offering it ... one bank was bidding it and we was just selling to one, buying from the other all day long.

Interviewer: Oh, right okay. Okay.

Interviewee: And making ... making the mark up.

Interviewer: And what cues and strategies would you have relied upon? How did you know ...? How did you know that?

Interviewee: How did I know ...?

Interviewer: How did I know ...?

Interviewee: How did you know that there was the ... you kind of noticed that anomaly that ... difference?

Interviewee: Well, you can just see peoples’ bids prices, peoples’ offers prices.
Interviewer: Okay.

Interviewee: Like with the arbitrage ... that ... that is just arbitraging.

Interviewer: And why would that be difficult for someone with less experience?

Interviewee: I'd say that that is the most simplest thing in the world!

Interviewer: Okay! I'm going to go back and impress my supervisor! I'll be like yeah, it's the simplest thing to do!

Interviewee: Are you going to quote me directly on that “the simplest thing to do in the world!”

Interviewer: Yes! I didn't realise I was doing that then actually ... I'm like... cool. Okay, final one. Have there been times when the equipment pointed in one direction, so, I'm guessing like the technical analyses, erm, but your own judgement told you to do something else? Or you had to like rely upon your own experience ...

Interviewee: Yeah.

Interviewer: ...to avoid being led astray?

Interviewee: There was, the market sentiment in all of the reports, was that euro-dollar was going to go up. Everybody thought that it was going to go up. And I just had a gut feeling that ... the whole market’s long. I think it is gonna spook down, which is basically it is ... it comes down. There was a ... I didn't know it was gonna come down. And I didn't even really think it did, but I thought that there was, that this was again, playing the percentage game.

Interviewer: Mm.

Interviewee: I thought that there was a good opportunity for a big move down because the whole market was long. They’d all have to stop out. If it did start coming off.

Interviewer: Yeah.

Interviewee: So, I’d like to be on that, if that was to happen. That doesn’t happen all the time.

Interviewer: Yeah.

Interviewee: But, it rarely happens, but when it does, that’s a good big move to be on.

Interviewer: Okay.

Interviewee: So, it’s worth having a little go at that sometimes.

Interviewer: Yeah.

Interviewee: Just going against the tide.

Interviewer: Okay. What happened?
Interviewee: There's been times when, in the example I'm giving ...

Interviewer: Mm.

Interviewee: It did go for me, but there's a lot of times when it doesn't.

Interviewer: Yeah, okay.

Interviewee: But, again that's again playing the percentage game.

Interviewer: Yeah.

Interviewee: It didn't so I lost 10 points I think, 20 points.

Interviewer: Yeah.

Interviewee: But on the time it did I made 150.

Interviewer: Yeah.

Interviewee: So ...

Interviewer: Okay. Okay ... Erm, and cues and strategies. How would you know that? Well, you said gut feeling ...

Interviewee: Well, that, that's a gamble.

Interviewer: Okay pure gambling!

Interviewee: Yeah ... that, that is a gamble.

Interviewer: Okay.

Interviewee: But it's taking, it's taking ... it's taking ... minimise risk really for ... bigger rewards.

Interviewer: Yeah. What made you think though, go against what everyone else is doing?

Interviewee: It's just that it does happen. Just going on past experience ...

Interviewer: Uh huh.

Interviewee: A lot of the time when the market is just so long, momentum's up, it looks like it's been over-bought. Sometimes it does still go up but, other times it ... it could crack off!

Interviewer: Okay, and why would that be difficult for someone with less experience? What makes it hard to do? Or identify?

Interviewee: Err ... that's almost impossible to identify.

Interviewer: Okay.

Interviewee: When that is going to happen, there are no clues, it is just a case of right place at the right time if you ... if you know what I mean and ... There is nothing that says that a
market is going to go in that ... collapse like that. Which is why the, the shock of it does produce the fear factor. Fear is, is what drives the markets.

Interviewer: Yeah.

Interviewee: It's fear that oh dear where is this going? This is going ... wherever, so people are selling out, people are jumping on it ...

Interviewer: Yeah.

Interviewee: ... and then that is when you get a good move.

Interviewer: Okay.

Interviewee: When, when it's trending up, it ... it's normally a slow grind up because, people ... people are long and they're just trying to follow ... follow it up ...

Interviewer: Yeah.

Interviewee: ... if you know what I mean. There is no reaction move. But on the downside, when it starts coming off all those people that have followed it up ...

Interviewer: Yeah.

Interviewee: ... All of a sudden go argh!

Interviewer: Yeah!

Interviewee: And that's what ... that's why there's a quicker move ...

Interviewer: Yeah.

Interviewee: ... against the trend than there is on the grind with the trend.

Interviewer: Yeah, okay. I can't think of anything else to ask you about that. Erm ... I think that is probably about it for that I think. I can't think of anything else to ask you about that one, I think that is kind of fine.

Interviewee: Okay.

Interviewer: Okay, that is good. Thank you very much for your time I think that it just about us complete.

[End of Interview]
APPENDIX THIRTEEN

Study III – Interpretative Phenomenological Analysis (IPA)

Analysis of the eight Day Traders’ transcripts produced four master themes and a number of constituent sub-themes, as displayed in Table A.2:

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Table A.2: Thematic Composition of Interpretative Phenomenological Analysis (IPA)

The ACTA framework used to structure the interviews produced additional insights into the Day Traders’ world, upon which this IPA is based. The four master themes provide insights into the ‘softer’ components of day trading. To this means, this analysis in conjunction with the ACTA results provides a more rounded understanding of the world Day Traders inhabit. The four themes: (i) ‘natural-born traders,’ (ii) ‘beyond quantification: re-conceptualising trading,’ (iii) ‘trading praxis’ and (iv) ‘the social grounding of trading’ are described in more detail below.

Master Theme 1: Natural-Born Traders

This master theme focuses upon the intrinsic qualities of Day Traders that makes them predisposed to this type of decision activity. The emerging discourse draws attention to the intrinsic importance of ‘ego,’ the linkage between the concept of ‘ego’ and the adoption of contrarian positions and finally, it builds an understanding of participants’ natural aptitude for trading through consideration of their trading styles.

The Significance of Ego

This first component emphasises the importance of the intrinsic characteristics of participants to their day trading activities. The emerging consensus was that Day Traders ought to have a considerable ‘ego’ in order to put forward their views of the market:

“... there is a lot of ego here. ‘Cos you’re saying I think if I buy this, it’s going to go up in value. This is what I think.”

(Day Trader H, 3010-3015)

Indeed, the concept of ego was manifest in a number of forms throughout the interviews. For example, Day Trader F highlighted a literal demonstration of this characteristic in the form of reported profits and losses:
“Most traders will tell you immediately whether they’re up or down on the day. Generally speaking, it would be a bit harder to get it out of them if they’re down, because they like to say that they’re up!”

(Day Trader F, 2213-2223)

This was echoed by Day Trader D’s reporting of turnover …

“… the average turnover on the desk is normally about $3 million or $4 million. Whereas mine could be $100 million.”

(Day Trader D, 1417-1422)

… and the concomitant belief of his own performance success:

“I mean over the years I think, you know, I’m pretty good at my job.”

(Day Trader D, 1292-1293)

And was similarly reflected within consideration of new recruits by conceptualising their environment as a ‘lions den:’

“You know, you would try and help the guy obviously, but most people would think ‘oh here we go, wet behind the ears.’ You know, poor lad. Nothing, nothing against him … But, he’s stepping into you know, the lion’s den almost.”

(Day Trader E, 663-673)

Whilst, the notion of ‘ego’ was deemed to be an important trait, participants also recognised the contradictory importance of modesty:

“I think when they look at traders individually there’s a lot of people saying ‘well, you need someone with a very significant ego.’ And that’s right you do need someone who is confident, but you also need someone who has got enough humility to know that the market is bigger than them, because many, many traders have taken on a market and paid for it!”

(Day Trader A, 693-705)

The same dichotomy was expressed in the form of confidence versus the ability to admit error:

“You need to be confident enough to, to risk the money. Erm, but you’ve got to be erm, big enough to say when you’re wrong.”

(Day Trader H, 2992-2993)

Thus, the emerging discourse at once emphasises the intrinsic importance of egotistical characteristics and humbleness to day trading activities. Continuing exploration of this theme, two points emanate. Focusing upon the first half of the dichotomy, participants emphasised the importance of confidence in shaping successive actions. Particular attention was paid to the difficulties created for subsequent actions when this dichotomy is out of balance:

“And when the market says no you’re wrong, erm, your ego gets bruised. So, how, how do you actually have the confidence to go in there again, and again and risk your ego getting battered?”

(Day Trader H, 3019-3028)

These post-action effects were also linked to increased errors:
“Confidence has a lot to do with it. And by confidence I don’t mean more experience means you’re always going to be right. It is as much confidence to be re-assured if you are wrong, you’re not going to beat yourself up about it. … because I remember you know, years ago I’d see something and think ‘I want to do it, I want to do it, I want to do it, I want to do it!’ And then I wouldn’t do it and then it would be right. And then you beat yourself up. And then it would make you then rush into doing the next thing that you weren’t so comfortable about because you were frustrated and then that, that would lead to errors.”

(Day Trader B, 674-707)

Second, participants suggested the latter element of this dichotomy to be pre-empted by an intrinsic awareness of the market:

“… when you have you know, an ocean coming in against you, erm, you know, you have got to know when to sort of pull your chair out and run back to the shore basically!”

(Day Trader A, 804-806)

Tying into the concept of awareness, Day Trader A warns against simply “believing your own hype” (689) and the need to overcome their significant ‘egos’ in order to appreciate the broader context of their view:

“Unfortunately there’s a saying in markets and it’s that … ‘If you can’t see the fool in the market, it’s probably you.’ ”

(Day Trader A, 679-681)

Views of the Self: Contrarian Traders

This second sub-theme builds upon the previous theme ‘the significance of ego’ by considering the linkage between the concept of ‘ego’ and the adoption of contrarian positions. The emergent dialogue highlighted the widespread practice of acting against the prevailing wisdom:

“… [I] decided to take on a position that really only maybe one other person in the market took on. So, it was a bit of a contrarian view. But erm, I do tend to be a bit of a contrarian trader as well anyway …”

(Day Trader G, 301-306)

The indefiniteness of markets appeared as a foundation for Day Traders’ contrarian views:

“… even though it could be a million people saying it. It, it’s not definite.”

(Day Trader D, 535-539)

Participants appeared to use this uncertainty in conjunction with an appreciation of the psychological mechanisms operating within markets, as a platform for developing alternative beliefs:

“… everyone was talking about it. But me being me, I paid it no mind whatsoever! … That’s an instance where a lot of people had talked that level up.”

(Day Trader D, 554-569)

The contrarian views of participants were in the most extreme instances conceptualised as anti-logic:

“So, basically I wanted to be in a situation where logically you would have gone one way, but because I knew the risk on the upside was so infinite because of the storage not being there, that erm, at the time I decided to take on you know, what I felt was a, reasonable risk / reward scenario.”

(Day Trader G, 319-325)
These examples illustrate the degree to which participants sought to re-define their practices contra to the norm. Recalling the centrality of 'ego', it could be suggested that the recounting of profitable trades pitched against the herd mentality acts as a mechanism by which a positive sense of the self can be achieved. This was evident in Day Trader C’s discussion of the recognition of a rare opportunity to create value:

“I thought that there was a good opportunity for a big move down because the whole market was long. They’d all have to stop out, if it did start coming off. So, I’d like to be on that, if that was to happen. That doesn’t happen all the time. But, it rarely happens. But when it does, that’s a good big move to be on. So, it’s worth having a little go at that sometimes. Just going against the tide.”

(Day Trader C, 1842-1859)

It was also evident in participants’ recognition of anomalies in markets:

“I’m actually quite good at that. I don’t know why? But I do notice what … the thing is, is that you’re sitting at your desk and you’re staring at three screens all day so you should notice something that moves, that hadn’t been moving for the most of that day. So funnily enough you know, I actually quite like telling people that. Especially on Reuters.”

(Day Trader E, 1296-1304)

Being the source of news by highlighting anomalies to peers is therefore another means by which participants maintained their ego. The integration of the concept of ‘ego’ as a means for understanding the adoption of contrarian positions would be incomplete without consideration of the culturally embedded aspects of trading:

“… there’s no business I think, where the monitoring is almost ingrained to such a large extent … So, really the self-monitoring you know, feedback loop... it’s almost ingrained in your psyche.”

(Day Trader F, 2227-2248)

Moreover, the very culture of trading necessitates strong performance management whereby the process of reinforcement is utilised as an active management tool:

“The important thing I think from my perspective, particularly managing some of these guys, is you want them to try and remember the good times when things aren’t going quite so well.”

(Day Trader F, 2412-2414)

Drawing these threads together, the notion of ‘ego’ and culture of the firm offer a framework for understanding participants’ execution of contrarian positions.

Niche Trading Styles

This final sub-theme builds an understanding of participants’ natural aptitude for trading. Despite, the self-contained and rule-bound nature of trading, a plethora of trading styles emerged. This variety in style was viewed as integral to the functioning of the market place:

“Imagine if you put 20 people in a room. And all gave them the same book that taught them how to trade ... they would all have the same view point.”

(Day Trader B, 600-610)

One trading mechanism followed the overall trend, ‘going short’ when the market appears expensive and ‘long’ when it is perceived to be cheap:
"...when I think everything looks either very expensive or very cheap I tend to get in. I tend to have a, quite a good nose for the market."

(Day Trader F, 213-215)

This strategy is used on the assumption that two or three runs can be used as an opportunity to create the core of annual profits. The use of “good nose for a market” denotes instinctive almost predatory connotations, that is matched by the animalistic undertones when describing a colleague’s trading style:

“Ed is very good at finding out where people’s weaknesses are. He is very good at that. He can just ... he can just smell it. He can smell blood in the water.”

(Day Trader F, 2127-2135)

The language used to describe the exploitation of weaknesses within the market i.e. trading “with a view that people have screwed up” (Day Trader F, 2139-2140) suggests an aggressive and predatory undertone. This is also echoed is Day Trader B’s trading approach that seeks to diversify risk and cover his tracks:

“Erm, and then there’s of course diversify risk. I’d be saying well, I really want to be long but, it might be all in UK power, I may try and buy some UK gas or some French power. And you know slightly cover my tracks a little bit.”

(Day Trader B, 873-875)

Discussing the trading style of a second colleague, Day Trader F describes his “forte” as spreads:

“So, I have one person called James who trades, erm ... His forte if you like is spreads. So, he’s trying to figure out where value has gone out of line.”

(Day Trader F, 75-80)

The common thread to the styles discussed thus far, is the innate abilities Day Traders exhibit for particular mechanisms within the markets. This extends also to the natural division that occurs between ‘technical traders’ and those that rely upon the more intuitive mode of gauging market sentiment:

“... I’m not really a technical trader ... as opposed just to very simple trend lines and the overnight highs and lows and maybe the days’ highs and lows I don’t really erm, hold much weight in the charts. Because it’s all about market sentiment for me, personally.”

(Day Trader D, 748-761)

Niche trading approaches also involved the unusual integration of short-term and longer-term trading strategies for one participant:

“A lot of people specialise in different areas, either in more structured deals or shorter term trading or longer term trading, but I’m one of the few people who actually looks at everything.”

(Day Trader G, 513-515)

A number of Day Traders also used ‘jobbing’ as a technique:

“I’d rather do the little bits and pieces and they call it jobbing if you like. You know, trying to catch each little blip. I find that a bit more productive.”

(Day Trader E, 1064-1078)

Like Day Trader E, Day Trader D also displayed a preference for ‘jobbing’ and outlined how the use of techniques depended upon the type of trading firm:
"Well, a lot of the time I think, even though we’re always kind of told the trend is your friend that kind of mentality, but you know, it’s different for me. No, it’s different. Yeah, it’s different if you’re a Bank and you can have your risk parameters so far away. You know a trend, it can do that in the middle and you know, steal all the trend ... But the trend is my friend is one of the trends that lasts 5 and a half seconds really. I’m not really bothered, you know, I’ll if [?] will say oh what do you think about the dollar, well, in a minute I think the dollar is strong. And then you know two minutes later the dollar is weak!"

(Day Trader D, 976-994)

The role of the trading firm in constraining Day Traders’ price-action is discussed in more detail in master theme 3: ‘trading praxis.’ Discussions of trading style also emerged in relation to changes in the dynamic nature of markets:

"... I changed my market view from I thought the Euro was going up, which it so obviously wasn’t looking back, but that’s hindsight trading! And I did, I sat back and started trading ranges, which is what the market has been doing for, for god knows how long and I thought it, it’s not going to go up until it’s run out of this level or this level ..."

(Day Trader C, 1629-1633)

Whilst participants discussed their approaches to trading as instinctive, the reality of trading as Day Trader C demonstrates is that trading approaches can only operate in congruence with the natural movements of a market at any one point in time.

**Master Theme 2: Beyond Quantification: Re-conceptualising Trading**

This second master theme examines the instinctive basis of trading practices. To this means, the first sub-theme, uncovers the emotive basis of trading specifically focusing upon the inter-relationship that exists between emotion and rationality. The second sub-theme focuses upon the intuitive basis of Day Traders’ expertise, induced by the recognition of patterns formed through experience. The final component considers day trading as a complex interweave of science and art.

**Rational - Emotional Dichotomy**

Participants described a variety of emotions experienced within markets. For example, during the activity of trading, participants expressed the excitement surrounding the uncertainty of markets and the potential for profit to adopt a form analogous to adrenaline:

"When markets are moving around there’s generally excitement generated at this end ... so you can feel excitement. So, sometimes it’s very exciting, but not always for the right reasons. I mean sometimes because you’re losing money as well, it’s still exciting. It still gets your emotions flowing!"

(Day Trader F, 1599-1607)

Other emotions used to convey the emotion of holding losing positions includes pain ...

"So you need to decide at what levels you’re prepared to see so much pain. If it’s going against you, how much pain can you wear?"

(Day Trader C, 435-437)

... and panic:

"I’ll be honest you still panic but you then ... the panic is shorter and then you can relate back to previous experience and say well, you know, these are the steps that I need to take."

(Day Trader A, 485-490)
The feeling of panic was not only felt within the self, but was also anticipated for other market players:

"... we know that people in the other companies can be disturbed ... panicked ... by erm, market movements."

(Day Trader H, 783-788)

To the extent that "... sometimes all this sort of analytical side of thing just sort of goes out the window!" (Day Trader F, 1749-1750). At the close of market, the emotions of Day Traders take a different form:

"... on the way home at night you’ll either be feeling sort of you know, elated or pretty bad."

(Day Trader F, 2253-2254)

Day Trader F even went as far as conceptualising end-of-day negative P&L as suicidal:

"... I’ve had traders who have lost a lot of money on a day. And there’s two ways I can go there. I can go and give them a bollocking. I mean, quite generally speaking they’re quite, they’re pretty suicidal as it is."

(Day Trader F, 2177-2182)

Perhaps most appropriate, is Day Trader F’s conceptualisation of the wide-ranging states experienced by participants to be an “emotional roller coaster” (2409). The emotions experienced also appeared to be manifest in a number of behavioural forms:

"Erm, when people enjoy it more, there’s energy on the desk. Erm, there’s a zing about people ... We have a hammer in the office. And if things are going well, you know, we whack the desk with the hammer. You know, it’s pretty obvious when people are making money. You’ll hear people cheering and all this sort of thing."

(Day Trader F, 2396-2404)

In some instances the emotion experienced by Day Traders is channelled into the physical action of hurling objects across the desk and verbal abuse:

"And I was like oh my god I’m used to such a nice office with nice people ... and here I am things are being thrown and you f’ing this and you just think oh no ... what have I done?"

(Day Trader E, 1666-1671)

Emotion in markets also extends beyond the trading desk and can be seen in counter party trading behaviour:

"Again, it just boils down to awareness, and, and you know, watching the price, the offers that are coming in are cheaper than the previous ones. It shows you that crikey, people are quite anxious to sell here."

(Day Trader E, 2162-2167)

As implied in the analysis so far, emotion is intricately tied to action. As such, it also stands that emotion is therefore tied to rational judgements, the cardinal basis of trading decisions. On this front, participants discussed the link between the rational and emotional aspects of trading in a number of ways. Participants highlighted the need to complement pure rational approaches to trading:

"... if I had my time again I would have studied maths and psychology ... I think that would be the two perfect disciplines for trading."

(Day Trader A, 1090-1095)
The use of psychology was also drawn upon in relation to the interpretation of market behaviour in the form of ‘neuro-linguistics:

“It’s like neuro-linguistic type stuff you know? And people behave in different ways ... And you get to understand that some people are more aggressive than others, some people are more cautious than others. So, everyone’s different and it’s only when you’ve been in the market for some time and perhaps you’ve met you know most of the counter parties that you get to realise, you know, who’s doing what.”

(Day Trader F, 772-787)

The link between the psychology of markets and rational action was also highlighted in Day Trader F’s discussion of the impact of Day Traders’ psyche upon subsequent actions:

“... the stories that traders will tell you is that you know, money gets money. So, when you’re trading well, you tend to be more confident and you tend to be less dithering. And obviously that means that you’re more likely to trade well. So, it’s quite interesting actually as to whether the psyche that you have, the amount of bravery effectively that you have and how you feel does have an effect on how much money you make. And whether you’re prepared to hold a position for a longer and all the rest of it.”

(Day Trader F, 1524-1541)

As was the emotional consequence of a collapsing market:

“When that is going to happen, there are no clues, it is just a case of right place at the right time ... Which is why the shock of it does produce the fear factor. Fear is what drives the markets.”

(Day Trader C, 1916-1919)

It was also suggested that this emotional component of trading, operates as the impetus for action:

“...there is a lot of rational-emotional people. So, you know they, the rational side takes them to this erm ... and the emotional side does give them a bit of incentive to work things out. But that emotional side also allows them to access these things quite quickly.”

(Day Trader A, 522-531)

It is undoubtedly apparent that emotion and rationality are inter-woven to the extent that participants talked of becoming wedded to particular views in the face of adversity:

“... whenever you’re long you’re always convinced the market it going to go down. And whenever you’re short you’re always convinced it’s going to go up. And it’s what we just call you’re just taught your position and think it and sometimes panic it. You know, you’re always utterly convinced that, that’s a signal against your position is ... always seem to magnify ... However, when you have no position you can be far more, not analytical, you’d be far more pragmatic about it in the end, you don’t get quite so emotional and attached.”

(Day Trader B, 1627-1648)

Likewise, Day Trader D talks of ‘doubling up’ strategies despite holding a losing position:

“... again with the doubling up, I think most people are kind of told don’t double up if you’re losing. ... But, if by looking at the day’s price action and again I’m still married to my view that it’s going up or going down then you know, I’ll think nothing of doubling or trebling up, it gives you a bigger position but it improves, slightly improves your price.”

(Day Trader D, 1246-1261)
Other participants chose to close out losing positions in an effort to preserve their 'mental capital':

"... taking a position off that's losing money, whilst it's not great, once it's off you can't lose anymore. You've preserved your mental capital and it gives you, you know, it also probably preserves your financial capital as well."

(Day Trader F, 1178-1192)

Analysis of participants' discourses has highlighted the highly emotive nature of trading and the inseparable nature of emotion and rationality.

**Trading: The Sixth Sense**

This second component to the theme 'beyond quantification: re-conceptualising trading' focuses upon the intuitive basis of Day Traders' expertise. Despite the strong quantitative connotations surrounding day trading, there is an increasing acknowledgement of the intuitive basis of this discipline:

"Intuitive sort of trading. Maybe not the best, but it sort of works for me."

(Day Trader H, 2474)

A number of expressions such as 'sixth sense' were used to this means:

"You will have to be so sharp and you know if somebody's talking to you, you need to be listening to another conversation. That's somebody's shouting at you or whatever and ... You know, you just have to, it's an environment where you can't slouch. You just gotta be aware of ... I guess I've called it a sixth sense, you just need to know and be aware of everything that is going on."

(Day Trader E, 585-596)

In addition to the development of a general awareness within markets, the notion of 'gut feeling' was also used with particular reference to decision-making:

"And what you try and do is try and quantify the value that you're going to make against what you think the risks are between now and then. And sometimes you don't do that necessarily as an explicit calculation in your head ... But, you would have a sense of that this is a good trade, or not such a good trade. So, it's probably a bit of everything really. It's probably part quantification, part gut feel, part you know, how well you're doing as well."

(Day Trader F, 1482-1495)

Day Trader E corroborates on the use of 'gut feel' to inform decisions, choosing to base 80% of his decisions on intuitive judgements:

"I spent a lot of my morning looking at research and formulating my view as to where I think it is going. Erm, I try and swing that 80% on gut feeling and 20% by being backed up by you know, looking at a chart ... or a similar sort of technical analysis."

(Day Trader E, 97-107)

Despite conversing in the importance of 'intuition' and 'gut feel,' participants found it difficult to conceive of these concepts in a concrete form:

"I look at it and I think hmm, there's something fishy about that and I can't always put my finger on why it is."

(Day Trader D, 1836-1841)

The recognition that it ought to be prompted by cues, led to Day Trader E to speculate that knowledge of market price-action acts as a trigger:
"I think it comes down to, it is probably more your sixth sense ... Well, there must be a visible cue, obviously you know where the market has been trading in the last couple of hours so, you’re aware of where the price has been.”

(Co-day Trader E, 2630-2636)

Cues were also said to derive from consideration of counter party interpretations of data:

"I think the cues really have been information from the ... this ‘soft’ information from relationships ... and the way that people are interpreting that data and how they speak about it.”

(Co-day Trader A, 773-779)

Action was also prompted by cues relating to emerging patterns within the market:

"I remember the day before I looked at the market and I just said to James, this just looks over done to me. It’s a bit too toppy. I think we should just sell some of our length. And you know it saved us about ... well it saved us about 5 million quid ... There was no real quantitative process to that. It was just, look this doesn’t look right. You can see what’s trading and how the market’s trading.”

(Co-day Trader F, 233-256)

Building upon this, Co-day Trader E suggests that insights into the market can be extracted from a number of cues:

“So how quickly it was trading, erm, and how people will behave in terms of putting bids and offers on. Sometimes the market’s horrendously wide. Sometimes it’s very narrow. If it’s very narrow it tends to suggest there’s not much fear about because people are working on effectively lower margins. So, effectively the margin, the value of the margin in the market would be the thing that would give you some ... the market itself gives you that information. You get a lot of information from there and the way the market trades. And who’s doing what as well, you can sometimes get a feeling for who’s buying and who’s selling.”

(Co-day Trader F, 726-745)

This was echoed in other participants’ discussions, where the partial fulfilment of orders can provide a cue of resistance in a market:

"I only got a partial fill, it ... you get a feeling ... that the market doesn’t quite want to go down.”

(Co-day Trader E, 2060-2064)

The consensus of participants appeared to be that the use of cues was experience-driven. Indeed, participants described a number of rules of thumb or “ready reckoners” (Co-day Trader F, 2555), which were used as frameworks for gaining an overall ‘feel’ of where value might lie based upon market margins and the typical size of deals. Knowledge of patterns in market support and resistance are also used as cues:

“...if there’s a level that everyone’s talking about ...I might have two knocks on the door and then the third time you will usually go through it.”

(Co-day Trader D, 1350-1355)

This example is particularly pertinent, as although it suggests that the expectation for the third wave to turn into a rally is intuitively driven, the third wave to which Co-day Trader D makes reference was actually a Fibonacci retracement. Thus, it may be inferred that whilst his ‘sense’ of the market is conveyed as instinctive it is in actuality pre-conditioned by technical analysis.
The Art of Trading

This final sub-theme furthers participants’ perception of day trading and its associated decision activities as a complex interweave of science and art. Indeed, Day Trader D declared:

“I’m not, you know, we’re not psychic! It’s not an exact science what we do”

(Day Trader D, 351-356)

Whilst participants were in general agreement that day trading ought to be defined as contra to an exact science, precisely how it should be re-defined and the degree to which this was advocated varied. For instance, contra to the above, Day Trader B adopted a more stringent definition of trading, affirming that his natural aptitude for trading is driven by the definitiveness of answers it permits:

“... I’m not very good at choosing what colour paint my wife wants to put on the wall! You know because there isn’t an answer. I’m not wild about questions that don’t have an answer!”

(Day Trader B, 1102-1108)

In stark contrast, other participants expressed doubt in day trading as a pure science due to its experiential roots:

“And you go ‘so why did you put the line there?’ You know, because it’s though experience. You know, erm markets do behave ... I mean I don’t think this is a science at all. I don’t think that there’s always a way to put it. But, you know through your own experience, through your own trial and error that you feel comfortable making particular assumptions about how you see the market moving in a particular line for example. And so you would trace a pattern, like a trend line around that sort of data.”

(Day Trader H, 1106-1127)

Day Trader A preferred to conceptualise trading as an ‘iceberg,’ suggesting the mainstay of activities to be analysis of the market with a smaller proportion relating to the art of executing deals:

“... you know, it’s a bit like an iceberg. One eighth is the execution and yes there is an art in execution in doing that in a good way but, seven eighths is analysing the market.”

(Day Trader A, 92-101)

The skilful positioning of trend lines in charts was also commonly referred to as an art due to the subjectivity they entail. In discussing technical charting, Day Trader H terms it as:

“... the art of drawing you might say!”

(Day Trader H, 1048)

The variability in the degree to which participants conveyed day trading as a science as opposed to an art may operate as a function of their personal trading style, firms’ preferred methods of trading and the type of market in which they operate. The discussion within this sub-theme is complemented by the previous sub-theme ‘trading: the sixth sense’ and also the section within the sub-theme ‘rational - emotional dichotomy’ on the psychology of markets which add to the argument against the conception of trading as an exact science.

Master Theme 3: Trading Praxis

This master theme examines the practices used by Day Traders. The first sub-theme uses participants’ use of gaming metaphors as a lens for understanding the strategies they use and the environment in which they operate. The second sub-theme considers the participants use
of optimisation as a rational ideal. The final sub-theme explores some of the constraints that exist that limit Day Traders’ behaviour.

Trading as a Game – One of the Same?

One of the central themes throughout participants’ narratives was the use of gaming metaphors. These served a number of explanatory functions. The first to be considered is Day Trader A’s use of the term ‘game theory:’

“So, you know, you’ve really got your game theory and then how do these people react when they’ve got these positions on?”

(Day Trader A, 250-251)

The use of the term ‘game theory’ i.e. a theory of competition marked by gains and losses amongst players, is particularly pertinent to day trading by its very definition. Components of participants’ theory of competition include the anticipation of counter party reactions (as above) and “…who else is in the game?” (Day Trader A, 245-246). Not only does the concept of ‘game theory’ involve the projection of counter party moves, but also an appreciation of mind games in use:

“If you didn’t know that you know, there’s different games people play. If you don’t know what the game is, then erm, obviously you know, you’re not going to understand that. If you were to blindly just buy or sell based upon whether you thought the system was long or short. You wouldn’t necessarily make any money.”

(Day Trader F, 2717-2729)

Day Trader E provides an illustration in practice:

“So, it is a game. It’s you know, the sellers have perhaps just naturally have got to just get rid of it. And the buyers are thinking well, sod this I’m trying .... I’m only buying it because I’m trying to hold the price up.”

(Day Trader E, 2090-2093)

The concept of game was also used as a point of contrast to illustrate the importance of profit:

“You know it’s very money focused really to be honest. It’s more about the result than the game to be fair. You know, quite honestly you could have a trader who really tries hard and does all his analysis and all the rest of it, but if they’re not making you money, they’re no better than the guy who just shows up from the pub at 3 in the afternoon.”

(Day Trader F, 2103-2118)

A second manifestation of this theme was more literal, and was used to dissociate participants from the true value of transactions:

“Err, one because you often find to start with it’s a bit overawing and if you see 10 points on something, in your head, you’re thinking ‘oh that’s 1,000 quid!’ I might take that, but over time you need to blank that out and not even think about it that way really. Don’t think … almost think of it as monopoly money because that is quite difficult, to not take your profit too early.”

(Day Trader C, 1228-1239)

Similar gaming ideology was used to convey the speed at which bids and offers were fulfilled:
"I mean I, did one trade err, where I made like £200,000 on one trade, in like 20 minutes. So, you know, when you're in that scenario, you've always got a bit of fear in the back of your mind. That you don't want to ... It's almost like having a hot potato - you don't want to be left with it. You want to try and get it on to the next person as quickly as possible. And you're ever mindful for when that circle might turnaround."

(Day Trader F, 1711-1730)

Language used also included the notion of “taking a punt” (Day Trader E, 62), when market conditions permit:

“You know, we don’t generally ... we take some punts on some things when things are quiet and other times if we’re working big positions we’ve got slightly more focused and just sort of try and offset the risk further out in the curve.”

(Day Trader B, 61-67)

By far, the most dominant analogy used in describing day trading was poker. This was used both as an implicit point of reference throughout participants’ discussions ...

“Whatever you’ve made last year you’ve been reset to zero. So, you have no chips.”

(Day Trader F, 1501-1506)

“... you can surmise the person always holding the most cards is always going to have an advantage.”

(Day Trader B, 719-720)

...but also served to illuminate several key aspects of trading. Day Trader C for example, highlighted the similarity between poker and ‘the percentage game’ whereby he managed risk vs. reward:

“You have got certain little tips which I suppose it’s, you could say it’s a bit like playing poker. Because what you want to do is play the percentage game.”

(Day Trader C, 139-142)

Poker was also used with explicit reference to the psychology of trading:

“Play with a small amount of money. Play with poker, and you’ll get it. You’ll get the psychology of it.”

(Day Trader H, 3104-3105)

The underlying premise being, that you do not have to hold a winning position in order to take profit:

“... sometimes things go right because you’re lucky! It didn’t go right for the reason that you thought that it would go right. Sometimes, things go wrong and you’re unlucky. Everything you analysed was correct, however, that separate fact that you hadn’t allowed for evolved. So, it was a mistake that wasn’t part of your strategy. Every now and again you’ll pick something, you pick a winner for the right reasons.”

(Day Trader B, 462-477)

Day Trader H also portrayed the analogy of bluffing in poker, as being similar to traders’ artificial inflation of market prices:

“... I mean, the closest I’ve got to it is, I play poker, which is ridiculous because it is very similar to trading ... you don’t have to be right to get the money. You don’t have to have a high hand. Which is the same in trading. Some days you can have the wrong position, but it will make money. As long as you get out before someone else does. It’s just like poker you might have a hand you don’t know. And ... you get people who will just keep on using their muscle and they’ll force the price. They can’t do it over a long time, but, they can do
it over a short period of time. And they can just push the market a bit higher. Just enough so someone goes oh no!”

(Day Trader H, 3041-3085)

A final demonstration of participants’ use of game imagery, made reference to casinos:

“I’m just … basically put the money on the table and try to make money!”

(Day Trader G, 91)

The simple objective of ‘making money’ and the commitment to a position, was also echoed in Day Trader E’s narrative:

“You know because obviously at the end of the day you are in a casino everyday. And obviously you’ve got to make money. So, I wouldn’t rush the first two stages and just jump into number three and just buy a position.”

(Day Trader E, 217-223)

The description of the trading environment as a casino reflected the uncertainty of participants’ experience in markets. However, it was emphasised that trading required a deeper level of pre-action consideration and lacked the arbitrariness of casinos:

“… to give you an analogy. If you were in a casino and somebody just happened to be having luck on roulette … sometimes you just get these guys who just, you know, they just put money on stuff and it just you know, comes in. Erm, it’s not quite as random as that, but you know, if you’ve got a guy who’s … you can just feel it. They’ve got enthusiasm. They’ve got P and L. I mean they’re making money everyday. They’re calling things right. They’re telling you why they’re doing things at the start of the day and it’s turning out to be correct.”

(Day Trader F, 2313-2342)

The concept of the casino was thus, employed not in a literal form, but as a means of reflecting the enthusiasm of markets. Day Trader E also used the notion of the casino in relation to the holding time of positions:

“It depends on how much money you’re prepared to lose. So, you know, how long do you sit in a casino? You know. Do you go on the roulette table all night? Or, do you just limit yourself?”

(Day Trader E, 982-996)

This was a metaphor used by Day Trader C to illustrate the interplay between emotion and the rational management of positions “Well, it’s a bit like gamblers. You’ve gotta know when to stop” (1616).

Reality of Optimisation

The second sub-theme comprising ‘trading praxis’ centred upon participants use of optimisation as a rational ideal:

“I mean my view is that if you’re not already working optimally, you’re not really the ideal person for the job. And that’s not to say that we are all perfect. What I mean is every execution really should be at its optimum.”

(Day Trader B, 1391-1403)

Participants’ interpretation of optimisation took the form of maximisation of potential reward against risk:
"Consider existing position, look at market and perceived drivers ... erm, determine optimal position. That will be a risk/reward position. So obviously the bigger the position, the higher the risk, and you know, there is a limit to how much risk we can take."

(Day Trader F, 430-440)

Day Traders' implementation of optimality involved the active attempt to circumvent sub-optimal actions and involved the consideration of trades within the context of their broader portfolio:

"I suppose the objective is really around, it's that rational-economic objective. Trying to maximise the opportunity you have been given to create the most value. And that's the real over-arching sort of objective. And then as you go down into the detail it's really trying not to sub-optimise those opportunities. So still having you know, the global view that you know, you don't do one trade that you know creates a lot of value at the expense of other trades."

(Day Trader A, 574-584)

Day Trader H illustrates this through a description of his experimental trading with 1-minute and 5-minutes charts:

"I only need two trades out of three to work! I only need one trade out of three to work actually. One trade that works really well forever! And then three, the other two I can get out quite quickly. So, I only need 1 trade to work erm, in four, five - whatever. Just, one that works really, really well!"

(Day Trader H, 1209-1227)

Although, positions are framed by a rational-economic objective, participants highlighted a number of factors that impede the realisation of optimisation. The first variable to be considered is execution risk. Here, optimality is constrained by an inability to buy or sell in a given market:

"Now there is of course what we would call execution risk. And that's being able to execute the trades. It's not always the case of just being able to buy what you want to buy and sell when you want to be able to sell."

(Day Trader B, 850-861)

In dealing with this eventuality, Day Trader B may choose to diversify into other derivative products:

"So, where I couldn't necessarily buy some UK power, I look for the next best thing. And that may be on one day French power, another day it might be UK gas. Erm, and I would cover that. You know, it's not ideal, it's not perfect, but it's the next best thing."

(Day Trader B, 185-198)

The second variable that marks 'reality of optimisation' is the tendency to become wedded to views. Whilst, this was discussed more fully in master theme 2 'beyond quantification: re-conceptualising trading,' it is important to highlight the role that this plays in sub-optimising the outcome of positions:

"... somehow mentally they think you know what, this position's working against me but, you know, I don't want to admit to myself that it's not working. And I reckon that it'll, just you know ... if it only just goes back tomorrow, I'll sell and I'll promise you god I'll never do it again! And of course, you know, life doesn't work that way ... just take the loss and have done with it!"

(Day Trader F, 1234-1254)
Whilst, maximisation of the rational – economic objective is held as the Holy Grail, the reality of trading is such that it is unlikely to be met. For instance, determining the exact point at which to close out of a position on a bull market trend (i.e. determining the point of market downturn) is inherently difficult. Under-estimation (i.e. closing out before the market has reached its maximum price) will lead to sub-optimal profits and over-estimation (i.e. closing out following the breach of maximum price when the market is on a downturn) will also lead to sub-optimal profit. The ‘reality of optimisation’ as Day Trader E explains is that “You know, you have obviously got to make more than you lose. So, it’s okay giving some money back, but as long as you try and make it back…” (Day Trader E, 1037-1038).

Other variables interfering with the attainment of optimality include data overload and the imperfect nature of information environments:

“I think it’s because there is so much to take in, in terms of data … there is an overload issue. And then again there is a relevance of information issue. What weighting do you place on each piece of information? And then it is also identifying the gaps, because you are often operating with imperfect information, that unless you know where you need more information, you can sometimes sort of blindly continue as it were.”

(Day Trader A, 672-679)

Indeed, the superfluous amount of information in circulation at any one time can prohibit optimisation:

“And in hindsight often times … there’ll be a piece of information that you didn’t know or there’ll be something that you didn’t know. But, dwelling on the fact that things are how they are is often times a recipe for disaster.”

(Day Trader G, 248-255)

Likewise the difficulties associated with prediction and the recognition of patterns in real-world environments was highlighted:

“It’s you know, as you probably know if you’ve ever tried to model any human relationship it’s quite complex, because you could say … I could put you in a situation and erm, maybe I’ve observed you over 10 times you know, and depending on the environment you’ve been in, had you been in a work environment, a social environment … whatever the same piece of stress or situation. And I could go and say “oh you know she’d do this” and I could tick that box. But, then if you were tested you might do something completely different. And why would you do something different on that day? It could be one tiny incremental piece of news.”

(Day Trader A, 297-318)

Not only is prediction difficult for optimisation in an informational sense, but also in terms of the reality of price markets, such as the uncertainty of future performance:

“I think that’s one of the general erm … mysteries of any price market. You know, you really don’t know where it is going to go.”

(Day Trader E, 2292-2294)

A number of participants dealt with the inherent difficulty of prediction by dissociating the self from this activity and connecting the control of markets to lie in the hands of a superordinate being:

“So you know forecasting is God’s own job I’m afraid!”

(Day Trader A, 1360)

Similarly, Day Trader G also suggested the ‘reality of optimisation’ to be a Machiavellian force:
"... it's a bit Machiavellian in that erm, yeah you know the famous thing that you can have the greatest idea or whatever, but if God's fortune doesn't smile upon you, you ain't going to go anywhere anyway."

(Day Trader G, 805-811)

The reference to the works of Machiavelli is integral to understanding participants' conceptualisation of optimisation. What Day Trader G is suggesting is that whilst it is possible to use their experience to take precautions in anticipation of market movements, the ultimate course of the market is beyond the realm of control. Whilst, participants' discourses do not suggest God to control the markets in a literal sense, it is used as a means of acknowledging the size and ultimate force of the market. The metaphor may also be viewed as a coping mechanism by whereby the impracticality of achieving the gold standard of optimisation may be attributed to an alternative power, leaving their ego intact.

A final component that contributes towards understanding of the 'reality of optimisation' continues this theme of predicting future market states. Whilst technical analysis (relying upon historical data) is the linchpin of day trading, Day Traders caution haste at becoming attached to historical prices:

"I just try and trade what I see in front of me. And I try not to get too carried away with well, this is what the price was last week, or this is what the price was last year. Erm, and actually that's a bit more difficult than you might think. Erm, it's hard for people to some, sometimes you just have to look at it and say you know what, it's just a number."

(Day Trader F, 1356-1370)

Indeed, the process of extrapolating past knowledge of markets to the future is described as "quite deadly" (Day Trader F, 1339). Other participants reinforce this view with a focus upon future states:

"A lot what I do, I do subconsciously, there's no doubt about it. Erm, I am an ex-tennis player. I used to play tennis and so erm, a lot of the ways you make decisions in tennis, is you prepare yourself ahead of time and then when it comes to making the decision, you just do it. And that's pretty much the way I will build scenarios based upon you know, erm, if this happens, what is most likely going to happen next?"

(Day Trader G, 101-127)

The paradox surrounding the ability of past performance to indicate future market states, also therefore suggest the 'reality of optimisation' to be complex.

Constraining Trading Behaviour: The Firm

This final component focuses upon those factors that constrain Day Traders' behaviour. The principal way in which participants' decision-making is constrained is through informal firm-based rules. For instance, Day Trader F's trading behaviour is constrained by the measurement-based approach of the firm:

"... you know, it's all measurement, measurement, measurement. We measure risk, we measure profit, err, we measure positions. Everything is sort of tied down in that respect."

(Day Trader F, 2426-2432)

The implication of such a highly regulated approach is that his decision-making is met with caution ...
"We're, we're pretty cautious. I mean, when there's a problem like that we just cover immediately ... So, err, but we tend to work in a very erm, when it comes to the physical side of the business particularly, we tend to be very disciplined in the way that we take action."

(Day Trader F, 1102-1120)

... and is actioned with the firm in mind:

"I get called in to our management basically to explain ourselves. And you know, there's nothing better to be able to go in and say ... 'we've lost x amount of money, but we've closed all the positions and that's the end of it. We can't lose anymore money now.' That's okay. Whereas if I go in there and I say 'well we haven't actually done anything yet, but we've lost this amount of money and I don't know how much it's going to be.' Then you know, that's quite a big erm difference I think. And certainly you know, I've found, I've had people here get fired. I've seen people here get fired for that."

(Day Trader F, 1255-1281)

This was also resonant in Day Trader D's narrative:

"So, I just, I could have panicked out a bit but I just waited again for it to trickle down and by that time you have got like erm management looking in and checking your positions and wanting to know what are you doing? So, by that time you're thinking I'm better safe than sorry, I'll better get out of it."

(Day Trader D, 726-744)

As Day Trader E states, the degree of cost consciousness varies between firms and thus directly impacts their risk strategy:

"But, it depends on the firm. And obviously here they are very conscious about cost and risk so ... Erm, so you know, you have to manage that risk. And try not to lose too much money each day!"

(Day Trader E, 1024-1033)

The behavioural constraints imposed by Day Trader E's firm, were contrasted against strategies employed by leading investment banks:

"So you do have to manage obviously how much money you have got to spend. Which perhaps isn't the best way to look at it! I mean if this was a bigger company and we had loads of money to throw around like [company name], you'd sell gold and you wouldn't even put a stop in."

(Day Trader E, 996-1007)

Participants' attitudes towards proprietary trading had an element of dissociation between the self and the capital traded as illustrated above ("how much money you have got to spend") and below:

"And in my opinion, the mental capital is more valuable ... especially, since it's [company's name] capital anyway!"

(Day Trader F, 1173-1177)

Expectations existing within the culture of the firm also impacted the decision-making actions of participants:
“And certainly you know, my attitude is that if I’ve got a guy that’s making a lot of money. I don’t really care what time of day he comes in the office. I don’t care how many holidays he takes or all the rest of it. But, if there’s a guy losing money, I expect him to be here first thing in the morning, last thing at night trying to figure out what they need to do differently to make some money. And that’s pretty much the culture of the company.”

(Day Trader F, 2259-2274)

Participants’ decision-making was also framed at a broad level by an understanding of managements’ interpretation of best practices. To illustrate, Day Trader F discusses the ‘professionally’ accepted strategies within his firm in response to the signal of a rising trend:

“And if you’re following a trend then professionally that’s a good, that’s a reasonable thing to do. Whereas to book a trend. To try and pick a top is a foolish thing to do.”

(Day Trader F, 645-647)

It appears that accountability for actions is one of the key drivers of behaviour, “... if you go long at that point and you lose money it’s easier to explain to management why you did that” (Day Trader F, 639-640). Whilst the aforementioned instances were embedded in firm culture, the guiding role of the firm also adopted more explicit modes. For instance, the role of the firm in constricting Day Traders’ behaviour was also illustrated in the improvement of overall P&L:

“Since, the end of the summer, we’ve had to kind of tighten things up slightly. So a way to try and make the same profit and loss ... profit not loss! Is to erm, is have a smaller position erm, and then adding to it. I mean it seems pretty obvious at the time to people, but that’s never been the way I’ve traded. I’ve just loaded it up run it 3 or 4 points and then get out of it.”

(Day Trader D, 1023-1035)

The encouragement to trade riskier positions (i.e. doubling up) was also actively managed by the firm:

“I’ll say to them listen guys, you know, if this goes against us don’t worry about it. You know, I’ll take the heat for it.”

(Day Trader F, 2203-2208)

As is the active management of participants’ trading strategies in lieu of negative P&L’s:

“You don’t want to change, but one lose a month’s fine, but two lose a month the flags are up, 3 lose a month and you could lose your job.”

(Day Trader D, 1447-1452)

One of the themes to emerge from consideration of the constraining role of the firm, was the concomitant pressure this brings for participants ...

“If you’re $10 million up by the end of January, it takes a lot of pressure off. It takes management pressure off, because they can see you’re making money. You are more able to lose a bit of money without you know, jumping off a bridge! ‘Cos you ... alright, you know, you could lose $3 or $4 million on a trade, but you’re still going to be up $7 million. So, it’s always nice if you’re up as early on in the year.”

(Day Trader F, 1506-1518)

... to the extent that sniping strategies (that are held in less regard by firms) are employed to increase their P&L:
“If I was having a bad day and I knew there was a figure coming out that was going to be extremely volatile. Then I would... put my two limits in. It might be two orders, one order below the market, one above the market.”

(Day Trader D, 1194-1200)

Trading was also constrained by a number of factors outside of the firms’ direct control including the liquidity of markets...

“What you should do and what you can do is sometimes very, very different in a market like the UK where you have, you have limited liquidity. And again experience, will help you come up with a quick solution.”

(Day Trader B, 1242-1245)

... and Financial Services Authority (FSA) regulations:

“... for example, we can do some you know fantastic gas deals, but they may be with companies who are laundering money. So, you have got to be extremely careful about that. You know, so we have got, we are FSA regulated. So, we have got to go through the money laundering checks and we make sure our people are trained in that and also in market abuse. What could constitute that so you know, that’s where you could make a serious mistake. And you know you could end up being sort of disciplined or fired or in your company being fined. So, you’ve got to be very cognitive of all that.”

(Day Trader A, 955-978)

In sum, there appears from the Day Traders’ narratives to be a number of constraining forces at play in the form of goals and norms that reside both implicitly and explicitly within the firm and also as governed at an industry wide level.

**Master Theme 4: The Social Grounding of Trading**

This master theme is concerned with conveying the social basis of day trading thought and action. The first sub-theme explores the social psychological basis of markets. The second sub-theme builds upon this basis to examine the methods participants use to establish relationships of informational interchange. The final sub-theme addresses the supporting role of communities of practice in the trading community in guiding both learning and trading behaviour.

**Markets as Social Psychological Sites**

This first sub-theme reflects the Day Traders’ social psychological understanding of markets. Whilst, the world Day Traders inhabit is marked by quantitative analysis, Day Trader G stated, “A lot of the technical stuff is actually a reflection of psychological stuff” (Day Trader G, 588-593). On this note, one of the common themes to emerge pertained to what is termed ‘irrational exuberance’ in markets:

“... it gets like an enthusiasm! And you can feel that and sometimes you know, you get sort of, try not to be but, you get sort of swept along with it. It was Greenspan that came out with this expression erm, “irrational exuberance!” That’s the expression! So, sometimes markets get irrationally exuberant.”

(Day Trader F, 1619-1633)

This emergent enthusiasm was also described as being marked by a “momentum behind the market to go upwards” (Day Trader F, 590-591). As Day Trader E remarked:
"A market will only fly in either direction, in fact the market will only go through the floor if everybody’s long and if everybody’s trying to get out at once. It’s like anything you have a mad rush to the door. It’s the same on the way up, the market going through the roof, or rallying as they say."

(Day Trader E, 387-401)

Markets could therefore be conceived of as a reflection of market behaviour. To this point, Day Trader F attributes the cause of irrational exuberance to the similarity in counter party views:

“...it’s because everyone’s pretty much on the same bandwagon. And everyone’s probably seeing things the same way. And actually, at some point it’s probably going to end in tears. Because you know, there’s only so many people that can buy into a market. And once everyone stops buying in, the price tends to fall and you can have some fairly significant corrections.”

(Day Trader F, 1634-1642)

Illustrating this concept, Day Trader G talks of his experience of psychological remorse that guides Day Traders’ behaviour within markets:

“... the psychological impact of seeing the prices going up and not being involved means that when it comes back down here, before it gets back down to where it was before. They have in their head that ‘oh gosh I really wish that I had put in then’ and it’s that remorse that brings them in here.”

(Day Trader G, 608-615)

Indeed, using knowledge of the psychological foundation and social nature of markets can be used as a basis for anticipating market movements. Understanding of the psychological effects of markets, can also be sued as means for interpreting counter party recommendations:

“Banks are gonna say that it is going to go up. That’s not necessarily to say that they want it to go up ... they know that there is always going to be like a reverse psychology. Oh, it’s gonna go up, it’s gonna go up, I mean hopefully everyone will then sell it down because they, in effect they really didn’t want it down.”

(Day Trader D, 485-492)

Those participants displaying an inability to appreciate the social psychological elements of trading are described as “wooden” (Day Trader A, 903) and likely to “gravitate more towards this type of black box analysis” (Day Trader A, 903-904). Day Trader A continues with the suggestion that an appreciation of the social psychological side of markets is largely determined through learning and experience:

“I came in on the technical side. It’s a lot of maths in there but, not so much of the softer side which is you know, erm, picked up much more through the job.”

(Day Trader A, 1103-1108)

As Day Trader G suggests people tend to be “inelastic” with their thought:

“... I don’t think a lot of people will put the psychological element into it. Erm, you know, people ... What’s the best way to describe it? People tend to be a bit inelastic sometimes with, with the way they think. And I think that erm, traders ... will be a little bit more elastic in you know ... Maybe even slightly less analytical. And a little bit more elastic to be able to understand how the, you know, the psychological element, what’s going on there.”

(Day Trader G, 639-648)
Thus, it appears that a key component of Day Traders’ expertise lies in interpreting technical analyses with a social framework. To this means, Day Trader A explains how the sentiment associated with irrational exuberance can build up such a force that the perception becomes reality and cautions against Day Traders’ neglecting this human dimension from their analysis:

“... because that sentiment erm ... what happens is, is that perception becomes reality, because it builds up such a strength. And I think that if you’d not seen that or not experienced it, I think that you will get caught, erm because you will be fundamentally erm stuck in the technical analysis and you won’t see the human dimension of that.

(Day Trader A, 810-818)

The final point, before closing this sub-theme relates to technological developments in computer modelling to buy and sell within markets. Whilst, the ultimate aim is to become closer to the goal of optimisation, participants expressed given that “…the market is just a collection of views of human psyche about where people think they should go” (Day Trader H, 2100-2105). The envisaged success of technology is therefore currently met with uncertainty ...

“I mean certainly there is, there are now, they are now talking in some markets of erm, computer models that will actually buy and sell without the human psychology. Erm, I can’t figure out if that is good or bad.”

(Day Trader H, 2087-2096)

... and remains one of the rising challenges facing Day Traders.

Informational Interchange

This sub-theme is based upon the methods participants use in establishing relationships of ‘informational interchange.’ As such, this theme mirrors the discussion on the social psychological basis of markets. Day Trader A in particular drew attention to the use of industry “favours:”

“... it’s very difficult to operate in, in this market without having a lot of good relationships because things go wrong all the time and you do need to have, erm you know people who will help you out when the going is tough ... because they know that one-day the boot will be on the other foot and you’ll be there to help them out. And so there is a lot of sort of almost favours stored up to keep the industry going.”

(Day Trader A, 532-544)

Whilst this stands in direct opposition to inter-firm competition, Day Trader A continues by expressing the expectation of reciprocal favours in payment:

“And yes people are extremely competitive and they are not going to give you, give anything away and yes you know, you will err have to pay for those favours but it’s more than erm ... you know they won’t sort of see you completely shut out as it were.”

(Day Trader A, 548-551)

The form of informational exchange varied across firms, and as Day Trader B suggested was dependent upon the scale and type of trading:

“So, it’s not, you know like you can call in the cavalry. As you might or you know, pull in a favour. Which erm ... you may be able to I’m sure on some of the larger project based roles.”

(Day Trader B, 1440-1449)
In this instance, informational exchange for Day Trader B is achieved through the more informal form of networking:

“But, actually on the case where I have taken the time to talk to individual traders, you do end up talking strategies which is important. It is. Erm, and you do talk you know, fundamentals and not everybody is a Bank so, you know if I’m talking to [company name] or you know in terms of a producer or a big consumer. It is interesting to hear other people’s points of view.”

(Day Trader B, 1600-1611)

Networking appeared to be the most dominant form of information exchange, with participants preferring instant messenger tools for counter party chat:

“Erm, there’s obviously the market rumours which you get through reports, you get loads of Bank reports, erm you get loads of just … it just counter-party chat on the chat messages. And err, you know a lot of people in the industry anyway so, you know everybody talks to everybody anyway.”

(Day Trader D, 606-613)

As Day Trader E illustrates, this can operate as an important mechanism for disclosing restricted information:

“Most people keep it close to their chest. Erm, but you know, you can just get to chat to people and hopefully, they’ll slip up or something and they’ll say ‘oh yeah we think it will go down here because we’ve got buying’ or whatever but you’ll hear two or three people with a similar sort of erm orders in the market.”

(Day Trader E, 185-200)

It is also used as a means of not only acquiring information, but also “talking” one’s book and pushing the market in a direction favourable to their position:

“… well, I kind of hang on with a few people on the Reuters. So, I’m typing conversations with people. It’s backwards and forwards, a bit like erm hotmail or you know, that sort of stuff. Erm, messenger. So, there’s always the information flow. Because obviously if I see that data and I’m bullish and I want gold up, then I’ll tell as many people as I can. ‘Cos hopefully that will get more people going in and buying a price. So, it’s called ‘talking your book.’ ”

(Day Trader E, 1516-1539)

Conversely, the degree to which counter parties are simply “talking their book” is intricately related to trust in the source of information:

“So, you know whether or not you have dealt with someone over a number of years and whether you trust that information. Or, how much is that person talking their own position as opposed to what’s the reality? And then you have got a bit of a cross-check back there. So, that model is also in the evaluation of the source. So, erm you know, I’m sure that we all do that everyday when we’re talking to people.”

(Day Trader A, 652-666)

The replication of information in this manner generally is not deemed to be “breaking any rules,” because it is public knowledge (Day Trader E, 1305). However, the “favours” described during the opening of this sub-section disclose information on an off-record basis, as Day Trader A outlines:

“… if you have got that type, the correct type of personality, you can get close to people but remain commercial. And that works tremendously well where you have got two people in opposite companies who get on very well but they both know that you know, that it’s a business relationship. So, there is some interchange of information. There’s a high level of
trust between those individuals, and it can be you know, almost like you know, a very, very high level of trust. Because you know that they do share some detailed information, but they know that, that will be reciprocated. So both parties are able to erm, to create value.”

(Day Trader A, 832-857)

There is almost an element of participants ‘breaking’ the rules at the firm level through the exchange of such information, which is met with the operation of a new set of informally negotiated rules i.e. the boundaries of information sharing, within industry cliques:

“... you've got to have some chemistry between people to communicate. And it's sort of a lighter skill as opposed to anything to do with this particular job. Erm and it's understanding how far you can go with the sharing. You know without erm, you know, the person sort of running around and saying 'oh, so and so just told me this' and that's it – you end up, you know getting in trouble.”

(Day Trader A, 869-881)

In concluding this section, the inherent difficulty in both managing counter party exchanges and interpreting those in a meaningful way lead Day Traders’ to refrain from exploiting these powerful modes of information acquisition:

“... you may over-rely on the technical side of things. Because it’s safer – it’s black and white, you know, you don’t have to evaluate the, what people are saying. You don’t really have to erm, you don’t have to work that hard when you, when you're trying to analyse technical data. But, if you’re really trying to communicate with someone and understand what they’re saying and you know, gauge the behavioural aspects of it, then that becomes ... can become close to impossible – so a lot of people shy away from that.”

(Day Trader A, 1388-1403)

Communities of Practice in Trading

This final sub-theme to this analysis examines the role of ‘communities of practice’ in the trading community (in addition to the theme of informational exchange outlined previously). One of the key emerging points to emerge from participants’ discourses made reference to the ‘community’ in which they operate. Although the size of each community varied according to the type of derivative product traded, there was an overwhelming sense of the collective:

“The gas market itself, is quite a small market. And it’s quite a small community. So, unlike for example, lets say the FX market. Where there’s probably like you know, 1,000 Banks around the world trading FX plus also 10,000 companies trading their own FX positions like we do for example. And there’s also you know, another 100 hedge funds trading FX and there’s another x, y, and z trading FX. In the UK gas market, it is a much smaller market than that. So, there is probably 40 counter parties that are serious and there’s probably another 50 counter-parties that are less than serious. Erm, there’s probably half a dozen big counter-parties and you know. So, you can actually get everyone in one room and you can sit you know in an evening and you would get to meet everyone pretty much.”

(Day Trader F, 802-835)

Day Trader H describes the community as having a ‘shared knowledge pool’ from which each Day Trader can draw. This sense of support within the trading community is evidenced in the following expose of the gas market:

“... not a ... such, a dog – eat – dog thing. It's a smaller market. So, what tends to go around comes around!”

(Day Trader F, 898-903)
This was also reiterated in by Day Trader B “... you are surrounded by very high achieving individuals. It is very difficult not to feel like the under – achiever among that” (1501-1502). The informal sharing of information between in-firm Day Traders contributes towards this sense of community:

“... we don’t know what everyone is doing. I mean it may just be a case of you hear it, it seeps in. Maybe you’ve talked about it in the car on the way home.”

(Day Trader B, 1324-1328)

The localised centre of the UK markets in London, creates a more intimate social forum within which this sense of cohesion is achieved:

“It’s very easy to go for a drink with somebody after work and get to know them. Erm, whereas for example, we have an office in the States, which you know, which is a much more disparate market. And erm, it’s very unlikely that the traders in the States will ... And also, culturally, they just tend not to socialise. This is a fairly new market, relatively and it’s still, you know, it’s going through a number of iterations, but it’s quite a friendly market. People don’t try to like rip each other off. Yeah, and if somebody makes a mistake on a trade and buys something for the wrong price, then generally people will let them out.”

(Day Trader F, 849-881)

As above, and illustrated by Day Trader B below, a number of the Day Traders operating within emerging markets highlighted the lack of established norms and trends which exacerbate the sense of community:

“The power markets are very young. And so it’s a good thing and some people may think that it’s a bad thing but there aren’t established trends. But, it is a good thing. Because if there, because if there were established trends and everybody knew about them then it would make it a very difficult product to trade.”

(Day Trader B, 585-596)

Day Trader A also addressed the issue of change within more established markets:

“...as we see markets change and open we see a power, you know, the people who hold the power, market power as it were gravitate from err, you know, companies that we knew very well, to companies that we knew less well. So, we then had to erm, go and talk to people that we’re not used to talking to. And a great example of that is the opening of the European market. So, when you’ve met people with different social models for example and different cultural sensitivities, you know, rolling up you know, with a very sort of US / UK and I know the French call it “Anglo-Saxon attitude” doesn’t always hit the mark for them. So, we’ve had to modify both the people that we recruit so they’re a bit more rounded and culturally sensitive.”

(Day Trader A, 992-1013)

Being responsive to changing markets ultimately necessitates a change in the make-up of their associated communities of practice. The established communities serve a number of practice guiding functions. For example, they serve as a point of leverage for broadening participants’ views:

“... if you think it and you know, you go down and have a few drinks with the traders and they’re all saying ‘I think it looks a bit tight forward too,’ and the more you talk about it, the more everyone goes ‘you know I’m not sure about this winter.’ So, sentiment is very important. That’s not collusion. That’s not us all getting together. It’s a fine line I would agree. But, erm, it is often the case when you meet people in the market, Analysts or traders or end users or some producers and erm... you just get this feeling that you know...
they’re worried about something. Erm, that can add to the sentiment in the market. That will come through. And through price action.”

(Day Trader H, 1007-1039)

This was resonant in Day Trader E’s practices also …

“I know quite a lot of people in the market, other professional banks etc, etc. So, I’ll ring them up and say you know, what do you guys think? And they might say ‘oh, I have got a load of buying down here’ or whatever.”

(Day Trader E, 166-172)

... and was seen as a valuable aid for widening their perspective “Cos sometimes, a different pair of eyes on something that you’ve been sitting there trading for years” (Day Trader E, 2713). Not only are these communities used to broaden views, but also as a means of directly leveraging upon their colleagues experience:

“... there is nobody I want to beat ... I just want to be as good as them. You know, I always want to be as good as them. I want them to see I am as good as them. I want to feel that I am. So, erm it is something, what I tend to find is you know, I see things that other people do, techniques that they use or things they understand better than me …”

(Day Trader B, 1520-1536)

These communities were also used as a means of seeking reassurance pre-decision. Indeed, Day Trader B describes the process as both being “a little bit like stress testing the idea” (1170-1171) and as a source of encouragement:

“... we also from our point of view we have the advantage of, of overlapping experience of working with people. Erm, they may reassure you on your decision. It’s having the confidence to say to somebody, you know, ‘this is what I want to do what are your thoughts on it?’ ”

(Day Trader B, 739-751)

As Day Trader B suggested above, confidence is integral to drawing upon others’ experience. This was also reflected in his discussion of the use of other Day Traders’ expertise for self-learning:

“...it is the confidence to say to somebody I really like the way you do that. I think the way I do that is stupid! Can you show me you know how you do it? Erm, and that just comes through developing a relationship with the guys you work with.”

(Day Trader B, 1698-1708)

A final point on the function these communities of practice serve, is in the identification of counter-party action:

“We can see what is going through on a minute by minute basis. You can see who’s trading. And if we’re ... the thing about the gas market, is that it is an anonymous market. So, unless you are one of the counter-parties to a trade, you don’t know who’s traded. But, you get a feeling for what’s going on. And you can start to, you can have a view as to who does what. Some people have quite ehm ... the way in which people trade sometimes almost leaves like a fingerprint. And you could say well I think that’s such and such a company.”

(Day Trader F, 264-281)

The notion of a “fingerprint” was endorsed by Day Trader G’s discussion of price-action, whereby ...
“... certain things I’ll see on the screens will sort of trigger something inside my head, going hmm that’s kind of. But, there’s a lot of that comes from experience from having been in the market a while.”

(Day Trader G, 204-217)

Again, experience within the trading community aid in the recognition process. It also aids as illustrated below in the interpretation of the reasoning behind specific counter party behaviours:

“Now, sometimes counter parties do that because they’re really desperate to buy and they just want a lift ... lots of volume. Sometimes, counter parties do that for reasons, which is that they actually want to try and convince the market that that’s what they want to do. And in fact what they want to do is sell it.”

(Day Trader F, 709-716)

To conclude, this sub-theme has illustrated the role of communities of practice within the a number of trading communities and the functions they serve in guiding informal exchanges of information, as points of leverage for broadening views and drawing upon expertise and finally, as a framework for interpreting counter party behaviours.
APPENDIX FOURTEEN

Publications

Book Chapter


Conference Presentations


Workshop Presentations

