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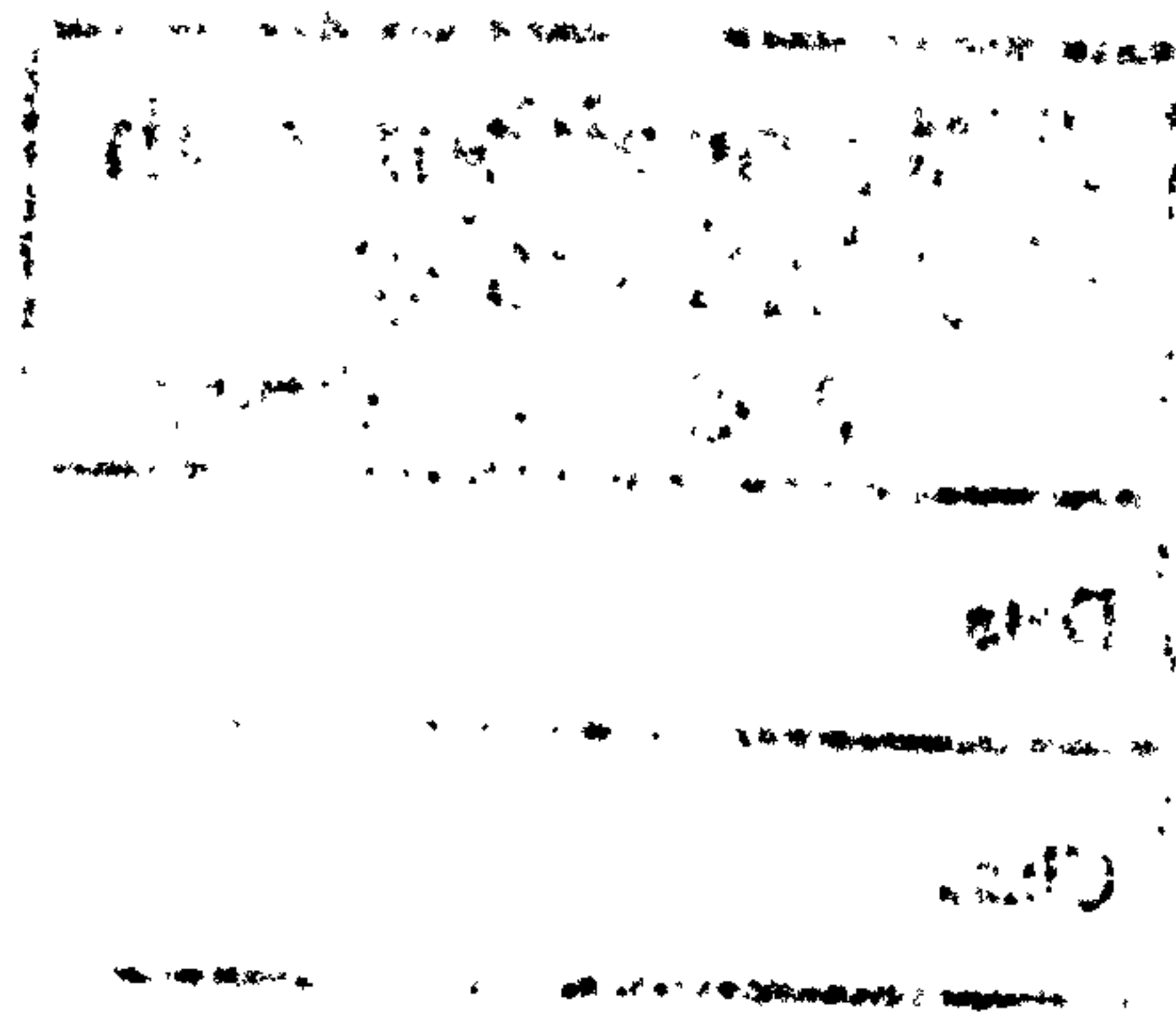
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Group and Individual Decision-Making in Project Risk Management

Submitted by

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Abstract

This research has shown how the nature of the construction project has become increasingly complex and has highlighted how project management decision-making has been supplemented with the use of risk management strategies. Subsequently the use of risk management strategies in construction project execution has had some of its weaknesses exposed, namely the failure of such strategies to consider the role of the individual within the risk management process. Consequently this research has undertaken an investigation to ascertain and understand the nature and impact of individual decision-makers upon the decision-making process. The attributes of and influences upon individual decision-making, risk and uncertainty perceptions and preferences have been explored and discussed in some detail. From those the 'risk prism', a metaphor for the perception and preference of risk and uncertainty, was developed to explore the manner in which these decision-making attributes function.

An investigation was undertaken to replicate the 'risky shift' phenomenon in decision-making groups populated by construction project management professionals. The results of this investigation ascertained the influence of the group environment upon construction management decision makers, namely that individuals were influenced to accept greater uncertainty in a group decision environment. Subsequently a case study investigation of an organisations attempt to introduce a new risk management strategy was undertaken from which an enhanced understanding of the group discussion and decision-making environment was ascertained.

As a result of these investigations an improved risk management process was developed and is presented within this dissertation.

*“Thestor’s son, the clearest by far of all the seers
who can scan the flight of birds. He knew all things that are,
all things that are past and all that are to come,
the seer who had led the Argive ships to Troy”*

Homer, The Iliad.

*“Alexander suddenly found himself passionately eager to
visit the shrine of Ammon.. one reason was his
wish to consult the oracle there, as it had a reputation for
infallibility.. he put his question to the oracle and received
(or so he said) the answer which his heart desired.”*

Arrian, The Campaigns of Alexander.

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Appendix 'B' - Questionnaire analysis

Appendix 'C' – Interview transcription

Appendix 'D' – Transcriptions of group discussions

List of Abbreviations

CA	Conversation Analysis
CDQ	Choice Dilemma Questionnaire
CIRIA	Construction Industry Research and Information Association
KCC	Kendall's Coefficient of Concordance
PRAM	Project Risk Analysis and Management
RAMP	Risk Analysis and Management for Projects

1 Introduction to Research

1.1 Problem Domain

This thesis describes research undertaken in the construction industry examining the nature of decision-making within the execution of project risk management strategies. The construction industry has adopted risk management strategies to manage the increasing uncertainty associated with construction projects (Williams, 1999; Baccarini, 1996; CIRIA, 1983). However risk management practitioners and those organisations utilising such strategies remain ignorant of the influences that phenomena such as risk propensity and perception exert upon group and individual decision-makers. This omission prompted Edwards & Bowen (1999) to call for greater consideration to be given to this area of project risk management.

This research examined the nature of risk management, group and individual decision-making under uncertainty. The conclusions derived from this research will ultimately assist in the improvement of risk management strategies by facilitating greater understanding and management of the influential cognitive processes that affect group decision-making.

1.2 Background to Research

As a result of the literature reviews and interviews with project management professionals a void in the knowledge regarding risk management was identified. This void concerned the role and potential impact of the individual and groups upon structured risk management processes as a result of their failure to acknowledge or incorporate those attributes of decision-makers. Therefore to address this void in knowledge the research was initiated to investigate the domain of individual decision preferences under uncertainty and their impact upon group decision-making.

1.3 The Nature of Construction Projects

The construction industry is project driven; clients demand bespoke assets to meet their organisational objectives, the purpose of which is to bring about beneficial change (Turner *et al*, 1996). Therefore construction projects are never repetitive, they are always unique endeavours via which unique objectives are achieved (Smith, 1999; Woodward, 1997). Consequently the construction industry experiences project design,

production and management processes of an iterative and complex nature that are distinct from those experienced by other industries such as manufacturing.

Risk management strategies in any industry are concerned with minimising the uncertainty associated with a decision domain by allowing a conceptualisation of the potential outcomes of any identified situation. Such strategies include the generic processes of identification, assessment and management within a bespoke framework tailored to suit the needs of the host organisation. The entire process is iterative, and is reliant upon the knowledge held by participating individuals.

1.4 Research Purpose

The nature of decision-making has been explored and documented within an accepted body of literature that details cognitive influences such as heuristics and their inherent biases, individual rationality, motivational and mood issues. However a thorough review of construction risk management literature has shown that, with exceptions such as Flanagan & Norman (1993), the industry remains ignorant to their effects of these cognitive influences, if not their existence. The cause for this can be argued to reside in the industry's nature to examine only the more tangible issues that concern its undertakings, as can be evidenced in the lack of literature concerning the political issues of project management (Pinto, 2000). Contrast this with the plethora of work undertaken in areas such as scheduling and information management (Themistocleous & Wearne, 2000). In a review of topic coverage within the International Journal of Project Management the area of risk management was one of the highest researched areas, but omitted any investigation into the subjectivity of the process (Themistocleous & Wearne, 2000).

Therefore one objective of this research was to redress this balance. Consequently the review of literature and subsequent investigation highlights the subjective nature of decision-making and the effect of the group decision-making environment on individual perception and choice. The literature shows how present risk management processes fail to consider the impact of the individual and group effects on decision-making. Consequently the two questions that are revisited throughout this thesis are:

What is the cumulative effect, if any, of factors such as mood, motivation, rationality and complexity upon individual and group decision-making?

and:

How do individuals manage the information required to interpret their environment?

However the justification for this research is founded in the notion that by failing to recognise the impact of individuals and group environments on the decision-making process contemporary risk management is failing to achieve the stated objectives of opportunity realisation and hazard avoidance.

1.5 Aims and Objectives of Research

The principal aim of the research is:

A1 Establish a risk management process that addresses the impact of individual and group reactions to risk and uncertainty.

The research objectives are summarised below:

O1 Ascertain the contemporary position of risk management strategies and determine the impact of individual and group reactions to uncertainty upon the execution of the risk management process.

O2 Conceive an approach that allows individual uncertainty preferences, perceptions and assumptions to be rationalised in a group decision-making environment.

1.6 Methodology

The methodology has been designed to assess the subjective nature of the decision-making environment and thereby to highlight and make accessible the process of deliberation undertaken by construction project management groups. Therefore the methodology comprises: initial investigation, by literature review and preliminary

interview; testing of theory by replication of an established study and case study research to test the findings of the study against the contemporary position of risk management decision-making within one organisation. The use of discourse analysis was chosen for the case study analysis as it allows insight into the discussion process and also encourages presentation of the research data for peer review within the analysis.

The need to design a replicable methodology was of primary concern. Therefore chapter 2 describes the methodology in greater detail.

1.7 Main Findings

The findings and conclusions of this research should assist in the formulation of more effective risk management strategies that consider the impact of individuals and groups in the deliberation and decision-making processes, as stated in the primary aim of this research.

Also it is hoped that this research will act as a platform from which further research can be based with two primary aims. Firstly to replicate this work and thereby establish its generality and secondly to provide the impetus for a more far ranging discussion on the topics raised within the construction industry and also the construction management research community. The following detail the main findings of this research.

1.7.1 Risk Management Process

Contemporary risk management processes fail to recognise the impact of individualistic reaction to risk and uncertainty as a result of the complexities associated with the decision environment. Therefore a risk management strategy has been proposed to redress this omission.

1.7.2 Risky-Shift Phenomenon

Construction management decision-making groups are subject to influence from the risky shift phenomenon as described in chapter 4. Consequently they are accepting greater risk and uncertainty than are the individuals that comprise the group.

1.7.3 Use of Rhetorical Strategies in Group Discussions

During group discussions regarding risk identification and assessment individuals resort to the use of a rhetorical strategy as described in chapter 6. The strategy is employed to convince other group members of the validity of their proposition by explaining often-hypothetical situations to the other group members that conveyed the desired position.

1.7.4 Use and Acceptance of 50/50 Propositions

Group members prefer to use 50/50 linguistic constructs of probability rather than numerical percentile expressions when they are unable to discern a meaningful difference between the prescribed forms of available options. Cohesive groups accept this interpretation of probability on a far greater number of occasions than do less cohesive groups.

1.7.5 Role of the Devils Advocate in Group Discussions

The inclusion within the group of an individual who is prepared to question the accuracy of the group's propositions enhanced the group decision-making process by encouraging their fellow group members to ask 'what if?' questions which forces a reconsideration and discussion of the proposition in question.

1.8 Thesis Outline

1.8.1 Chapter 1: Introduction to Research

Chapter 1 provides an overview of the research. It outlines the background to the research area and the justification for the research endeavour. The aim and objectives of the research are stated together with the methodology designed to achieve them. Finally the main findings of the research are outlined in brief.

1.8.2 Chapter 2: Research Design and Methodology

Chapter 2 discusses the philosophical background to the design of the research methodology employed to execute this research. It also introduces the methods of data collection and analysis together with their strengths and limitations. Comparisons are made between the methods used and those that were considered inadequate for the task with justification for their inclusion or omission.

1.8.3 Chapter 3: Management of Uncertainty

Chapter 3 introduces the 'risk prism', a metaphor for individualistic reaction to uncertainty and risk. This chapter hosts a discussion concerning the nature and philosophy of risk and risk taking behaviour, of complexity, information and contemporary risk management strategies.

1.8.4 Chapter 4: Risk and Decision-Making

Chapter 4 discusses rationality and the theories of decision-making, the nature of group and individual decision-making and the influences on decision makers such as mood and motivation. The effect of group discussion upon risk preference is described together with its ramifications. The subjectivity of risk management and how it relates not only to the individualistic nature of bespoke risk management processes but also to the qualitative methods used to identify and manage risk is noted.

1.8.5 Chapter 5: Group Effect upon Individual Decision-Making Preferences

This chapter describes a replication of the Wallach *et al* (1962) study using the original choice dilemma questionnaire. The chapter also outlines the method adopted to implement the current study and examines the results obtained from construction project management decision-making groups together with the analytical statistical tools used.

1.8.6 Chapter 6: Case Study Investigation

Chapter 6 describes the practicalities of data collection and the purpose of the case study investigation. This chapter reports on the findings derived from the case study investigation of construction risk management decision-making groups and presents the data, the method of data collection and analyses the results.

1.8.7 Chapter 7: Discussion

This chapter revisits the research aim and objectives and presents a proposed risk management process. A discussion is held regarding the literature and case study.

1.8.8 Conclusions, Recommendations and Further Research

This chapter reports the performance of the research with regards to the achievement of the research aim and objectives. The conclusions and recommendations of this

research are discussed in light of their limitations together with recommendations for risk management practitioners.

1.9 Summary

This chapter has introduced the research by examining in brief the research domain, purpose, aim, objectives and methodology. The main findings derived from the research have also been included. An outline of the thesis is included to show the logic of the approach undertaken to deliver this research.

2.0 Research Design and Methodology

2.1 Introduction

This chapter will discuss the philosophical background to the design of the research methodology employed to execute this research. It also introduces the methods of data collection and analysis together with their strengths and limitations. Comparisons are made between those methods adopted for use and those that were considered inadequate for the task with justification for their inclusion or omission.

2.2 Research Aims and Objectives

The principle aim and the objectives of the research are re-stated here to facilitate clear comparison with the adopted methodology and its design. The principal aim is:

A1: Establish a risk management process that addresses the impact of individual and group reactions to risk and uncertainty.

The research objectives are summarised below:

O1: Ascertain the contemporary position of risk management strategies and determine the impact of individual and group reactions to uncertainty upon the execution of the risk management process.

O2: Conceive an approach that allows individual uncertainty preferences, perceptions and assumptions to be rationalised in a group decision-making environment.

The research aim and objectives define a focused line of reasoning around which the methodology can be designed and the research methods applied. It was considered necessary to identify the relevant data points with respect to the causal mechanisms that resulted in influential affect, to include these within the research objectives and to design the research methodology accordingly. Fenn (1997) stated that a replicable methodology is crucial to the execution of any research undertaking. Consequently the

methodological framework as shown in figure 2.1 was designed, the focus of which was the individual decision-maker and their performance within a group environment.

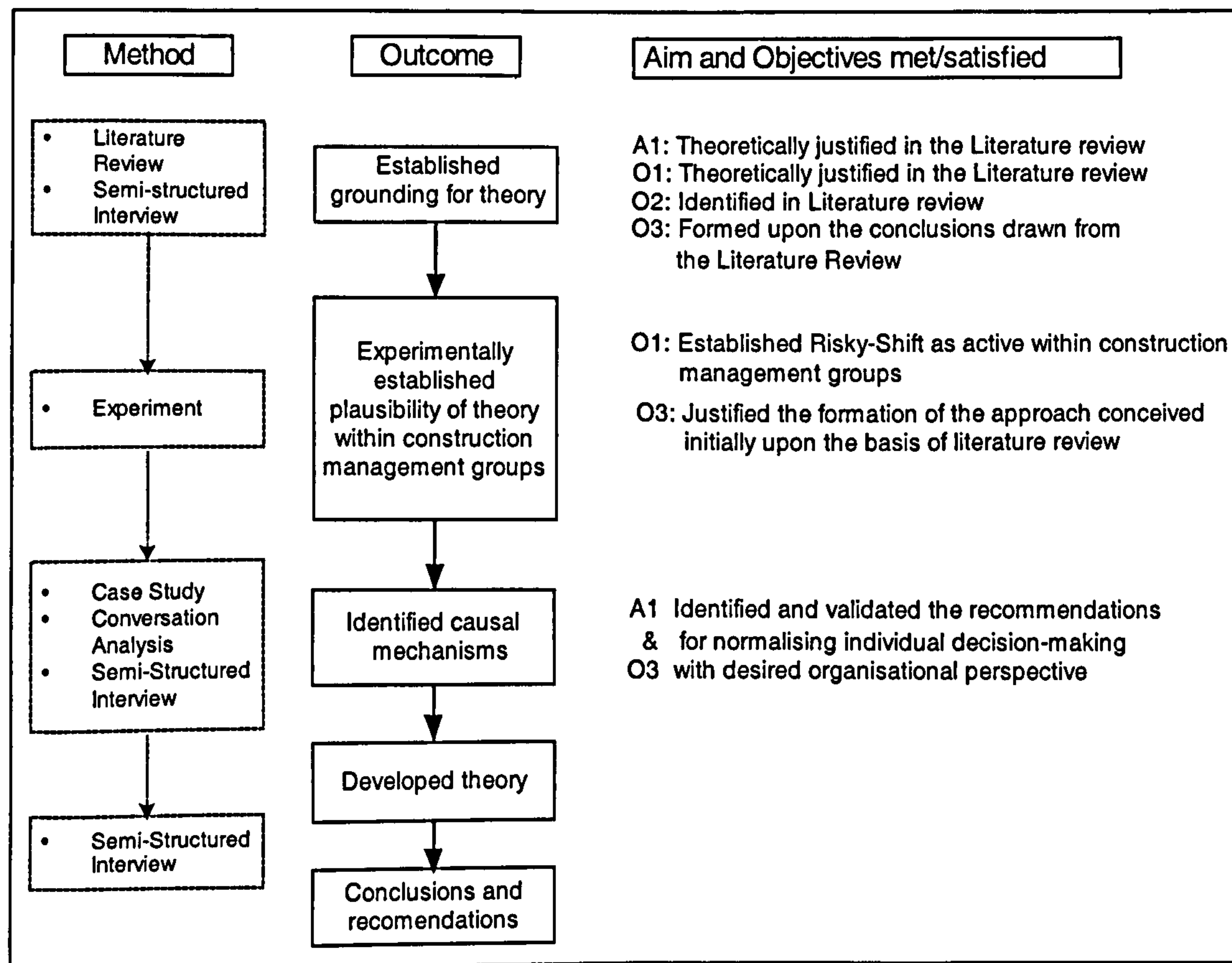


Figure 2.1. Research methodology

Easterby-Smith *et al* (1991) propose that any methodology relating to phenomenological research should be able to satisfy the following three criteria:

- **Validity** - has the researcher gained full access to the knowledge and means of the informants?
- **Reliability** - will similar observations be made by different researchers on different occasions?
- **Generalisability** - how likely is it that ideas and theories generated in one setting will also apply in other settings?

These criteria have been considered and designed into the methodology and are included within the following discussion.

2.3 Introduction to Research Design

To facilitate effective and replicable research a bespoke research methodology that rationalises the process of investigation by establishing the “principles and procedures of logical thought processes” (Fellows & Liu, 1997) is necessary.

2.3.1 Research as a Learning Process

Root (2001) has defined academic research as “nothing more than a formalisation of the learning process”. Therefore the epistemological position, detailed within the research methodology, should make explicit which part of the learning process is under consideration. Garfinkel (1967) deems that social actors utilise models that minimise the uncertainty and enhance the predictability of daily life in order to make sense of their environment. In terms of Kolb’s (1986) learning cycle, which is founded upon the notion that all learning needs to be grounded in experience, the individual gains experience, reflects upon it, conceptualises that experience and subsequently experiments with that conceptualisation of the original encounter to produce further experience and so on. Within this dissertation the experiment undertaken in chapter 5 provides a model of a particular human environment, group decision-making, which is then compared against a perception of the reality of group decision-making as achieved by the execution of the case study in chapter 6. The product of the research is information and consequently knowledge, the derivation of which Rosen (1982) defined the ‘dialectic triad’, the notions of thesis, (the originator), antithesis, (the refuting counter-thesis) and synthesis, (the unity of thesis and antithesis). An idealisation of the research typology consists of three forms:

- pure research that leads to the development of theories;
- applied research that answers specified problems; and
- action research whereby the researcher interacts with the phenomenon in an attempt to change and thereby understand it.

(Easterby-Smith *et al*, 1991)

In practice it is unusual to find that any one of the three forms, which contain those research strategies contained in table 2.1, is strictly adhered to at the exclusion of the

others. Consequently the purpose of research is to provide the order and predictability by which to navigate the uncertainty associated with ones environment.

2.3.2 Positivism and Phenomenology

The positivist approach to research assumes that the world exists as a set of hard and fast rules; something only exists if it can be measured, and assumes that an observer's interaction with their environment will not influence the pattern of observed events.

Conversely the phenomenological approach is that the reality of the world is socially constructed and that the observer is indistinguishable from their environment.

Strategy	Form of research question	Requires control over behavioural events?	Focuses on contemporary events?
Experiment	How, why	Yes	Yes
Survey	Who, what, where, how many, how much	No	Yes
Archival analysis	Who, what, where, how many, how much	No	Yes / No
History	How, why	No	No
Case study	How, why	No	Yes

Table 2.1. Relevant situations for different research strategies (Yin, 1994)

Therefore by strict definition positivism applies purely deductive reasoning whereas phenomenology adopts an inductive approach. However any research may be biased towards one approach but is likely to remain a combination of the two. Easterby-Smith *et al's* (1991) comparison of the two approaches is shown in table 2.2. Popper's (1982) notion that the comparison of theory with reality and the subsequent assessment of the differences between predicted and actual constitute the only source of 'realist' knowledge is a fundamentally positivist view.

In essence Popper (1982) states that whilst there may be many instances that uphold a theoretical position none will ever be conclusive therefore it is more productive to seek the refuting evidence. In essence this is the position that has been adopted by the construction management research community; a dominant positivist rationality has emerged (Seymour and Rooke, 1995; Root *et al* 1997). However the failure of the rationalist approach to satisfy the needs of the construction research community has

led to introduction of social science research methodologies that clearly exhibit a phenomenological bias (Root, 2001).

	Positivist paradigm	Phenomenological paradigm
<i>Basic Beliefs:</i>	<p>The world is external and objective</p> <p>Observer is independent</p> <p>Science is value free</p>	<p>The world is socially constructed and subjective</p> <p>Observer is part of what is observed</p> <p>Science is driven by human interest</p>
<i>Researcher Should:</i>	<p>Focus on facts</p> <p>Look for causality and fundamental laws</p> <p>Reduce phenomena to simplest elements</p> <p>Formulate hypothesis and then test them</p>	<p>Focus on meanings</p> <p>Try to understand what is happening</p> <p>Look at the totality of each situation</p> <p>Develop ideas through induction from data</p>
<i>Preferred Methods Include:</i>	<p>Operationalising concepts so that they can be measured</p> <p>Taking large samples</p>	<p>Using multiple methods to establish different views of phenomena</p> <p>Small samples investigated in depth over time</p>

Table 2.2. Comparison of phenomenological and objectivist positions (Easterby-Smith *et al*, 1991)

Consequently many researchers have combined these two methodological approaches into a pragmatic approach (Easterby-Smith *et al*, 1991). As Runeson (1997) and Raftery *et al*, (1997) have made clear, phenomenology has developed in response to, and acknowledges the existence of, the positivist approach that in turn does not necessarily acknowledge the position of the other. Consequently when viewed, as in Kolb's' (1986) depiction, the learning cycle is viewed as a cyclic and iterative process whereby the positivist approach is concerned with the testing of models and the phenomenological approach is more concerned with the generation of those models. There is a sense that the two approaches deliver information that is different in kind (Popper, 1982) however Quine (1992) defines the difference as one of degree as opposed to kind. Similarly Easterby-Smith *et al* (1991) consider the differences between the two to be philosophically incompatible. Nonetheless no aspect as the learning cycle may be viewed as absolute; each has some form of reliance upon the other as depicted by the iterative nature of the cycle.

The following discussion in chapter three regarding the nature of risk and uncertainty will ground the establishment of 'risk' as an inter-subjective realisation and one that does not sit easily as either an objective nor subjective phenomenon. Consequently the phenomenological approach, whilst acknowledging that social phenomena exist, seeks to establish their presence by ascertaining their nature rather than their number, a difference founded upon emphasis and not kind (Root, 2001). This research reflects the iterative nature of the learning cycle and uses tools borne of both methodological positions in a complimentary manner to establish a more rounded interpretation of the phenomena, as advocated by Loosemore & Dainty (1996).

2.3.3 Deductive and Inductive Reasoning

The logically derived conclusions of deductive reasoning are considered immutable. The top-down approach of deductive reasoning tests the original hypothesis against gathered data enabling comparisons between hypothesised reality and actual reality that will either confirm or refute the original theory. Accordingly deductive reasoning is useful to establish cause and effect and focuses a theory into a testable hypothesis (Trochim, 2001; Graham, 2000). Whilst deductive reasoning is logically justifiable, inductive reasoning is not. Conversely inductive reasoning is founded in probability theory and works from 'the small to the large'; it operates on the premise that generalisations may be made with regards to the nature of a particular phenomenon (Arthur, 2001).

Consequently inductive reasoning is used to make subjective inferences about ones environment generalised from the observers prior experience and is therefore susceptible to criticism on the grounds of various well detailed psychological phenomenon such as bias (Tversky & Kahneman, 1982a). However these relative positions have been established as complimentary rather than mutually exclusive as in the discussion surrounding the qualitative and quantitative debate.

2.3.4 Quantitative versus Qualitative

Quantitative research compares factual data with theory, 'how much?' and 'how many?' questions, whilst qualitative research seeks to determine individual conceptions of reality and their interaction with their environment by asking 'how?' and 'why?' questions (Walker, 1997). Qualitative research therefore forms the basis

for theory building and is often a precursor for quantitative research (Fellows & Liu, 1997). Contemporary construction management research has benefited from a discussion regarding the merits of both of these approaches (Seymour & Rooke, 1998, 1995; Seymour *et al*, 1997, 1998; Runeson, 1997; Harriss, 1998 and Wing *et al*, 1998). One benefit derived from this debate was the recognition that construction management is as much a social process as a technological one and therefore choosing one approach whilst discounting the other would be counter productive (Raftery *et al*, 1997). Consequently the information generated by the quantitative research reported in chapter five informed and gave direction to the qualitative case study reported in chapter six.

2.3.5 Risk Prism

The risk prism in figure 2.2 is a metaphor that has been designed by the author to present the concepts and problems that are considered throughout the thesis. It is utilised to illustrate the differences between the problematic philosophical concepts regarding the objectivity and subjectivity of risk. Consequently the prism is used to represent these conflicting views of risk as afforded by risk management processes and individual decision makers respectively.

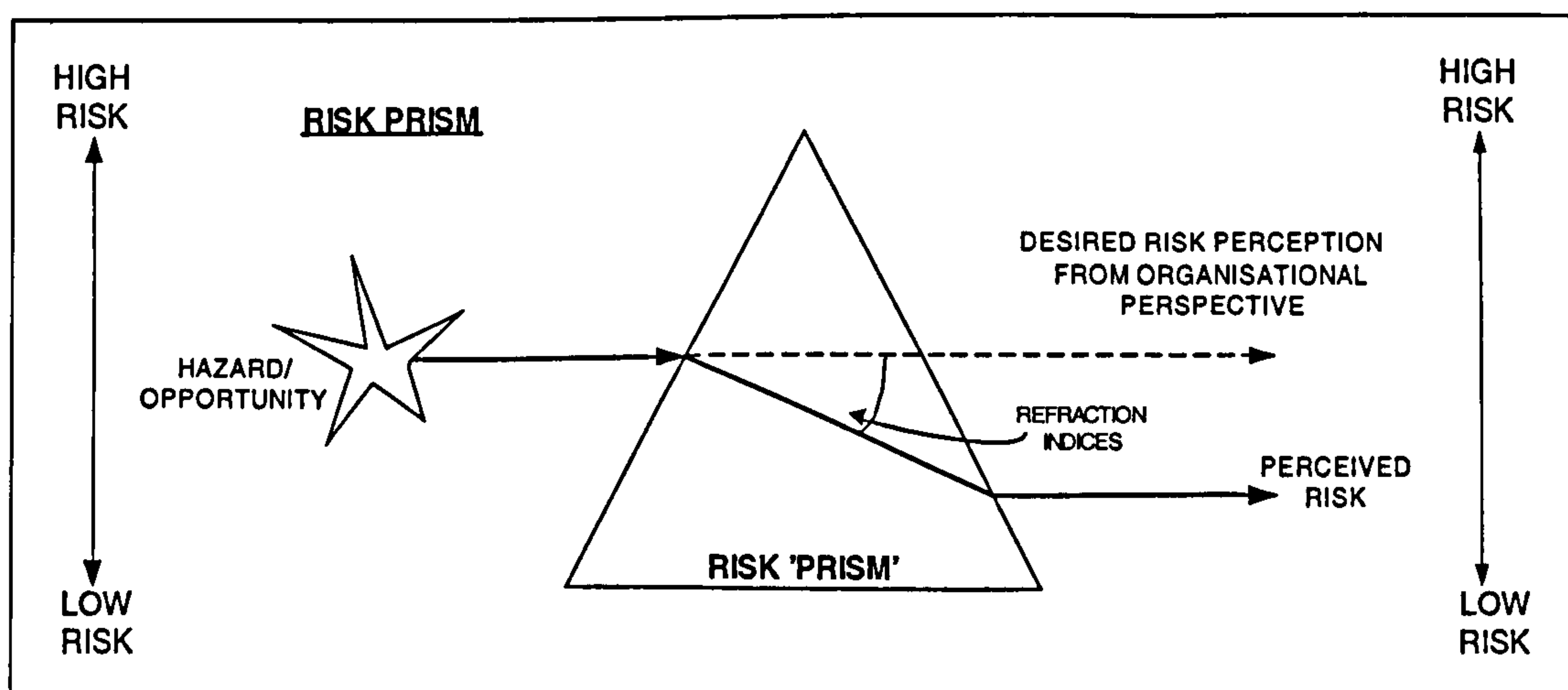


Figure 2.2. Risk prism

The depiction of risk to the left of the prism is not intended to convey a definite and objective notion with regards to the 'reality' of that risk. The risk has to be depicted if the metaphor is to function, and can only be shown in a fixed position within the two

dimensional figure. Consequently its position within the figure is a compromise that allows the metaphor to function.

2.4 Literature Review

Published literature constitutes the most accessible font of peer-reviewed knowledge from which to start any investigation; the research question in this instance was distilled from an initial literature review. The critical review of literature was concerned with the topic of risk, uncertainty and risk management from which omissions in existing knowledge were identified from literature reporting a specific perceived lack of understanding regarding the role and influence of the individual within risk management. The literature review commenced by reviewing the literature within the construction management discipline but quickly extended beyond that into the disciplines of social science and psychology.

As the body of literature available was unlikely to be anything other than voluminous a keyword list was compiled to limit the number of search items. This list was never considered finite or in any way complete, but was constantly updated and reviewed by adding and removing items as new literature highlighted concepts and theories that might have been applicable. In this manner the literature remained manageable ensuring that the review did not ramble or meander too far from the topic area. The critical review of literature contributed in three respects to the research:

- it allowed gaps in contemporary knowledge to be identified;
- it ensured that the most current ‘thinking’ and theories were considered and included within the research; and
- it went some way to ensure that the research was not a duplication of previous work.

Consequently the review theoretically satisfied the requirements of research objective O1. The validity of this position with regards to objective O1 is reliant upon having conducted a thorough survey and review of the most current literature, as a literature review is inherently historical. However it allows the most current published, peer reviewed thinking to be ascertained, and therefore conveys the recognised current

position of the construction industries approach to risk and project management. The review therefore validated the principal aim A1 of the research. The theoretical background established by the review allowed the remaining objective O2 to be fulfilled.

The literature review identified the risky-shift theory that predicts groups will be happier to live with greater uncertainty than the individual group members, and identified a number of causal group mechanisms responsible for the change in individual preferences. However the phenomenon had never been established in professional decision-making groups whose members had a prior occupational acquaintance, for example members of the same construction organisation, team or project.

2.5 Experimental Design

The identification of an industrial collaborator and the method of pilot testing the research instrument, implementation and subsequent analysis of the instrument are detailed in chapter 5. The Wallach *et al* (1962) CDQ, the tool originally used to identify the risky shift phenomenon, was implemented in this research to test the premise of objective O2 in construction management decision-making groups. The subsequent identification of the risky shift within the professional decision-making group and confirmation of its validity contributed the following to the research:

- a) this was the first instance that the phenomenon had been identified as active within construction management decision-making groups; and secondly
- b) the findings concluded that construction management professionals could be influenced to alter their decision preferences.

Therefore practicing professional construction management groups were highlighted as a source of contemporary phenomenological data with regards to the causal influential mechanisms.

2.6 Case Study Design

The case study is concerned with ascertaining the dynamics of the individual and group deliberation processes. The method of case study execution is detailed in chapter 6 therefore this section will restrict its self to a discussion of the rationale behind the design of the case study methodology. Yin's (1994) case study definition encompasses one of the primary benefits of case study research over experimental design in that the study investigates "a contemporary phenomenon within its real life context". Accordingly case study research has many benefits that are difficult to incorporate into experimental design such as:

- individual's do not feel constrained by observers and are therefore able to react and display emotional responses that are not outside that normally experienced; and
- the studies allow the causal links between true to life interactions to be identified (Yin, 1994).

Conversely an experiment:

- purposefully removes a phenomenon from its naturally occurring environment to focus upon a restricted number of variables that may be controlled (Yin, 1994);
- may constrain individuals to exhibit behaviour that reflects their perception of what the experimenter may expect, desire or require in terms of answers and responses; consequently
- individuals may be under the impression that there are correct and incorrect answers, and answer accordingly.

However Gummesson (2000) highlights three criticisms often levelled at case study research; these are:

- they lack statistical reliability and validity;
- they may generate rather than test hypothesis; and
- they cannot be generalised.

These criticisms whilst valid are applicable more to the misuse of case study research consequently the first two can be addressed in this instance by examining the purposes of this case study research. The study would allow observation of the contemporary events within the training workshop whereby a new approach to risk management was being introduced. Therefore the intention of the case study was two-fold; firstly to develop the findings of the literature and experimentation that contributed to the development of aim A1 and objective O2. The second intention was to identify the causal mechanisms and impact of group influence and to provide support to the epistemological grounds of the principal aim A1 and objective O2 of this research from which a theory may be derived. A three-stage case study methodology was developed to achieve this, figure 2.3. Yin (1994) addresses the final, criticism that case studies cannot be generalised, by asserting that the conclusions should be generalised to theory rather than between studies.

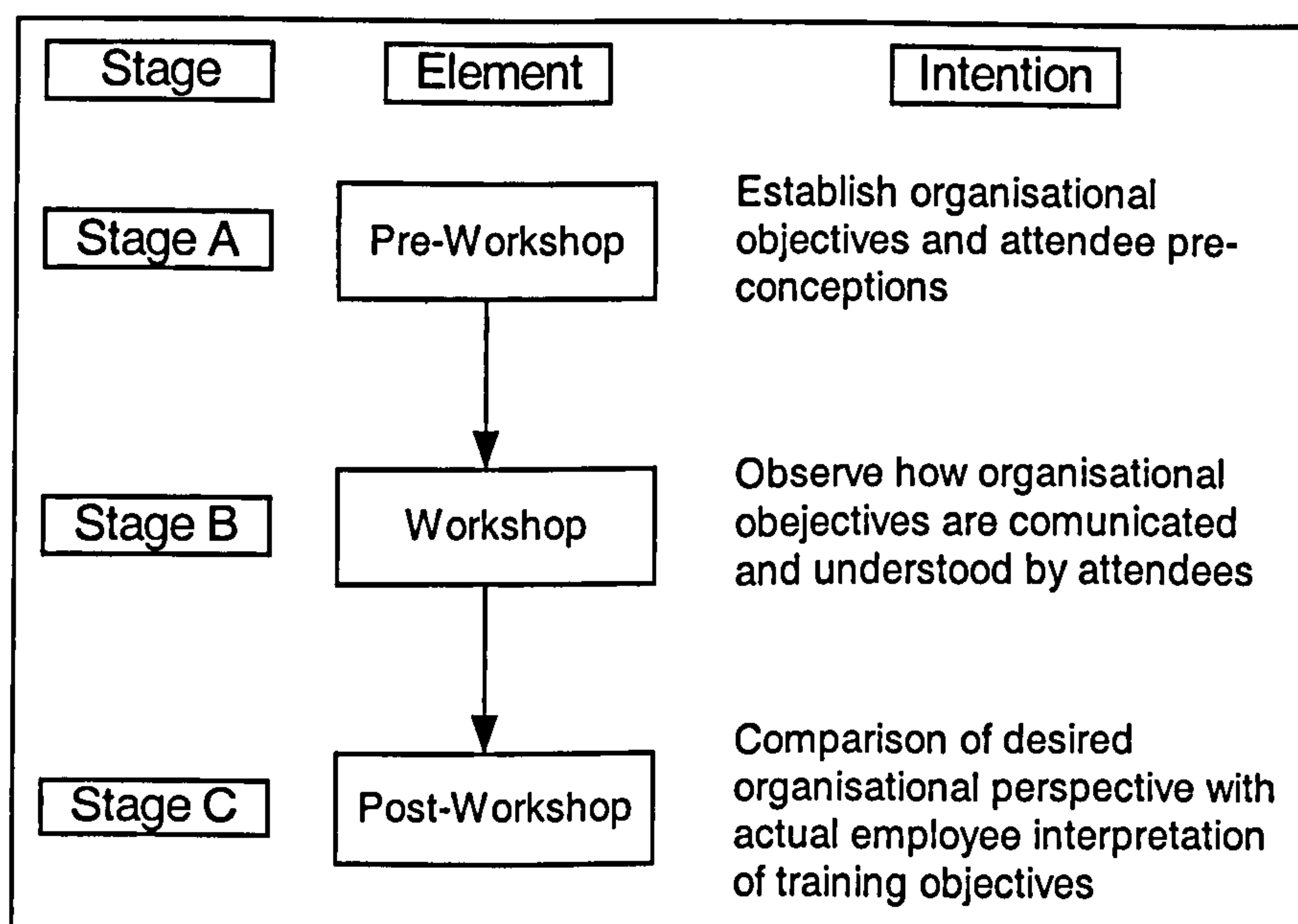


Figure 2.3. Three-stage case study methodology

The methodology was broken down further into seven procedures (see figure 2.4) that would facilitate data collection. The seven procedures were designed to ascertain the organisational objectives, process of organisational communication, employee interpretation of the organisations communication and the transposition of the organisations objectives into working practices by the employees. Whilst some of the seven procedures could be executed concurrently some were logically dependant upon others. For example employees had to be interviewed to ascertain their understanding

of the organisations proposed risk management strategy prior to their attendance at the workshop.

The solid lines between the stages of the case study in figure 2.4 denote the logical flow of the investigation whereas the interrupted lines between stages denote the process of data comparison, contained within procedure D1. Table 2.3 shows the stages of the case study, the procedures, the timing of their execution with regards to the workshops and the resultant data that was collected.

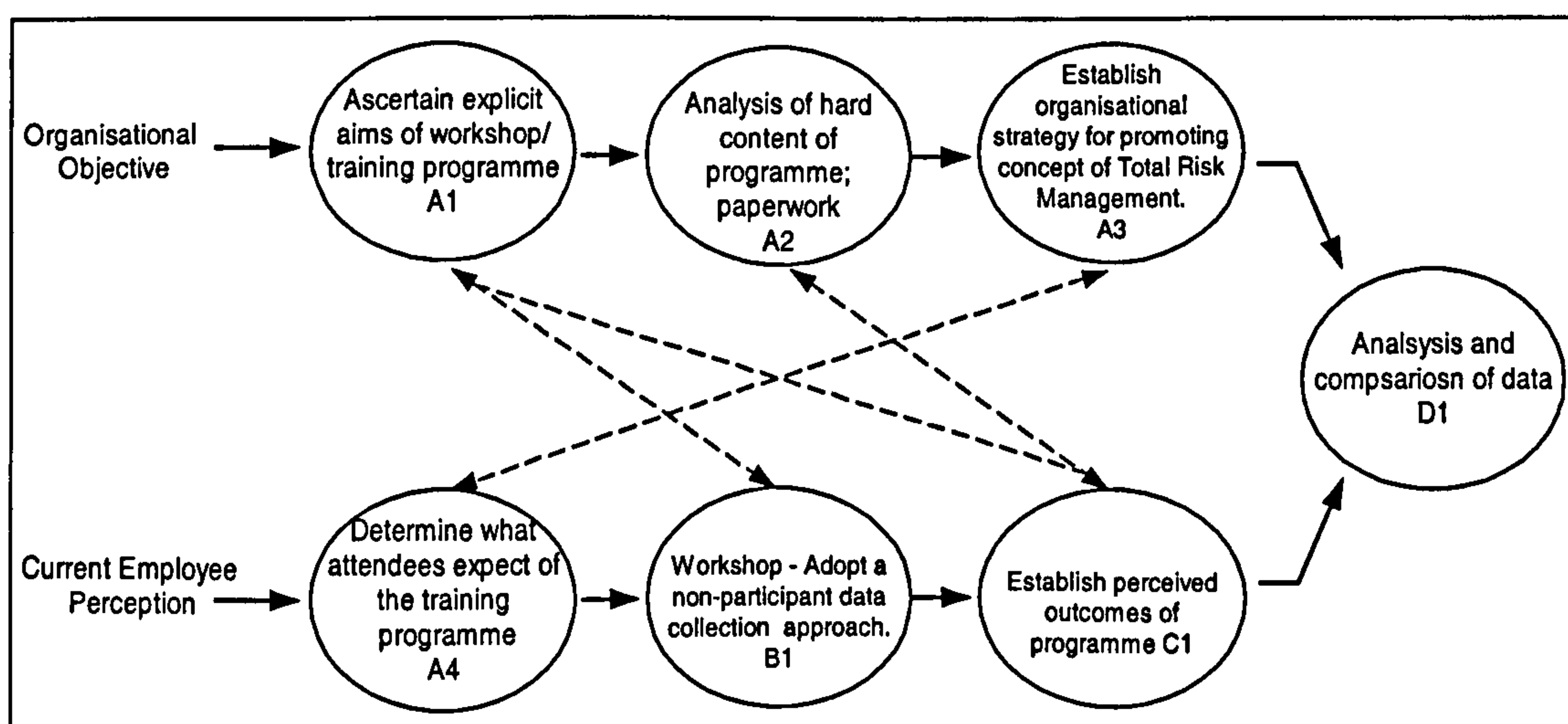


Figure 2.4. Schematic of case study methodology

2.6.1 Interviews

Interviews in this instance are deemed to have occurred where the researcher and one other discussed issues relating to the research objectives with the intention of eliciting information from the interviewee. There are possibly two main categories of interview, the informal interview that may be conducted as opportunity permits or the formal, pre-arranged interview (Gummesson, 2000). Informal interviews demand a more probing, spontaneous and unstructured technique governed by the situation rather than by the topic of interest (Gummesson, 2000). Within these two categories fall the interviewing techniques defined by Fellows & Liu (1997) as:

- structured;
- semi-structured; and
- unstructured interviews.

Formal interviews tend mostly to be structured and follow a pre-determined and structured course of questioning and will not deviate from the prepared questions.

Item	Method	Data Gathered
A	<i>Pre-Workshop</i>	
A1	Ascertain explicit aims of workshop/training programme via interviews with designers of programme.	Historical information relating to the purpose and rationale behind TRM.
A2	Analysis of hard content of programme; paperwork – how is it being sold/marketed etc.	Contemporary data used to communicate desired organisational perspective.
A3	Establish organisational strategy for promoting concept of Total Risk Management (TRM).	Historical and contemporary data from semi-structured interviews and published articles etc.
A4	Determine what attendees expect of the training programme.	Pre- workshop semi-structured interviews by telephone or in person to establish attendees' pre conceptions.
B	<i>Workshop</i>	
B1	Adopt a non-participant approach.	Audio recordings of group conversations over the duration of the training programme.
C	<i>Post workshop</i>	
C1	Establish attendees perceived outcomes of programme.	Post-workshop semi-structured interviews.
D	<i>Analysis</i>	
D1	Analysis and comparison of data.	Adopt an emergent approach as opposed to content analysis of training programme.

Table 2.3. Constituents of the proposed case study methodology

Similarly they may be semi-structured and follow a defined course of questioning but one that is not prescriptive and allows deviation from the defined path to allow exploration of areas of interest that may be highlighted by the interviewee. All three interviewing techniques may include recorded audio recording that allow a more complete transcription and further analysis at a later date however in isolation this method does not capture symbolic information such as that conveyed by body language (Gummesson, 2000). Therefore written notes should also be kept to supplement the audio recordings.

In this instance where formal interviews were arranged they followed a semi structured interviewing technique, with audio recordings on mini-disk combined with written notes. Some interviews were informal and held over the telephone; these followed a semi structured approach and were recorded, again on mini-disk, with the permission

of the interviewee. All interviews were subsequently transcribed for purposes of analysis.

Steele (2000) highlights several strengths and weaknesses associated with interviews as detailed in table 2.4. In response to these issues the interview questions were founded in the research aims and objectives, but were not prescriptive or suggestive in their composition. Finally whilst no formal training in interview techniques was undertaken, texts such as Brenner *et al* (1985) and Gummesson (2000) were consulted to establish good interviewing technique.

2.6.2 Discourse Analysis

The primary intention of the discourse analysis was to establish how the group members interpreted the message being communicated and how they arrived at a shared group understanding of that message. To accomplish this discourse analysis combined with conversation analysis of the transcribed conversations was undertaken, as the two approaches independently would not show the whole picture.

Strengths	Weaknesses
Interviews allow both parties to explore the meaning of the questions and answers involved. In this way the responses can be negotiated.	The interviewer must train in order to achieve adequate results. This means that the investment of time into the design of i) a suitable questioning structure; ii) an effective interviewing technique; and iii) a data collection programme (as they apply to the interview).
Any misunderstanding on the part of the interviewer or interviewee can be checked immediately in a way that is not possible with questionnaires or tests.	Owing to the fact that there is face-to-face contact between interviewer and respondent, there is an opportunity for bias to occur.
Interviews facilitate rapid (immediate) response. This gives directness to this method of information gathering.	Verbal data, by virtue of its quality and varying degrees of structure, are particularly susceptible to error in interpretation.

Table 2.4. Strengths and weaknesses of interviewing (Steele, 2000)

The two approaches provided the following data:

- Conversation Analysis discloses the structure of the discussion between the group members. The practice also provides an accepted transcription procedure and notation glossary.

- Discourse Analysis allows the process of understanding to be highlighted and discussed. This was important in highlighting how the group members established a position with regards to the problem at hand.

Conversation analysis (CA) was developed by Harvey Sacks (c1964) in response to a request made by a medical institution for help in soliciting the names of callers to a counselling service (Sacks, 1992). CA has developed into a systematic social hermeneutic study and analysis of naturally occurring conversation, 'talk-in-interaction', the purpose of which is to understand the tacit, organised reasoning procedures inherent in how individuals understand one another (Hutchby & Wooffitt, 1998; Have, 1999). The methodology of CA is qualitative in nature and shies away from the contents analysis of the frequentist approach in order to ground theories in naturally occurring behaviours as exhibited by participants talk-in-interaction (Markee, 2000). Therefore the methodological foundation of CA has been described by Hutchby & Wooffitt (1998) as:

- talk –in-interaction is systematically organised and deeply ordered;
- the production of talk-in-interaction is methodic;
- the analysis of talk-in-interaction should be based on naturally occurring data; and
- analysis should not initially be constrained by prior theoretical assumptions.

From an ethnomethodological perspective society and cultures are constructed by a collection of communications (Littlejohn, 1992). Consequently CA attempts to identify the sequential organisation inherent in conversations that lead to a shared understanding of the environment (Hutchby & Wooffitt, 1998; Littlejohn, 1992). This view underpins CA's rejection of the functionalist perspective and is more akin to Garfinkel's (1967) view that individuals are sufficiently cognisant and rational to account for their own actions. Therefore, whilst society may communicate desired values these are not simply accepted and internalised to be replicated in perpetuity. Rather they are established through inter-subjective agreement between individuals whose collectivisation of values establishes cultures and norms of behaviour. Therefore CA is an ideal method to ascertain how the transposition of communicated

organisational 'values' are understood, internalised and implemented, in this instance by construction management professionals.

Whilst the method of data collection and analysis are discussed in chapter 6 there are several methodological considerations that must be considered when utilising this manner of information elicitation for the purposes of constructing theory. Firstly the talk-in-interaction data must have occurred naturally and not in response to an artificially structured investigation such as an interview (Hutchby & Wooffitt, 1998; Have, 1999). In this instance the data was collected using mini-disk audio recorders, placed as unobtrusively as was practicable, within the two group discussion rooms. The researcher was introduced to the assembled attendees who were informed of the purpose but not the objectives of the research, subsequently permission was obtained from the attendees to make audio recordings of the conversations. However as the groups were aware that their conversations and deliberation processes were being recorded the validity or purity of the recorded data may have been compromised because of one or a combination of the following:

- the group members may not have appreciated the confidentiality of the recorded material;
- they may have perceived that the researcher was looking to identify a preconceived correct answer;
- failure to provide this correct answer may make them look foolish; and
- their inability to provide the correct answer may be reported to their employer (confidentiality issue) and result in some form of punitive response.

The aggregation of these factors implies that there is a possibility that the discussions and responses may not have been as forthcoming as they may otherwise have been in order to avoid the ramifications detailed above. As it is necessary to obtain permission from participants before recording conversations these criticisms are unavoidable and such considerations must be levelled at similar methods of data collection. Also the groups presented the findings and conclusions of their discussions to their peers directly after their group discussions. Therefore whilst the presence of recording equipment may have influenced their discussions, the 'threat' of peer review arguably

provided sufficient motivation. Similarly the group participants were not asked to provide any additional explanations or to comment upon the originally recorded text as self-report data may reconstruct and reinterpret original behaviour as opposed to explain it (Markee, 2000).

Secondly whilst it is imperative that the research findings communicate the participants rather than conversation analyst's perspective relative to the phenomenon the recorded material may still be subjectively and intuitively explained by the analyst (Markee, 2000). This difficulty may be overcome by adopting the following two methods:

- provide data samples together with the analysis for the reader to 'judge' for authenticity; and
- provide a triangulation of data sources together with counterexamples in order to facilitate replication of the study by other analysts (Hutchby & Wooffitt, 1998; Markee, 2000).

In this instance two sources of data were considered sufficient (Fellows & Liu, 1997) to provide a triangulation (sic) of sources; transcriptions of audio recordings together with their analysis and 'hard' copies of presentation materials produced by the groups concurrent with their discussions.

2.7 Summary

This chapter has outlined the rationale behind the design of the implemented research methodology. The conclusions drawn from this research are to be distilled into a theory that will inevitably be limited because of the following two factors:

- the data was solely collected from a single organisation; and
- the observed sample size was small in relation to the construction industry employment total.

However in essence the case study research constitutes a pilot study to ascertain the validity of initial proposition contained within aim A1 and to identify the options for

proliferating the identified manipulation effect as included within objective O3. Consequently the theory derived from this research will inform the subsequent investigations that will endeavour to replicate and generalise from the work started here. To that end the conclusions and recommendations will reflect the need for further, wider ranging, research to establish the validity of the theory and conclusions contained herein. The nature and execution of this methodology has allowed conclusions and recommendations to be reported in this thesis that are both verifiable and replicable.

3 Management of Uncertainty

3.1 Introduction

This chapter reviews the philosophy of risk and risk taking behaviour, complexity, and the types and nature of uncertainty. Their cumulative impact upon decision-makers is investigated together with how information is used to minimise this impact. The structured risk management processes used to model the decision/problem environment are then examined in light of their objectivity.

The literature review will show that there is a body of knowledge that recognises the impact of personal experience, the use of judgemental heuristics, leadership influence, problem familiarity, culture and motivation upon individual risk preference. However many risk management processes seek to objectify risk by providing structure to the process. This structure encourages the use of such processes by organisations at both a project and strategic level and engenders the notion that the resultant outputs of such processes are definitive and certain. It is proposed that organisations view the structure of the process as a buffer that normalises the differing perceptions and preferences of risk management professionals around a desired organisational perspective, expressed within the bespoke nature of the structured risk management process. However this research shows that the processes fail to achieve this and instead offers a different process for the normalisation of group and individual perceptions and preferences, in chapter 7.

3.2 Defining Uncertainty

Within the scope of this review uncertainty can be considered to have two separate interpretations derived from the same definition. The chosen 'generic' definition of uncertainty is the one provided by the Collins English Dictionary (1995), which defines the term 'uncertain' as "not able to be accurately known; liable to variation, changeable". The first interpretation states that uncertainty is only concerned with our prediction of future events, which is a concern of risk management. The second is uncertainty of a subjective nature, a state of mind, which relates to a lack of understanding relating to a particular system or event (Cohen & Christensen, 1970), which is an issue that risk management processes also attempt to address. Similarly

Edwards & Bowen (1999) treat uncertainty as a personal and therefore subjective response to a situation that is lacking clarification, information; lacking predictability and understanding and thereby inducing doubt.

Within the scope of risk management uncertainty is usually regarded in terms of the doubt associated with predicting the occurrence of the multiple possible ramifications of a decision (Smith, 1999). Uncertainty may therefore be associated with the unpredictable nature or possibility of realising one of a set of future possible states. In this instance uncertainty carries a descriptive, taxonomic aspect (Rowe, 1977) uncertainty as to what a 'thing' actually is, how to label it and to discern its' function, purpose and other attributes. An understanding of the how, why and when of the 'thing' is necessary before a prediction can be made as to its' possible future movements. This is a definition that is intrinsically risk management and one that provides a basis for the analysis, evaluation and control of uncertainty (Baker *et al*, 1999). In order to reduce the descriptive uncertainty, attempts can be made to learn more about the underlying processes that govern that system; i.e. the sources of information that act as a basis for decision making, and the mechanism by which decisions are made. By establishing these governing factors, measurement criteria can be established.

Christensen (1979) deems uncertainty to be intrinsic in an individuals inability or failure to accurately predict the reaction of our environment to our interaction with it, implying that there is nothing unpredictable about the world only our comprehension of it. Nonetheless the effect of uncertainty depends upon the individual's estimate of their own skill at the task at hand and their estimate of chance affecting the outcome (Bell, 1979). However there are many chaos theorists who will argue that an individual's environment is the archetypal irregular and dynamic system (Lorenz, 1960). Consequently to minimise the uncertainty associated with any system or event information is required to clarify the state of the system at any one time.

3.3 Defining Risk

Popper (1982) describes an indeterministic world by using the analogy of rolls of film, the stills from which show possible future states and 'interactions' yet to be completed. The sensitivity of indeterministic systems such as construction projects to initial

conditions implies that observations further into the future on any chosen roll of film will have greater discrepancy between predicted and actual futures, consequently the closer the view to the present the more accurate will be the prediction. The prediction of future events is in essence risk management and the perceived uncertainty associated with achieving that future state is the concept of risk.

March & Shapira (1992) note that there are two different connotations to risk, the first revolves around the notion that a decision outcome may be other than was intended. The second centres on the level of certainty of achieving any one, or a combination, of those identified possible future states. All attempts to define and agree upon an acceptable generic definition of risk have proven to be a fruitless exercise (Doderlein, 1987). Professionals who are charged with managing a risk management process treat risk as an objective reality the nature of which may be quantifiably defined. To non-professionals risk is the term adopted in everyday life to describe a future state whose certainty of outcome is not known but is perceived by the decision maker to be non-beneficial (Beck, 1986).

3.3.1 Risk as Loss or Gain

In everyday language and in professional risk lexicons it is the realisation that a situation may induce 'harm' that inspires the recognition of risk in association with a hazard. Beck (1986) suggests that risk is the philosophy concerned with systematically understanding and managing the nature of harm or loss associated with a hazard. Edwards & Bowen (1999) define risk as "the probability that an adverse event occurs during a stated period of time". Similarly Chicken & Posner (1998); the Royal Society (1991;1983); Cooper & Chapman, (1987) and Beck (1986) are in agreement that for risk to exist there must be some exposure to probable financial or physical loss. Jackson & Dutton (1988) concluded that individuals were more inclined to acknowledge threats than opportunities, however their research may have identified the organisational response to threats and opportunities by asking questions relating specifically to occupational issues.

There is however a growing trend within risk management for the inclusion of opportunity, expressed as the probable exposure to either physical or financial gain, to be included within the remit of risk management (Hillson, 2001; Kahkonen, 2001;

Cooper & Chapman, 1987). The notion of beneficial aspects of risk revolves around the scientific objective view that risk is a measure of uncertainty associated with one of an identified set of future states. This view is in contrast to the present cognitive approach that defines risk as the term most apt to describe the cognitive processes underlying decision-making relative to a perceived non-beneficial decision outcome without regard for any opportunity or benefit that may arise (Glendon, 1987).

3.3.2 Probability and Risk

The Royal Society (1991; 1983) defines risk statistically as the probability that an adverse event will occur within a certain time frame. The probabilistic quantification of risk is reflected in BS4778, 1991 Part 3 that defines risk as a “combination of the probability, or frequency, of the occurrence of a defined hazard and the magnitude of the consequences of the loss”. Chicken & Posner (1998) define risk in terms of the outcome of a hazard multiplied by exposure to the hazard. These probabilistic frequentist interpretations seek to establish risk as an objective reality the substance of which is contained within the level of potential loss and perceived exposure to the loss-incurring hazard. The assessment of both these variables is included within the risk assessment stage, but forms only one part of, the risk management process. Nonetheless the quantification techniques used to predict the likelihood of occurrence and potential impact are often thought to objectify the assessment and eliminate the subjective elements of the process (Kasper, 1980). This objective view of risk is expressed in figure 3.1.

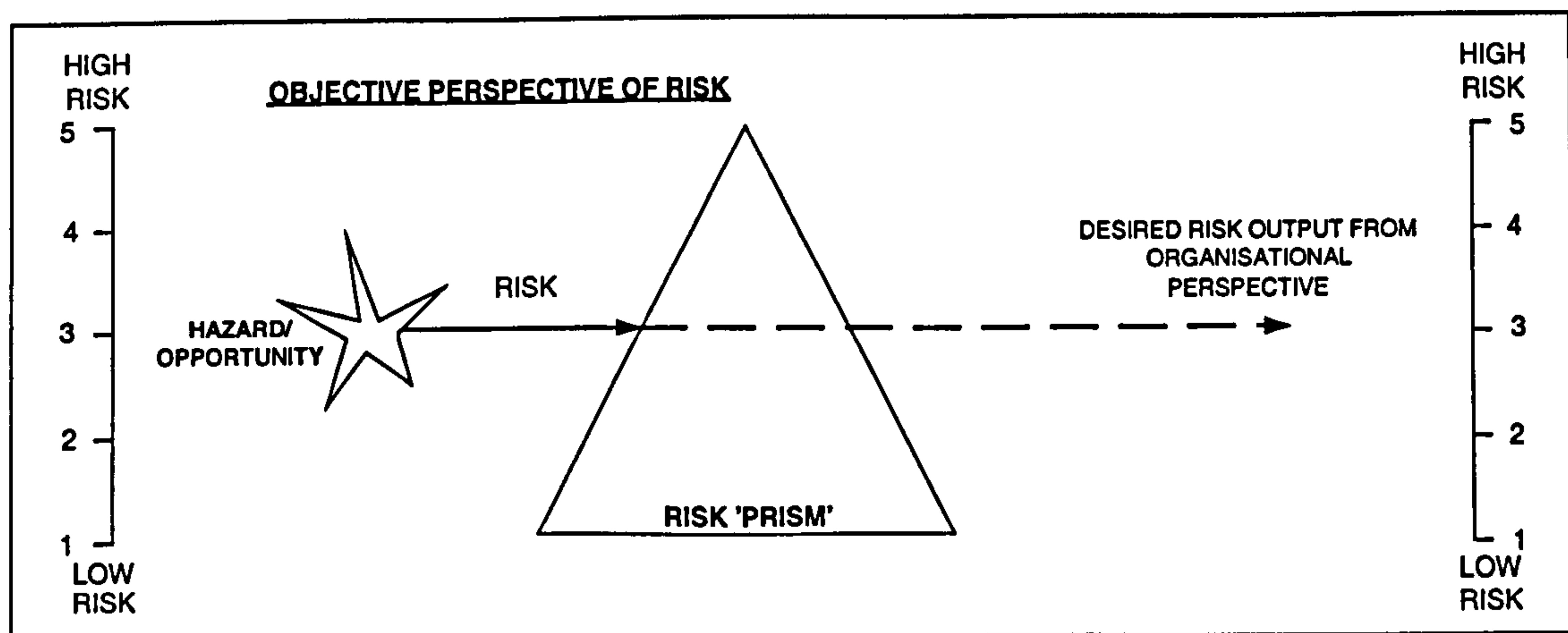


Figure 3.1 Objectivity of risk

The risk is deemed to 'exist' as a definite article and subsequently an individuals' perception is also supposed to reflect this objectivity. This view of risk and uncertainty is reflected in the risk management processes used by many organisations that utilise frequentist probabilistic interpretation of the decision domain. The respective probabilities of occurrence are founded upon individual intuitive derivation yet viewed as objective as they are an output of an objective and structured process. As a consequence the risk management processes become a mechanism to control the individuals' view of their environment that removes the subjectivity inherent in their decision-making that is prevalent outside of the process. However chapter 6 will illustrate the subjective nature of the risk assessment process in construction project management.

As great emphasis and reliance is placed upon the frequentist probabilistic interpretation of the decision domain by the risk management process it is necessary to consider the nature of frequentist probability theory. The following discussion will show that there are primarily two fundamental problems when using probability theory for risk management purposes. Firstly individual decision makers do not understand the nature of frequentist probability theory and secondly the theory is founded upon mathematic determinism and not real world indeterministic environments.

Individuals, including professionals with higher degrees (Bruine *et al*, 2000), misrepresent probability and rarely if ever consider probabilistic interpretations of events as such, similarly:

"independent events may be treated as related, preferences may be expressed where there is no mathematical justification, and concepts like hope, pessimism, or fairness may intrude" (Bell, 1979).

A probability can be defined as "a measure of the degree of confidence one may have in the occurrence of an event" (Collins Concise English Dictionary, 1995). Two of the fundamental axioms of probabilistic calculation state that probabilities are expressed as values >0 and <1 and that the sum of the probabilities associated with the variables should sum to unity. Consequently to calculate a probability an exhaustive list of variables, which Shackle (1969) defines as 'distributional uncertainties', must be

constructed. These are generally obtained from a sample population within which the variables are believed to be distributed in a random fashion. A sample is chosen at random and tested, the results from which are used to predict the relative frequency of the event, but without stating exactly on which of the next one hundred occasions it will occur. Therefore fulfilment of any statistical prediction is contributable to coincidence (Hansel, 1979).

Any objective probabilistic quantification of risk must be based upon observed and recorded historical events of a similar nature to the ones identified as possible future outcomes of the present decision option. Whilst it would be pedantic to insist that the inimitable nature of human affairs renders historical comparisons to be specious there must be a close resemblance between the historical and the potential future states. However the more precisely an event is defined the fewer the recorded occurrences of similar events will be and hence any estimate of frequency placed upon it will be increasingly unreliable (Cohen, 1979). To truly predict a hazard in probabilistic terms an all-encompassing, holistic view is required of the decision domain in which the event is due to take place. This is possible in a mathematical phase space where probabilities are bounded philosophically and restraints such as system stability and determinism can be inferred. However this is not a practicable assumption in any real world dynamic environment where events are non-deterministic and uncertain and where an exhaustive list of variables cannot be identified. To illustrate this argument Singleton & Hovden (1987) have stated that the probability associated with any given situation changes as new information comes to light and acknowledge that there are very few instances where the extent of the information available to a decision-maker is ever complete. However Shackle (1969) states that when probability is founded upon knowledge and is deemed to be objective there could be no uncertainty as knowledge and uncertainty are mutually exclusive:

“When we are discussing uncertainty we cannot qualify or specify its degrees by a variable whose values are knowledge of the kind which answers the question about which we are uncertain. This is fundamental” (Shackle, 1969).

Shackle is implying that when there is knowledge there is no uncertainty, however probabilities never express certainty in any real world situation because the relevant

information is never wholly accessible or 'knowable'. The frequentist interpretation of probability does not allow subjective experiential knowledge to figure in probabilistic calculation. However the determination of subjective probabilities is based upon experience, the sum of the information available, analogy and symmetry of present events to those of the past (Spjotvoll, 1987).

Bruine *et al* (2000) state that it is often impossible to choose a precise probability for unfamiliar risks. However individuals who are required to do so often make statements for which they lack supportive evidence. Therefore calculated probabilities based upon observed relative frequencies of phenomena outside of controlled environments are liable to be incomplete whether through ignorance or error. Consequently probability theory applied in real world dynamic environments constitutes a possibilistic approximation of what is to occur without true certainty. Adams (1995) is of the opinion that precise quantification of uncertainty is an unattainable goal and that more could be done to manage uncertainty if the emphasis is shifted from probabilistic quantification to possibility for guidance. Consequently the use of probabilistic interpretation in project risk management has recently been criticised by Al Jaafari (2001).

3.3.3 Expressions of Confidence

A great deal of reliance is placed upon a frequentist probabilistic approach to risk assessment, which has had its failings outlined in the previous discussion. Another criticism that may be levied against the use of subjectively derived probabilities resides in their derivation.

Probabilities are numerical expressions of the confidence that any given prediction will be either correct or incorrect, for this reason a 50/50, or 50% expression of confidence is meaningless. However Bruine *et al* (2000) have shown that even professionals with advanced degrees use 50/50 expressions when answering questions in their own field of expertise. The authors reconcile this inconsistency by differentiating between singular responses, which relate to a specific individual event or occurrence, and distributional responses that relate to a broad spectrum of instances, but which relate to the same classification of event. Kahneman & Tversky, (1982b) concluded that individuals place too much reliance upon the veracity of singular information;

consequently too little importance is placed upon distributional information. Decision makers often rely upon singular information of the most salient or memorable instance of the event. The saliency of those events encourages the individual to consider only that instance and not the overall class of events to which it belongs. Ultimately this will lead to a conflict with the objective perspective of the structured risk management process as prospectively greater, or lesser, possibilities of occurrence will be identified that will be greater than is warranted based upon the available distributional data.

The popularity of numerical expressions of uncertainty is understandable considering the 'precise' and normative nature of numerical expression. Group members can place their perceptions upon an ordinal scale allowing comparison of 'predictions' and enabling communication from the same 'base line' to be undertaken. However there is a danger that numerical quantification, especially where used to arrive at an inter-subjective interpretation of reality, may exacerbate the sense of certainty inherent in the structured process where there is none.

The preceding discussion highlights the uncertainty inherent in probabilistic prediction of risk; the following discussion will highlight how many scholars maintain a distinction between uncertainty and risk.

3.3.4 Uncertainty and Risk

The two schools of thought with regards to uncertainty and risk attempt to either divorce one from the other or to assimilate the two. Tversky & Fox (1995) characterise risk under the umbrella of uncertainty as a known probability distribution at one end of a knowledge scale whilst ignorance resides at the opposite end where "decision-makers are unable to quantify their uncertainty". Arguably ignorance is expressed by 50/50 propositions indicating that the decision maker effectively has no knowledge of the decision environment. Smith (1999) defines risk as a decision expressed by a range of possible outcomes with attached probabilities and uncertainty as a state where there are ranges of possible outcomes but no assumed probabilities. Pender (2001) distinguishes between risk as the form of incomplete knowledge where the future can be predicted through the laws of chance, and uncertainty where the probability of future outcomes cannot be constructed. Seale *et al* (1995) whilst defining risk and uncertainty independently of one another acknowledge that there are

very few situations where “true uncertainty”, or ignorance (Tversky and Fox, 1995), reside. Smith (1999), Seale *et al* (1995) and Pender (2001) assume that there is something definite and certain about any probabilistic interpretation or prediction. Dichotomously Hertz & Thomas (1984) have suggested that:

“.. risk means uncertainty and the results of uncertainty.. risk refers to a lack of predictability about problem structure, outcomes or consequences in a decision or planning situation”.

Similarly Niehans' (1959) position is that when there is more than one possible future state there is uncertainty. Further Gunning (1999) claims that any attempt to distinguish risk from uncertainty will be spurious. Risk and uncertainty would therefore appear to be irreducible. Consequently any discussion regarding risk must address the consequence of the decision maker's intuitive reaction to the subjective and environmental uncertainty upon the decision-making process.

3.3.5 The Wicked Problem

Rarely is a decision maker in a position whereby they have all the information they require when considering any decision environment. For any system that exhibits irregular characteristics, prior observation will not provide pertinent information with regard to its nature as it currently stands. The sum of the data/information available will be insufficient to allow an absolute description of that system. Therefore being uncertain means being in an unsure state of mind arising from this incomplete definition/description. To be uncertain one must be in a state where information is lacking, information that would allow one to accurately ‘know’, describe and measure the degrees of freedom of a system and allow the prediction of any variation or change. Consequently the ramifications of any decision may not be immediately obvious to the decision-maker.

The implications of having to make decisions in this type of project environment combined with the need to compromise reflect the nature of the wicked problem as defined by Rittel & Webber (1973), a problem for which the answers are not true or false only good or bad. This premise of the wicked problem is founded entirely in the notion that due to the reciprocal nature and ramifications of any one decision,

consensus is unlikely to be achieved with regards to the choice of decision alternatives amongst stakeholders. The concept of the wicked problem arises with open systems where the solution to the immediate problem will have ramifications for those operations linked with that solution via the project organisation and complicated by the relationships of the project processes and systems (Rittel & Webber, 1973).

Accordingly it may not always be possible to identify one future state that satisfies all parties to the decision realm. Consequently any prediction of the ramifications of a decision must consider the bias inherent in individual and group contribution to the process.

3.3.6 Possibility and Risk

Managing project risk implies the management of uncertainty and by definition where there is uncertainty there is a lack of information and knowledge. The decision-maker can reduce the uncertainty by controlling the problem environment and restricting the given situational variables by using judgemental inference and assumption (Edwards & Bowen, 1999). The decision maker's experiential knowledge and expectations, which may be expressed as possibilities as opposed to probabilities, will influence their perception of the problem domain and will dictate the form the assumptions take.

The notion of the possible in terms of risk management has two important attributes. Firstly what is possible lays the foundations for quantifying the probable allowing experience to play a role in the determination and expression of the possible (Spjotvoll, 1987; Cane & Goldblatt, 1979). However utilising experiential knowledge “..is a long way from the kind of situation in which a frequency probability may be calculated” (Christensen, 1979). Secondly the notion of the possible fills the void left by the approximation of what is probable (Galtung, 1979). Shackle's (1969) concept of 'potential surprise' reconciles the apparent contradiction in this seemingly (economically) irrational 'gambling' behaviour. The individual may not be surprised should they not win the lottery but a little more surprised if they were to win. The degree of surprise experienced at either outcome is a true measure of the initial belief in the original propositions, “zero potential surprise expresses zero disbelief (Shackle, 1969)”.

Potential surprise allows individuals to attach equal weightings to more than one identified future outcome that cannot be achieved using probabilities. For example an individual who would feel no surprise if any one of four possible future states were achieved would have to attach equal probabilistic weightings of 25% to each which may not reflect the possibility that they feels is warranted. However, when expressed as a possibility the individual may consider that each of the four has a 90% potentiality, the measure of possibility becomes non-distributional, which distributional probability cannot express. Similarly when dealing with individual levels of aspiration for goal achievement and motivation, many possible future states may be identified which cannot be expressed probabilistically (March & Shapira, 1992).

In summary, risk is irreducible from uncertainty. Furthermore it is normally the detrimental effects of uncertainty that lead to the identification of risk. Expressions of probability are often found to be illogical which implies that most expressions are based on the notion of the possible as opposed to the probable. The concept of potential surprise is ignored by current risk management processes but offers an insight into the mechanisms at work in the subjective conceptualisation of likelihood in decision-making under uncertainty. Similarly the weaknesses of the frequentist approaches to the interpretation of uncertainty have been discussed and highlighted the need for a more reliable measure of uncertainty for risk management processes. Consequently the risk management process proposed in chapter 7 proposes the use of possibilities as opposed to probabilities as the measure by which certainty may be expressed.

3.4 Risk-Taking Behaviour

Individual and organisational risk-taking behaviour encompasses the deliberation processes that exhibit their risk acceptability. At one moment this acceptance may exhibit averse and the next acceptance behaviour (Isaac & James, 2000). This may be in part because what is deemed acceptable to the individual and organisation is often only defined after deliberation and comparison of their actual status with that which is desired (Rasmussen, 1987). Therefore risk-taking behaviour may be considered as behaviour relative to the achievement of specific objectives whether they are the attainment of beneficial goals or the avoidance of hazards. Consequently organisations

utilise structured risk management processes to achieve organisational objectives whilst individuals utilise unstructured cognitive processes to achieve desirable outcomes.

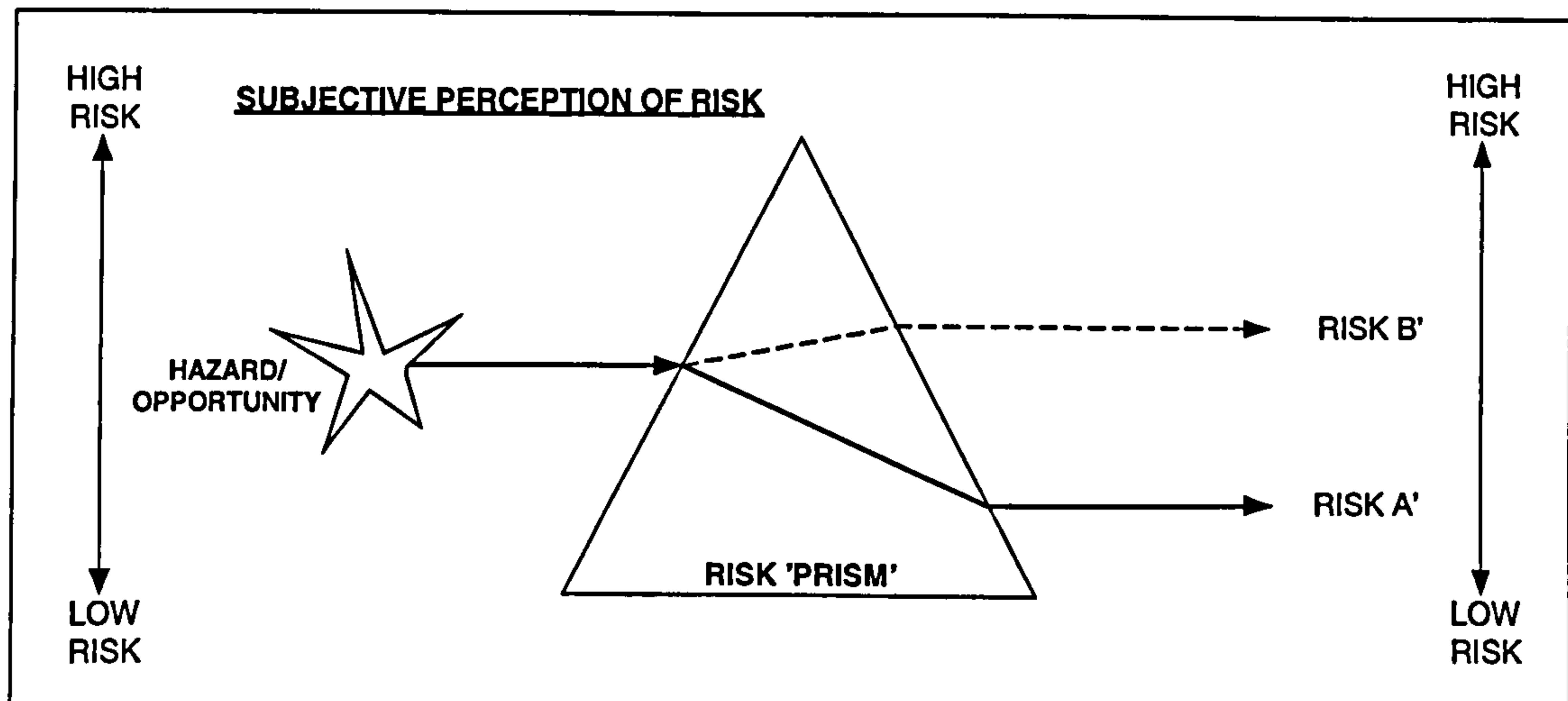


Figure 3.2. Subjective perception of risk

Figure 3.2 shows how the subjective perception of risk differs between individuals. The risk prism contains those individual attributes such as risk propensity, experience, problem familiarity and intuition. These individual attributes interact and influence the uncertain decision maker to produce a subjective interpretation of the decision domain. This subjective estimation may not be comparable, and may conflict with an organisations view of the hazard or opportunity as dictated by the objectivity proposed by the organisations structured risk management processes. Risk A' and B' are the independent perspectives of two different individuals. They are measured against subjective scales relative to the individual as either high or low risk. They are valued by gauging the possibility of occurrence against the desirability of the potential outcome; their relationship is evidenced as risk taking behaviour.

Weber and Milliman (1997) define risk-taking as decisions for which skill and information are assumed to reduce uncertainty and influence outcomes. Many of the previously quoted definitions of risk apply equally to risk-taking behaviour highlighting the consequential relationship between behaviour and risk; see March & Shapira (1992); Glendon (1987) and Beck, (1986).

There are three constituents of risk-taking behaviour commonly referred to as risk perception, propensity and preference (Vlek and Stallen, 1980). A fourth term, 'acceptance', is subsumed within risk preference as they describe the same end state i.e. what is acceptable is reflected in the individuals preference. Sitkin & Pablo (1992) and Sitkin & Weingart (1995) view both risk propensity and perception as filters through which situational determinants are viewed, shown in figure 4.1. Although risk preference is omitted from figure 3.2 'risky decision-making behaviour' could be considered an individuals risk preference.

3.4.1 Risk Perception

Perception involves inferring the structure and nature of the environment from specific stimuli (Chater & Oaksford, 2001). Glendon (1987) believes that experience with uncertainty can alter ones perception and ultimately reaction to it as expressed by Kolb's (1986) learning cycle. Therefore perception of risk can be considered as having three differing attributes; firstly there are the situational specific phenomena that incline an individuals perception to change as the decision domain alters as communicated by external sources (Sitkin, 1992). Secondly there are those same situation specific attributes that are gauged internally without external intervention against the individual's experiential knowledge. Consequently our perceptions and reactions to risk may be learned.

The Royal Society (1983) makes a distinction between objective risk as identified by experts and perceived risk as identified by non-experts. The discrepancies between the expert, the scientific, rational and objective measurements, and non-expert, the irrational, subjective and intuitive approaches, often render one unable to identify with the others perspective (Glendon, 1987; Beck, 1986). However it is the structured process of identification and quantification that lends risk the notion of objectivity and not the subjective views of the 'scientists' and professionals who populate those processes. The professionals retain their subjective perception of uncertainty that would otherwise be deemed to be so if it they were not generated via the structured process of risk management. Greenwood (1997) and Brehmer (1987) have contested the objectivist interpretation of the term 'risk perception' for the implication that there is some tangible, physical attribute of risk. They instead prefer the notion that risk perception is actually a more apt description of an individual's unique and intuitive

appreciation of any given decision domain. Conversely Loewenstein & Mather (1990) consider risk as a tangible threat or hazard and report that there is no relationship between perceived and actual risk aiding to further alienate the subjective and objective approaches to risk management. There is a tendency to assume that professionals are not susceptible to subjective interpretations of risk and that it is only the non-professionals who make risk judgements non-objectively. However there are similarities in how both the scientific and the non-scientific communities will arrive at their own notion of objectivity regarding risk. Chapter 6 will show how risk management professionals also, via dialogue and comparison with peers, agree to what is in actuality an inter-subjective reality by way of a resolution and aggregation of their own individual perceptions.

3.4.2 Risk Propensity

Risk propensity, defined by Adams (1995), Sitkin & Weingart (1995); Sitkin & Pablo (1992) and MacCrimmon & Wehrung (1990) as an individual's tendency to court greater or lesser uncertainty, is ignored by the structured risk management processes. Importantly Sitkin & Weingart (1995) have shown that risk propensity limits the individuals search for information and biases their evaluation of the decision domain and their risk perception, ultimately pre-conditioning that individuals risk preference. Adams (1995) believes that decision-making in uncertain environments constitutes a cognitive balancing act between risk perception and risk propensity whereby ones view of the environment is balanced against ones intrinsic desire to court or avoid uncertainty. The outcome of this balancing act rewards the individual with their risk preference that is translated directly into action in the form of decision-making. Figure 3.3 has been described as a modest model representing an individuals risk thermostat, a metaphor describing an individuals desire to live with uncertainty at any one moment in time (Adams, 1995). Figure 3.3 shows how the perception of danger and the potential for reward in any decision domain are balanced against the individual's propensity to take risks. Their propensity is in turn influenced by their prior experience (the 'accidents' element) with the decision domain currently faced, encouraging the recognition of risk propensity as an unstable personality trait that is open to influence.

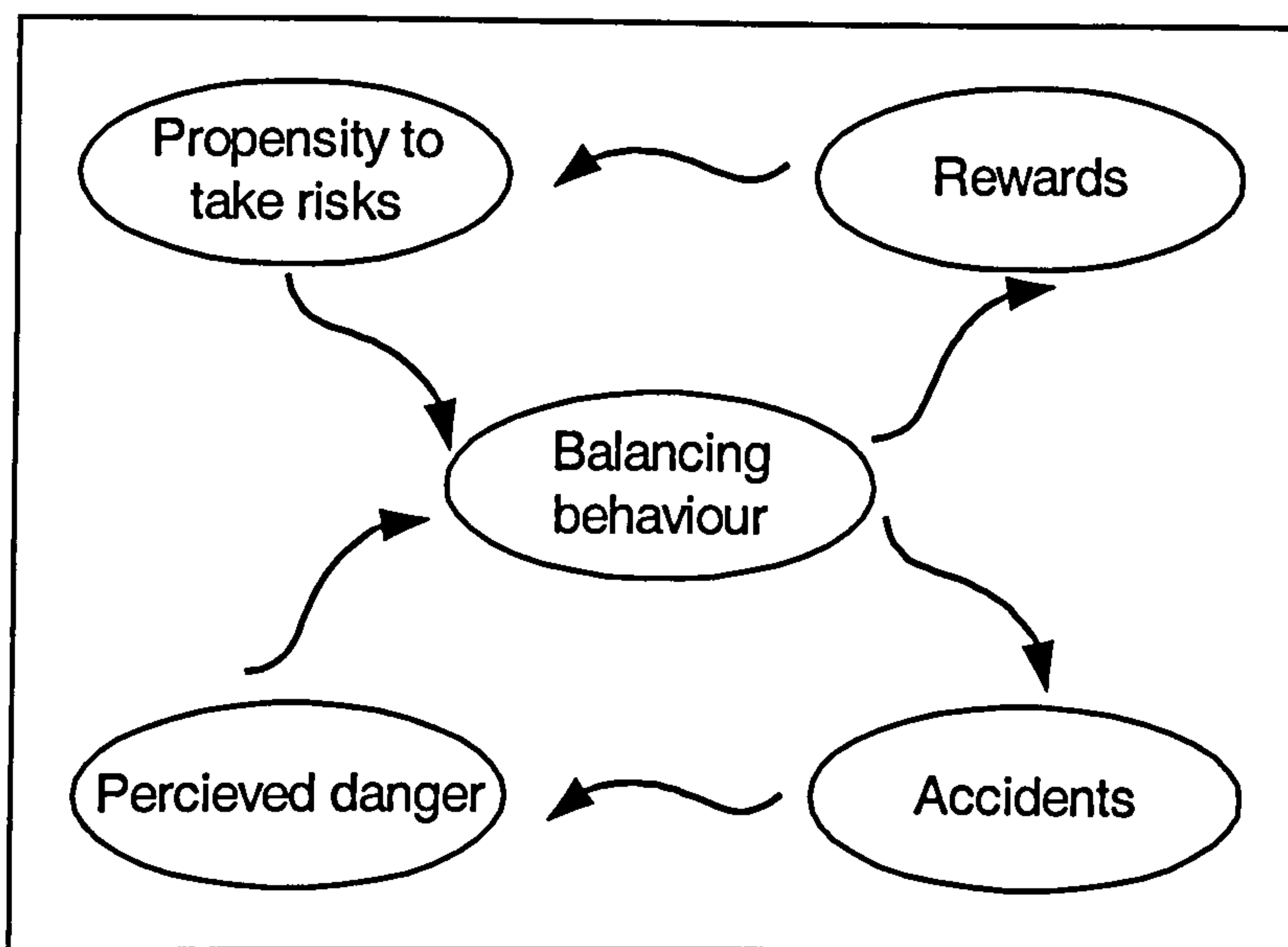


Figure 3.3. Risk thermostat (Adams, 1995)

The balancing behaviour can be considered to represent the individual decision makers 'risk preference' at any one moment in which the individual's perceptions concerning any possible loss and/or gain are weighed against the expected utility of the outcome. Raftery *et al* (2001) also determined that risk attitudes change over time and in reaction to stimulus, attitudes in this sense can be considered to replicate risk preferences, which have been shown to be an amalgamation of perception and propensity.

Slovic (1972; 1962) advocates the dominance of situation specific factors, such as economic climate, over the influence and indeed the existence of risk propensity as a stable personality trait. Similarly Koziellecki (1974) found that environmental factors in conjunction with other personality traits, such as aggressiveness and platitude, interact to determine situational specific risk behaviour and consequently argued that risk propensity could not be established as a stable personality trait.

However Sitkin & Pablo (1992) are of the opinion that risk propensity is of more influence in decision making than has been previously realised and have established risk propensity as the dominant influence upon decision-making under conditions of uncertainty. As propensity changes over time it becomes an emergent feature of the decision maker that, as experience is accumulated, will be less influenced by

situational specifics allowing greater cross-situational consistency (Sitkin & Weingart, 1995).

The theory of risk compensation predicts that each individual has a set level of uncertainty or risk, their propensity, that they are willing to live with and will regulate their lifestyle accordingly (Duilisse, 1997; Adams, 1995; MCarthy & Talley, 1999).

The assumption is that the notion of experience and familiarity bring enhance the perception of control over future events. Consequently structured risk management strategies will magnify the perception and compensating behaviour of the individual by translating an already underrated threat or over rated opportunity into an objective reality.

3.4.3 Risk Preference

Sitkin & Pablo (1992) consider risk preference to be an individual's personality trait that either attracts or repels them from risk. There are three widely accepted terms used to describe an individual's attitude towards uncertainty, or their risk preference. Firstly individuals who thrive on and court uncertainty are deemed risk seeking, whilst those individuals that shun uncertainty are deemed to be risk averse. Thirdly there are those individuals who are indifferent towards uncertainty, and are described as being risk neutral. As propensity has been shown to be liable to change, so has risk preference. Subsequently it is unwise to label an individual with any of the preceding three preferences. This can be further illustrated by examining figure 3.3, which shows how perception and propensity interact to produce a risk preference. As both perception and propensity are liable to change so is the individual's risk preference.

Nonetheless Weber & Milliman (1997) sought to establish risk preference as the stable personality trait determining individual choice. The authors are of the opinion that differing preferences are as a direct result of the differing cognitive perceptions of a problem domain and remain distinct from the emotional response that governs risk preference. Therefore a person's perception of the decision domain may be influenced but not their underlying risk preference. There are however similarities between the dichotomous views of risk seeking and risk averse individuals. Maehr & Videbeck (1968) observed that a certain amount of uncertainty of outcome increases the saliency of the task for both high and low risk-taking subjects.

In summary, risk perception is a subjective view of the decision domain whilst risk propensity is the desire to either seek or avoid uncertainty in those circumstances. Both an individual's risk perception and risk propensity are likely to fluctuate as the situational variables change. If an individual's risk propensity becomes more stable as their experience grows it is likely to be specific to the phenomenon to which the experience relates.

Adams (1995), Sitkin & Pablo (1992), Sitkin & Weingart (1990) and McCrimmon & Wehrung (1990) believe risk propensity to be an aspect of the individual's personality that influences their desire to either take or avoid risks. However Weber & Milliman (1997) have shown that risk preference is a stable personality trait, positioning it in the previously determined role of risk propensity, albeit open to influence via the individual's perception of the problem domain. All of the previous authors agree that the cognitive function of risk perception is the one factor that can be manipulated to produce differing decisions. As both the differing views of propensity and preference believe that they constitute the malleable personality traits that influence decision-making, their relative positions would appear to be based upon semantic differentiation.

3.5 Risk Management Processes

Ordonez and Benson (1997) have shown how decision-makers switch to using more simple decision evaluation strategies when under pressure of time constraints therefore timely provision of information by clients, stakeholders and the project team will facilitate more efficient decision-making. Risk management processes seek to satisfy this demand by providing a structured framework for information provision and deliberation that in turn exemplifies the objective view of risk as expressed in figure 3.1. The purpose of the process is to provide a model of the decision environment so that weaknesses in understanding may be defined and consequently solutions designed. They attempt to do this by utilising techniques that quantify risk and hence provide an objective and definite view of the decision domain. Similarly they seek to remove the subjectivity from the execution of what is designed to be a replicable process. Consequently as project management professionals utilise risk management strategies

in order to obtain a better understanding of the decision-environment in which they operate, the results and outputs of these processes are treated as objective and definite.

In the construction industry the use of risk management processes is made necessary by the increasing complexity of contemporary construction projects which place demands upon the project management team that may not have been encountered before (Smith, 1999; Edum-Fotwe & McCaffer, 2000). Consequently the project management team must establish a bespoke and iterative risk management framework within which project uncertainty will be managed (Akintola & McLeod, 1997).

Information such as progress reports, risk analyses, cost projections and historical project data in conjunction with individual knowledge is then used to inform and facilitate prompt decision-making by the project management team within the risk management framework. However there are a number of problems associated with the use of this type of information with regards to quantitative risk management. These problems are associated with the inimitable nature of construction projects that renders cost comparisons, at anything other than a superficial level, spurious.

3.5.1 Objectivity in Risk Management Processes

There are many pre-defined risk management (RMgt) processes available all of which comply with the generic framework for the management of risk and uncertainty. Such a generic framework is shown in figure 3.4 which details Raftery's (1994) visualisation of the RMgt cycle.

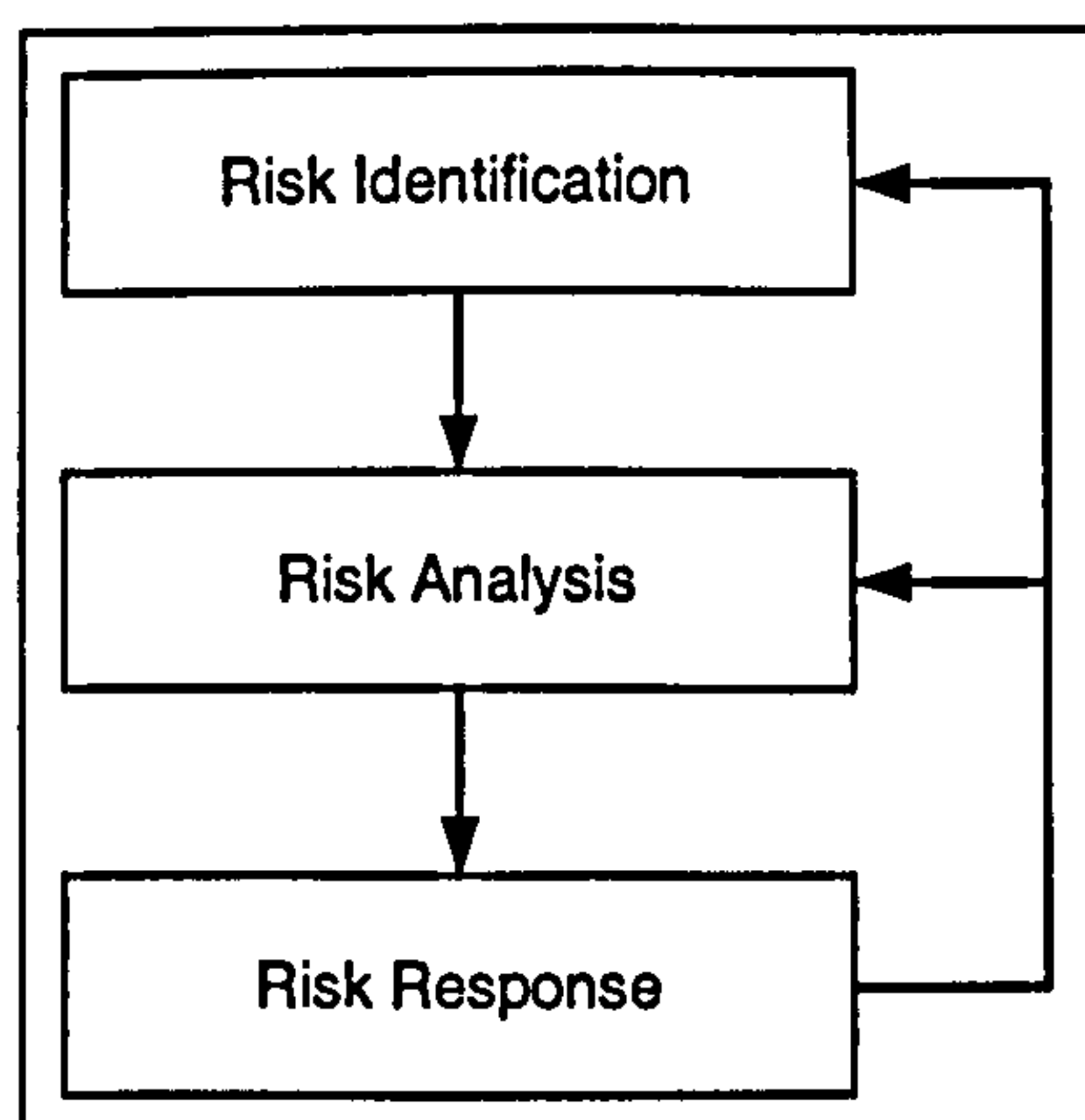


Figure 3.4. Risk management cycle (Raftery, 1994)

Risks are identified, recorded and assessed qualitatively and quantitatively and a response devised relative to the perceived potential impact should the risk be realised.

The Project Risk Analysis and Management guide (PRAM, 1997) uses the same three steps as the core to its risk management cycle as does Laxton's (1996) process, figure 3.5. The principle remains the same for the Risk Analysis and Management for Projects guide (RAMP, 1998) whereby risks are identified, recorded and assessed, mitigation plans prepared then assessed and the most suited is then implemented. Laxton's (1996) acknowledge the reciprocal nature of the process by noting that residual risks, those that arise as a result of the implemented mitigation plans, need to be assessed in the same manner as the original risk. The PRAM guide (1997) and Hall (1998) expand upon the aforementioned risk management processes by introducing a 'gap analysis'.

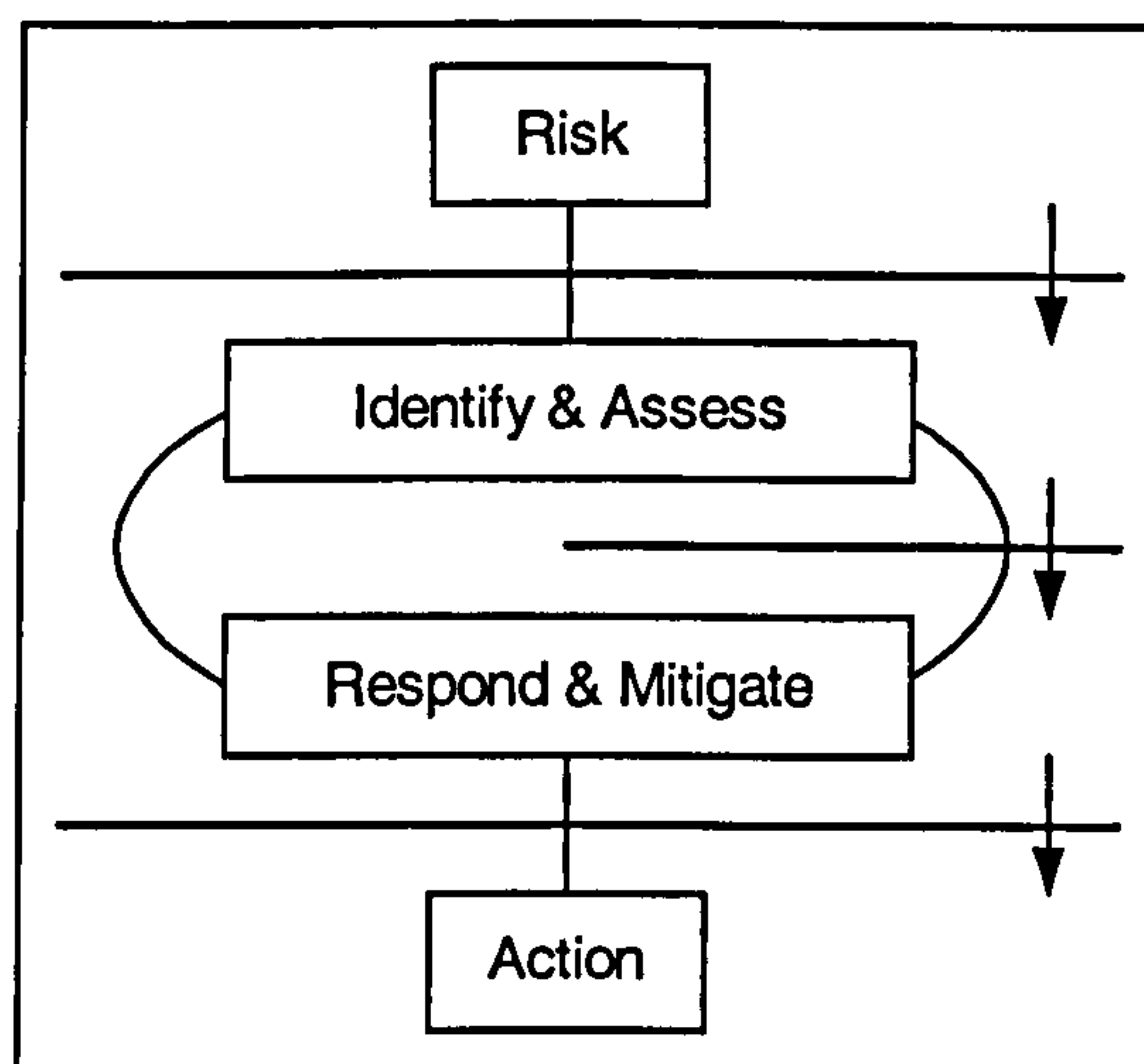


Figure 3.5. Laxton's (1996) risk management process

This analysis arises as a result of contrasting current status of identified sources of risk with a desired status after the implementation of mitigation plans, an area that Laxton's (1996) fail to mention specifically within their guide. It is fair to conclude that the majority of the risk management processes available are based upon the same foundations and are in essence mechanistic, prescriptive (Chapman, 2001). The depth of detail entered into in some guides varies but the messages and the approaches are basically the same; identify, assess, manage and monitor risk. These processes are often viewed simply as metaphors to focus attention, and to a certain extent control the subjective execution of the process (Raftery, 1994).

The objectivity of these processes is implied within their structure and execution. They assume that the individuals who contribute to its execution have the same

understanding and perception of the decision-making environment. It is assumed that the contributors to the process are rational, have developed a clear and shared understanding of the decision environment, have established common goals and objectives and are using these shared understandings as a base from which to execute the process. Similarly it is assumed that the knowledge, beliefs and perceptions held by the contributors is complimentary and when undertaken from a perspective of a shared understanding will effect a full and objective interpretation of the decision environment. However often the beliefs and perceptions of participants are in conflict with one another's and work to alter rather than compliment those of their fellow participants as evidenced by the risk shift phenomena (Wallach *et al*, 1962). Whilst Clarke (1997) has highlighted the need to manage the perceptions and preferences of project decision makers in order to deliver successful projects the area of subjective decision-making has been largely overlooked by construction management research. Instead research has concentrated on the more objective issues of risk management, such as risk quantification using statistical analysis and the methods adopted to do this (Edwards & Bowen, 1999; Raftery, 1994). Consequently it is argued throughout this thesis that no structured risk management process addresses the issues of the subjective nature of decision-making and the potential impact upon the execution and output of that process. Figure 3.6 proposes the risk management processes at the next degree of detail highlighting the subjective nature of many of the sub processes.

3.5.2 Subjectivity in Risk Management

Project team members' intuition, judgement and experience comprise the three distinct sources of information relied upon by construction management to inform the risk management process (Akintola & McLeod, 1997). This subjectivity is reflected in the individual's willingness to live with uncertainty and is reflected in any decision-making environment. The subjective interpretation of risk implies that there is no objective scale by which uncertainty can be measured; risk is not a definite article but exists primarily because it is recognised. This implies that for groups to react to risk, a shared group understanding of what that risk is, what its impact may be and how likely it is to occur is required.

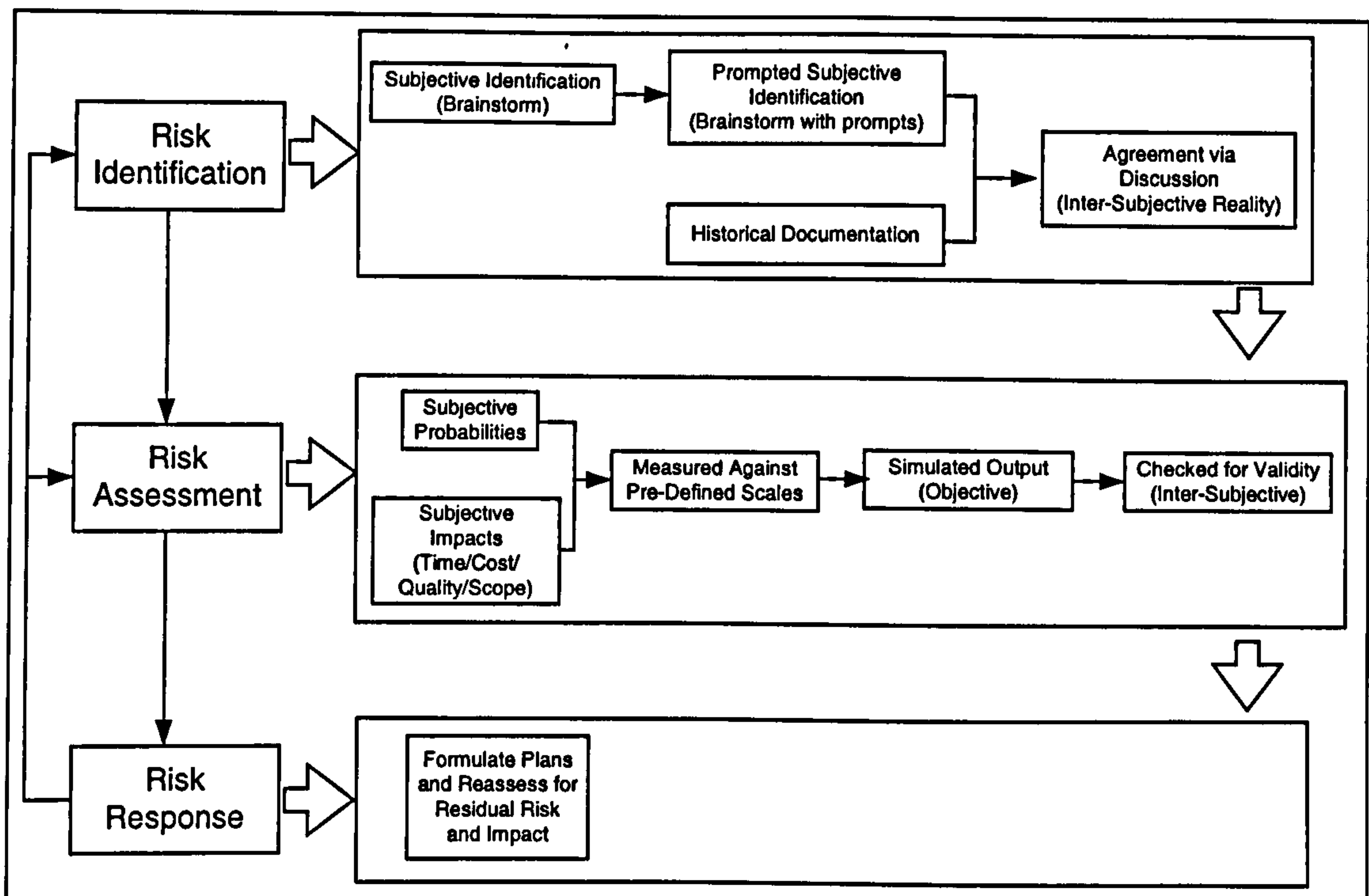


Figure 3.6. Proposed conceptualisation of contemporary risk management processes

This amounts to the establishment of an inter-subjective social reality that is entirely in contradiction of the scientific objectivity encouraged by the risk management process. The establishment of a group social understanding relies on the establishment and understanding of the measurement uncertainty (Rowe, 1977), which relates directly to the manner and measure of value of those taxonomically defined variables under consideration in the decision-domain. The measurement criteria are implicit within the taxonomic definitions but may remain difficult to quantify. They are strictly a subjective measure on behalf of both the originator and the recipient and so to apply requires agreement by both parties as to what is acceptable demanding as a precondition a common language in communication and an agreed rationality. This is in part what objective risk management processes seek to establish, but do so by prescriptive as opposed to descriptive methods.

It is arguable that individual perceptions have the greatest potential for impact in the identification and assessment stages of the risk management process. This is primarily because, as chapter 6 will show, the assessment and identification processes are inherently subjective. The identification of risk and sources of uncertainty are bounded only by the assessors' imagination and experience. Similarly the assessment

stage is likely to reflect the assessors' feelings and interpretation regarding the previously identified risks. The process of proposing management strategies and monitoring is subsequently restricted to the choice of more tangible and tried management practices. Therefore whilst it is difficult to dismiss any proffered source of uncertainty and risk because it is uncertain, it is much easier to visualise and identify a management strategy that that reflects a more realistic decision option.

The preceding discussion has highlighted the contradiction in the use of an ostensibly objective process, one that visualises the decision domain as defined and definite. It is assumed that the contributors to the execution of the process reflect this objectivity in their shared understanding and perceptions. However the process is populated by decision-makers who are only able to perceive the decision domain as subjective and are not afforded the opportunity to arrive at a shared understanding before engaging in that process. This is by virtue of the objectivity implied in the process execution, which relegates the need to arrive at a shared understanding before undertaking the process, as communicated in figure 3.7 below.

The left hand element shows the implied objective perceptions of the participants as they converge on the organisations distinct and objective interpretation of the decision environment. The right shows the subjective perceptions of the participants both converging and diverging dependant upon the effects of various influences within the execution of the process. The alteration in the perceptions of the participants is brought about by a culmination of group influence on the individual (the risky-shift), leadership influence and problem familiarity etc.

Consequently the output of the subjective interpretation of the process is the more realistic, i.e. the output is an amalgamation of the subjective views of the participants. The following discussion introduces some of the causal mechanisms that induce a sense of uncertainty, and hence the subjective perception of the decision environment by groups and individuals.

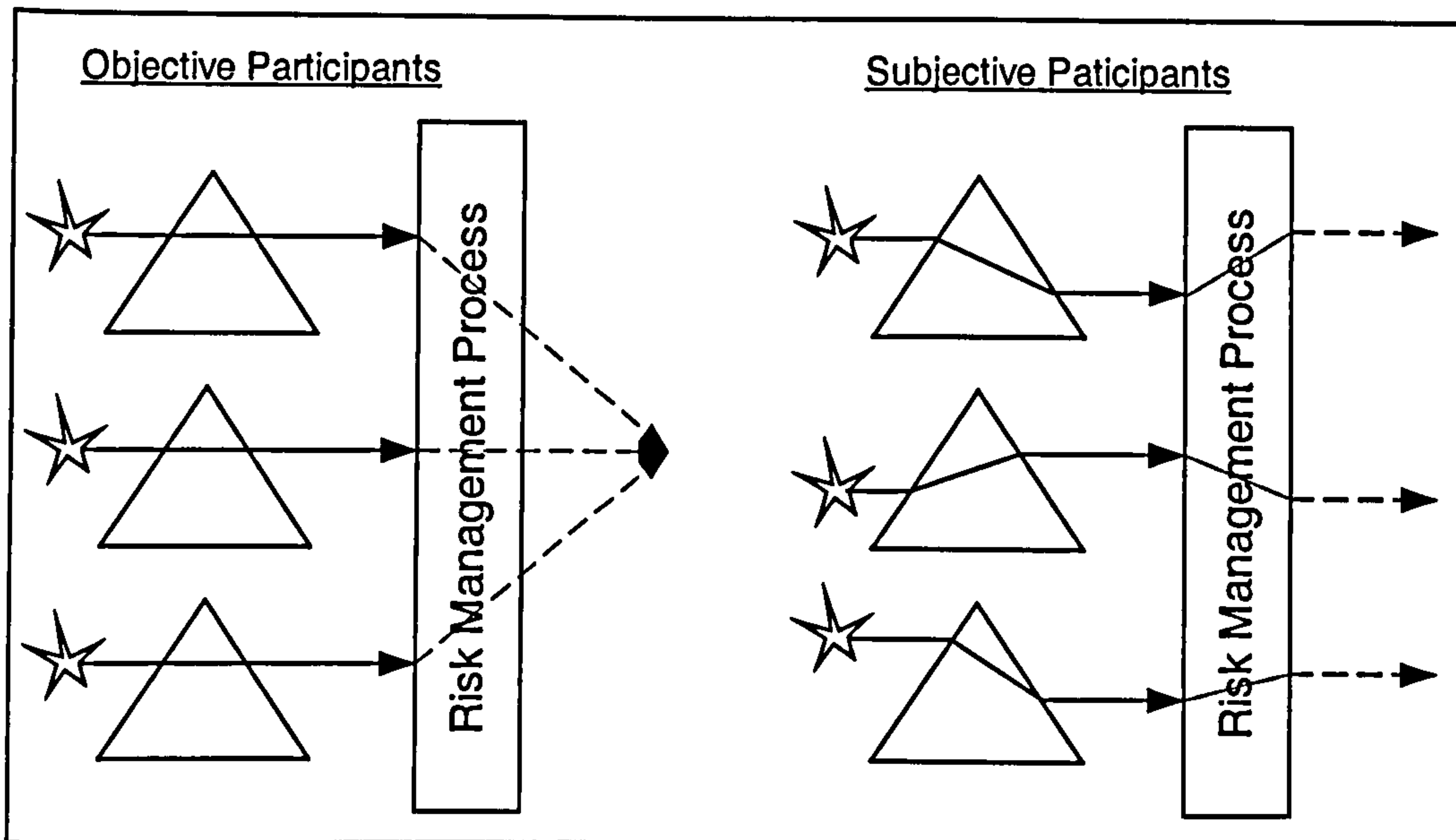


Figure 3.7. Participation in the risk management process

3.6 Complexity

Complexity is usually defined as having many 'parts'; singular objects inspire a view of simplicity. Therefore it is the number of the parts and their interactions with one another that comprise the whole that inspire the notion of complexity (Gregoire & Prigogine, 1989; Baccarini, 1996). Gidado (1996) defines two aspects from which project complexity may be viewed: the management of the processes required to deliver the product, and the operative and technical complexities associated with the need to execute the project delivery processes. This definition expresses the view of complexity associated with a project organisation where ownership by differing organisations discriminates the many varied parts from one another by their ownership and the interrelated nature of their dependencies.

3.6.1 Characteristics of Complexity

Cambel (1993) argues that because of the many different forms that complexity may take there is no encompassing definition available, but what may be formulated is an operational definition, the characteristics of which are:

- purpose and function; e.g. the product type and intended use;
- size and configuration; e.g. a microchip or a building brick and their interaction with the whole;

- structure, (composition and makeup); e.g. proportion of size to number of components and their interactions, new, old, tried or untried technology(ies); and
- type of dynamics.

Cambel (ibid) argues that not all four factors are necessary for complexity to result. It is the comparison of one or more of these aspects with its environment that constitutes a subjective view/assessment of complexity. Baccarini (1996) expands upon this perspective by defining project complexity as two distinctly separate elements; the discrimination of the parts as the differentiation complexity and the interrelated nature of their dependency as their interdependency. The complexity of the product may also influence the project complexity; the more complex the product the more complex the project required to deliver it. As a consequence of complexity the decision maker introduces uncertainty into the decision domain by virtue of the subjective interpretation of that environment.

3.6.2 Subjectivity of Complexity

Complexity may also be described as having a perceptual phenomenon, the state where a system or object becomes indiscernible or indescribable to the observer; where the interactions of a system's constituent parts lie beyond complete comprehension. It is in this area that the risk management processes fail to afford a shared understanding of the decision environment and instead exacerbate the cumulative effects of the subjective interpretations. Similarly in a situation where one cannot truly discern the nature of the phenomena, object or system under scrutiny the ensuing lack of understanding ensures there is complexity. By acknowledging the existence of the subjective nature of complexity the contradiction and conflict between the objective and subjective views of risk and uncertainty is substantiated.

Klir's (1985) position on the subjective nature of complexity is that; "the complexity of an object is in the eyes of the observer" reliant upon the observers ".. interests and capabilities" and the observers ultimately incomplete interaction with that object, i.e. ".. based on a limited... number of attributes that the observer is capable of distinguishing on the object". This is similar to the perspective forwarded by Hansel (1979) who states that the observer's behaviour or state of mind regarding an event is dependent upon the experience that the individual has had with an event of a similar

nature. Experience associated with the event, or an event of perceived similarity, may reduce the subjective complexity by providing references from which information can be drawn, which Ashby (1973) finds “.. the only workable way of measuring complexity”. The representative and availability heuristics work in a very similar way. The former allows the decision maker to make a cognitive short cut by making reference to a similar problem or prior occurrence whilst the latter encourages which previous occurrence is considered. It is the results of these cognitive short cuts that the structured risk management processes attempt to convert in an objective reality by a process of probabilistic quantification. In direct contrast Baccarini (1996) has stated that subjectivity is not a reliable measure of complexity. Nonetheless a measure of complexity derived from the number of interactions, their nature, etc. may well provide an approach that restricts the subjective interpretation within the defined limits thus stabilising the parameters within which the complexity is seen to exist.

The management of projects fundamentally revolves around solving non-routine problems that may possess multiple solutions as a direct result of this complexity. Consequently problems may be ill structured and variable making it impossible to comprehensively identify all of the degrees of freedom associated with any given problem (Li & Love, 1998). Similarly Gunning (1999; 1996) agrees that construction managers face complex problems due to the inherent uncertainty of contemporary construction projects for which rational solutions are unavailable. These factors make formulating prescribed responses to construction problems almost impossible therefore project management professionals, by necessity, must rely upon experiential knowledge to derive solutions. Similarly, because of the complex and non-linear relationships between many project processes there are multiple solutions available to project managers. This often results in decision compromises (Li & Love, 1998) and assumptions being made that may not reflect the objective maximising behaviour expected of them by the structured risk management processes. The assumptions that are made allow the decision-makers to minimise the complexity and uncertainty regarding their environment. It is these assumptions, which shape the individual perception and understanding of the environment, that require addressing before the process of risk management is undertaken.

It therefore follows that by allowing participants in the decision-making process to arrive at a shared understanding of the decision environment, and minimise some of the complexity and uncertainty, the process will begin to eliminate some of the subjectivity to which it is currently prone. Consequently the risk management process proposed in chapter 7 includes such a function in its execution.

3.6.3 Social Interaction

One other element of project delivery that structured risk management processes are failing to manage is the interaction between the project team members. Project professionals have choice and decisions are made that reflect this, decisions that are made utilising the often-incomplete information available at the time, making their behaviour unpredictable. However the objectivity of the risk management process assumes that the entire spectrum of information has been collated and rationalised. Consequently any decisions are made as a result of deliberation and consideration of the information provided by the process. The outcome becomes rational and objective, however any two individuals who make a decision based upon the same information may not arrive at the same decision; and if they do so it may be for different reasons. This unpredictability contributes to the irregular nature of non-regulated social systems where the actors have freedom of choice. This uncertainty is not wholly undesirable, without uncertainty there is no need for innovation, and without innovation there is no progress (Dalchar, 1993).

The effect of this internally generated perturbation upon the project system will remain unclear. As with any complex dynamical system, the project will be extremely sensitive to initial conditions; i.e. the system state at the outset will quickly manifest itself in changes from what will be predicted using historical data of systems that did not exhibit the same initial conditions. As individuals base decisions partly on reactions to experience they may not take the path most trodden, but will exhibit freedom of choice and exercise that choice that will in theory take them closer to realising their own agenda.

“.. the adaptive possibility of societies is the main source allowing them to survive in the long term, to innovate of themselves, and to produce originality”
(Gregoire & Progoine, 1989).

Consequently the risk management processes attempt to control the social system by confining the decision-making of individuals to within rational and objective parameters hence minimising the internal perturbations. However therein lies a contradiction; the process is populated and only exists as a result of the input and maintenance of that social system it attempts to control. This contradiction is exacerbated by the failure of the process to understand the mechanisms at work within the subjective social decision-making environment. Such mechanisms utilise information as a tool by which uncertainty and complexity may be minimised; consequently it is a lack of information that leads to uncertainty and complexity (Cambel, 1993).

3.7 Information

The more pertinent and the more detailed the information available the more assistance it will be to the decision-making process. Consequently information may reduce the descriptive uncertainty associated with system complexity by affording greater clarity as to the manner of function and purpose of the system. Whatever the nature of the information it may be derived from a wealth of sources such as internally generated information in the form of knowledge based upon experience or externally generated information such as that communicated by experts. Whichever form the information takes it must be recorded and analysed by the individual and then acted upon if it is to be of any use in the decision making process. Cohen & Christensen (1970) and Cohen (1972) cite four types or varieties of information.

- Selective information describes the statistical elements of information transfer. Therefore unexpected or exceptional information increases the situational uncertainty by posing more questions than it answers.
- Inventive information describes the communication of a metaphor that implies a resemblance between itself and an object or action to which it does not directly relate. Metaphors are not intended to be interpreted in a literal manner; they mean something more than what they actually say (Cohen & Christensen, 1970). Metaphors are easily misunderstood as a subjective association made

by the recipient may facilitate an interpretation other than that intended by the originator.

- Semantic information relates to the shared understanding of elements contained within a communication of information that may be selectively quantifiable or non-selectively non-quantifiable.

Whilst selective and semantic information may reduce uncertainty, inventive information will not because of the nature of its compilation; to convey something other than what was intended is to invite a further subjective interpretation.

- Aesthetic information is communicated by objects such as works of art that can never entirely be communicated by semantic or selective information (Cohen, 1972). For example an individual may view the structure in an abstract painting or simply interpret the kaleidoscope of images as complexity without structure.

Figure 3.8 shows the translation of inventive and aesthetic information into a collective semantic understanding, which may be derived by an inter-subjective social agreement. Therefore in reality the risk management process attempts to turn the subjectively derived semantic information into an objective selective format.

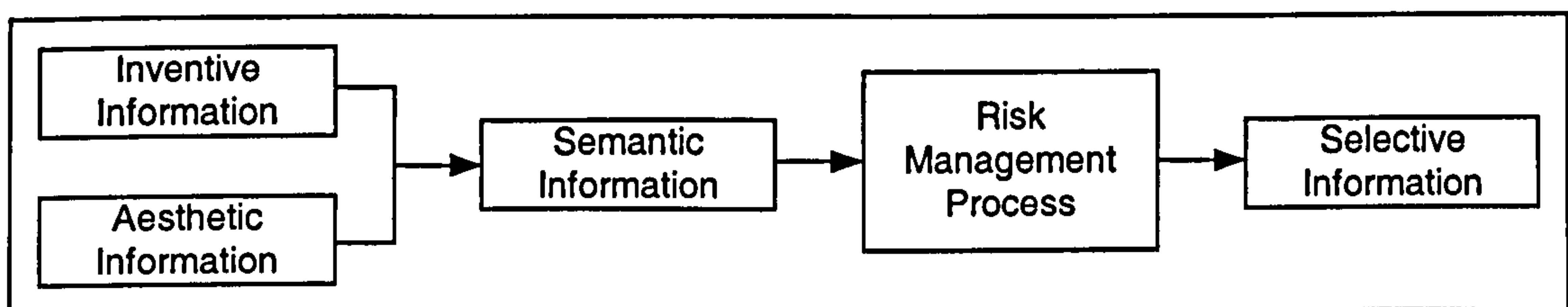


Figure 3.8. Information translation via the risk management process

The translation of semantic into selective information may be compromised by assuming that the decision-maker has undertaken a rational and objective interpretation of the entirety of the available information. This objective interpretation does not occur and it is impossible to differentiate between the subjective emotional and sensory aspects of experiential encounters with information; although that is what is often asked of rational decision-makers (Cherry, 1979). Individuals are often asked to

make decisions based upon an objective interpretation, ignoring the emotional 'evaluation' that is often made regarding a situation before any attempt is made to locate and interpret the available information. Such scenarios and situations have inspired the likes of Gleick (1987) to enquire how the human brain sorts and decodes the vast amount of information that falls upon our senses at any one time.

Cherry (1979) offers one such method for interpreting information and recognises that not all information that falls upon an individual's senses is registered as a 'signal' or something that requires them to act. Only then do individuals decide upon how best to respond, as a result of what Klir (1985) terms "... some specific measurement procedures". Therefore not all information that is registered by an individual's senses is processed as a signal. Complacency and repetition of task may de-sensitise an individual to the presence of signals, an issue that receives further discussion in chapter 4. However experience allows individuals to establish views of the world by which new environments and situations are compared and interpreted. As has previously been mentioned the reliance upon probabilistic calculations of likelihood neither recognises nor allows experiential information to participate in the calculation process.

3.8 Information Processing

The objective and rational perspective required by the risk management processes does not allow for any omission or frailty in the decision making process. Hogarth (1987) states that information perception is selective, a valid reaction to what is intrinsically an extremely complex environment. To minimise the complexity certain information is anticipated and reliant upon the physical and motivational factors at play at that particular moment. This is akin to 'categorisation theory' (Dutton & Jackson, 1987; Cantor *et al*, 1982), which forms the basis for an individual's long term memory storage of objects, people and events within a prototype set; the contents of which all conform to a given category. In its simplest form the theory states that individuals do not re-invent the world anew everyday. Instead an individual may categorise information, objects etc, and relate new experiences to the older recorded, categorised ones in an attempt to minimise the complexity of their environment and assist in their understanding of it. In order to prevent becoming overwhelmed by information the decision-maker cannot afford to recognise and take account of all the information that

is available to them. Instead they must make assumptions about the available information in order to keep pace with events as they transpire, a concept that closely resembles the theory of bounded rationality. This is again in contradiction with the structured risk management processes that rely upon frequentist statistical analysis, which necessitates that the entirety of the information relevant to the decision domain be considered and included within any analysis.

Decisions based on intuition and experiences are founded upon information contained within the individual's memory. However the use of judgement is necessary in complex situations whereby judgemental heuristics can assist in managing the information load placed upon the decision maker (Nutt, 1998). Hogarths' (1987) view is that the human memory works on past associations, reconstructing information from the past to match the demands of the present. Hogarth (1987) states that people; “.. do not possess intuitive calculators that allow them to make what one might call ‘optimal’ calculations”. However people do possess intuitive calculators that may not be calibrated to the same scale and functions between individuals, but do nonetheless offer the individual the ability to make inferences and judgements based upon the information available to them at the time. The risk management processes, whilst attempting to objectively and rationally calibrate these calculators, fail to do so because they do not control the actual communication of their output. Nor do they control the derivation of the information that constitutes their input. Consequently they provide information that is deemed objective, but which is based upon inter-subjective agreement made between group and organisational members.

3.9 Summary

The philosophical natures of risk and uncertainty have been investigated and the two have been found to be irreducible; without uncertainty there is no risk. There are however two main interpretations of risk; the subjective and the objective. The objective view sees risk as a definite article that exists in the world and can be gauged and measured. The subjective view sees risk as a possible future event whose realisation may be unwarranted.

Within the identified generic risk management processes the objective view is predominant and consequently risk is measured by combining the probability of its

occurrence and its potential impact. These risk management processes consider the nature of individual decision makers to be objective and rational; therefore the outputs of such processes are objective. Decision makers react differently to uncertainty and risk, however it is misleading to label any one individual risk seeking or averse. The decision maker reacts to the stimuli of each specific decision domain on its own merits. A contributory factor to the perception of uncertainty is the complexity associated with the individuals environment; the greater the complexity the greater the perceived uncertainty and hence the risk. Information is therefore used to minimise the complexity, and hence the uncertainty, by allowing a description of the decision environment.

The structured risk management processes rely upon distributional probability calculations whilst individuals rely upon non-distributional possibilities to communicate their subjective perspective of risk. Consequently organisations use risk management strategies to achieve objectives whilst individuals use cognitive processes to achieve desirable outcomes that are not always maximising in an economic sense. Therefore risk management has been shown to be a subjective process that relies upon the input of individual decision makers to achieve an inter-subjective interpretation, or model, of the decision environment. Consequently the structured risk management strategies, which fail to recognise or address these issues, require modification as undertaken in chapter 7.

Chapter 4 investigates the nature of individual rationality and decision-making processes, the nature of information processing that takes the form of heuristics etc, and the role that mood plays in influencing decision makers.

4 Risk and Decision-Making

4.1 Introduction

Chapter 3 showed how project management was managing the uncertainty associated with increasingly complex construction projects through bespoke risk management strategies.

The subjectivity of risk management relates not only to the individualistic nature of bespoke risk management processes but also to the qualitative methods used to identify and manage risk. An individual's willingness to live with uncertainty and their intuitive notion of risk cloud their judgement of the likelihood of potential outcomes so that often decision makers are considered irrational.

This chapter will begin by investigating risk-taking behaviour and continue to explore human rationality and the descriptive and normative theories of decision-making. The progression of the argument within this chapter identifies how risk perceptions translate into decision risk preferences and hence the need for a greater understanding of the impact of individuals and decision-making groups upon the risk management environment. The effect of group discussion upon risk preference is discussed together with its ramifications.

4.2 Rationality in Decision-Making

Conceptualising the conflicts between the predominant normative and descriptive theories of decision-making is fundamental in achieving an understanding of the conflicts within the risk management process. This conflict revolves around emotional responses to situations and the fallibility of the human mind that often render individuals incapable of deriving optimal decisions in complex environments (Diehl & Sterman, 1995).

4.2.1 Rationality

English & Allison (1993) have conceptualised human rational thought as having the two following interpretations:

- a) "...doing what is sensible, reasonable, or most beneficial to the actor, is closely related to the concept of maximisation or optimisation"; or
- b) "...a decision process in which the actor evaluates outcomes of possible courses of action and chooses amongst them".

Interpretation (a) constitutes a line of reasoning that has imposed a normative model of decision-making and encouraged the idea that rational man ought to seek to maximise economic benefit from every transaction (Kahneman & Tversky, 1984). Chater & Oaksford (2001) seek to differentiate between the rationality that allows people to achieve their goals and the 'objective', normative rationality of economics, (and structured risk management processes). They conceptualise rationality in two forms:

- c) "... thinking, speaking, reasoning, making a decision, or acting in a way that is generally reliable and efficient for achieving ones goal"; and
- d) "... thinking, speaking, reasoning, making a decision, or acting when one has a reason for what one does sanctioned by a normative theory".

Interpretation (c) may be an everyday rationality which is independent from the formal systems of rationality as demanded by the more normative theories described in interpretations (a) and (d).

4.2.2 Normative Theories of Decision Making: Economic Rationality

Normative models of human behaviour are intended to function as predictive tools for the observers of human decision-making behaviour; they pertain to show individuals as they should behave. Amongst the most prominent of the normative models is the theory of the economically rational man. This theory predicts that the individual should attempt to obtain the economic optimum form any situation without regard for their wants and desires (Shackle, 1969). This theory predicts that the decision-maker is aware of the most beneficial option available to them, can identify an exhaustive list of the beneficial and non-beneficial ramifications, eliminate all uncertainty and is left with no doubt as to the outcome should any particular decision be made. Where they are unable to do so unaided, structured processes such a risk management will facilitate such optimum decision-making. However this is not the case where desires, needs and wants of the decision-maker are considered.

Howarth (1988) comments that in some cases non-rational behaviour can be closely linked with a verbal expression of beliefs rather than the objective reality of the situation. Simon (1981) has also called this theory into question intimating that man is incapable of discerning the optimum option from any environment. Therefore when it is reported that man is incapable of utilising rational, normative cognitive processes it is likely that an everyday rationality, description 'b' or 'c', is being utilised in instances where rationality 'a' or 'd' is expected. English & Allison (1993) have shown that what is deemed 'orderly' rational behaviour can in fact be as a result of an individual's ".. random response to external constraints", a form of rationality by fortune.

However with the realisation that decision-makers consider more than simply the economic value of a decision outcome, descriptive theories of decision-making, such as bounded rationality, have gained greater favour.

4.2.3 Descriptive Theories of Decision Making: Bounded Rationality

Simon's (1957) theory of Bounded Rationality considers man incapable of evaluating the whole of the decision realm and acknowledges the following factors as determinants to the deficiency in human decision-making:

- a) decision-makers may lack knowledge of the problem definition, any available alternatives, criteria, and impact of choice upon outcome;
- b) decision-makers may have practical considerations such as time and cost constraints placed upon them that limit their ability to discern the whole;
- c) individual perceptions will produce differing opinions between individuals;
- d) individuals can only commit a finite amount of information to memory for analysis and reference; and
- e) the individuals' intelligence will limit the quality of their decision relative to the optimal decision available; should this be known.

(Bazerman, 1986)

Raferly (1999) considers bounded rationality as descriptive of an individual's indolence in their search for information. However a series of investigations by Kahneman & Tversky (1972, 1979, 1981, 1982a, 1982b, 1984) identified a series of

judgmental heuristics determined by necessity and not lethargy. Similarly Whiting (1979) considers man to be a conservative information processor by necessity. The belief that there are problems that require rational decisions is founded in the belief that an objective reality exists and has inspired the notion of the irrational decision-maker; one who fails to exhibit maximising behaviour in his decision-making (Al Jaafari, 2001). Whilst numerous examples of inexplicable decision behaviour can be found at the highest levels of decision making this has more to do with very human frailties such as ego and misplaced loyalty than to the omission of objective decision-making (Janis, 1982).

4.2.4 Mind Models

Risk management processes expect an exhaustive assessment of the decision-domain to have been executed. However the mind models theory advocated by Johnson-Laird (1983) states that when faced with a problem an individual creates a mental model of the circumstances surrounding that problem in order to identify any potential responses. According to this theory the number of mental models required to satisfy the problem provides a measure of the level of difficulty of that problem. However when the individual fails to construct counter-models of the problem the process fails to deliver the optimal solution. This process could be undertaken but is often not accomplished spontaneously by the individual possibly because decision makers often restrict themselves to constructing only one model from which an answer is derived. This in turn relegates the individual's impression that a second or third mental model is required in order to fully appreciate the problem domain. In addition prior knowledge has been shown to have a strong influence upon the comprehension of the problem domain and plays a crucial role in the development of the initial model (Harris, 1998; Tversky & Kahneman, 1982c).

4.3 Influences upon Decision Makers

Katzell *et al* (1970) identified two sources of influence upon decision-makers. Firstly 'situational parameters' that one cannot influence such as the global economy and secondly the 'dependant variables' that are open to influence such as group culture. Both the situational and dependant elements of a decision domain must be identified if influential policy is to be established to maximise the group effectiveness.

Hale (1987) provides a “tentative interpretation” of how an individual questions their relationship with the risky decision domain. The first concerns their relationship with the decision domain; “Can I influence it? Do I understand how? Do I trust the people in control? Who benefits from the situation?” The second concerns the issue of consequences; “How bad (good) would it be? How soon will I suffer (benefit) and for how long?” The terms in parenthesis have been added to supplement Hale’s (1987) ‘questions’ that originally conveyed only negative attributes; to truly encompass the issue of individual uncertainty they must also consider positive issues.

Vlek & Stallen (1980) propose three measures of perceived risk to fill the void left by the purely quantitative measures of perceived risk, as follows:

- physiological measures such as heart rate and blood pressure;
- behavioural measures such as avoidance or courting behaviour; and
- cognitive measures such as opinions of expressed possibility.

The authors believe that these measures provide a more accurate medium for comparison and communication of individual uncertainty. Katzell *et al* (1970) make distinct the situational variables that are open to influence and manipulation whilst Hale’s (1987) questioning strategy allows the individual to ascertain which situational variable falls into which of those categories. Finally Vlek & Stallen’s (1980) proposals allow the individuals perception, understanding and response to the situation to be measured. Figure 4.1 shows how the decision maker must consider the decision-macro and microenvironments and highlights the factors that influence his understanding and perception of those environments. The figure shows how the problem being considered, with or without the aid of a structured risk management process, exists within a macro environment, which includes issues mainly beyond the control of the decision-maker. The microenvironment contains those decision variables that may be perceived by the decision maker and relates directly to those possible ramifications of the decision that may or may not affect the individual. Consequently within a group environment there will be more than one decision maker operating within the microenvironment, all with their own individual perceptions of that decision environment.

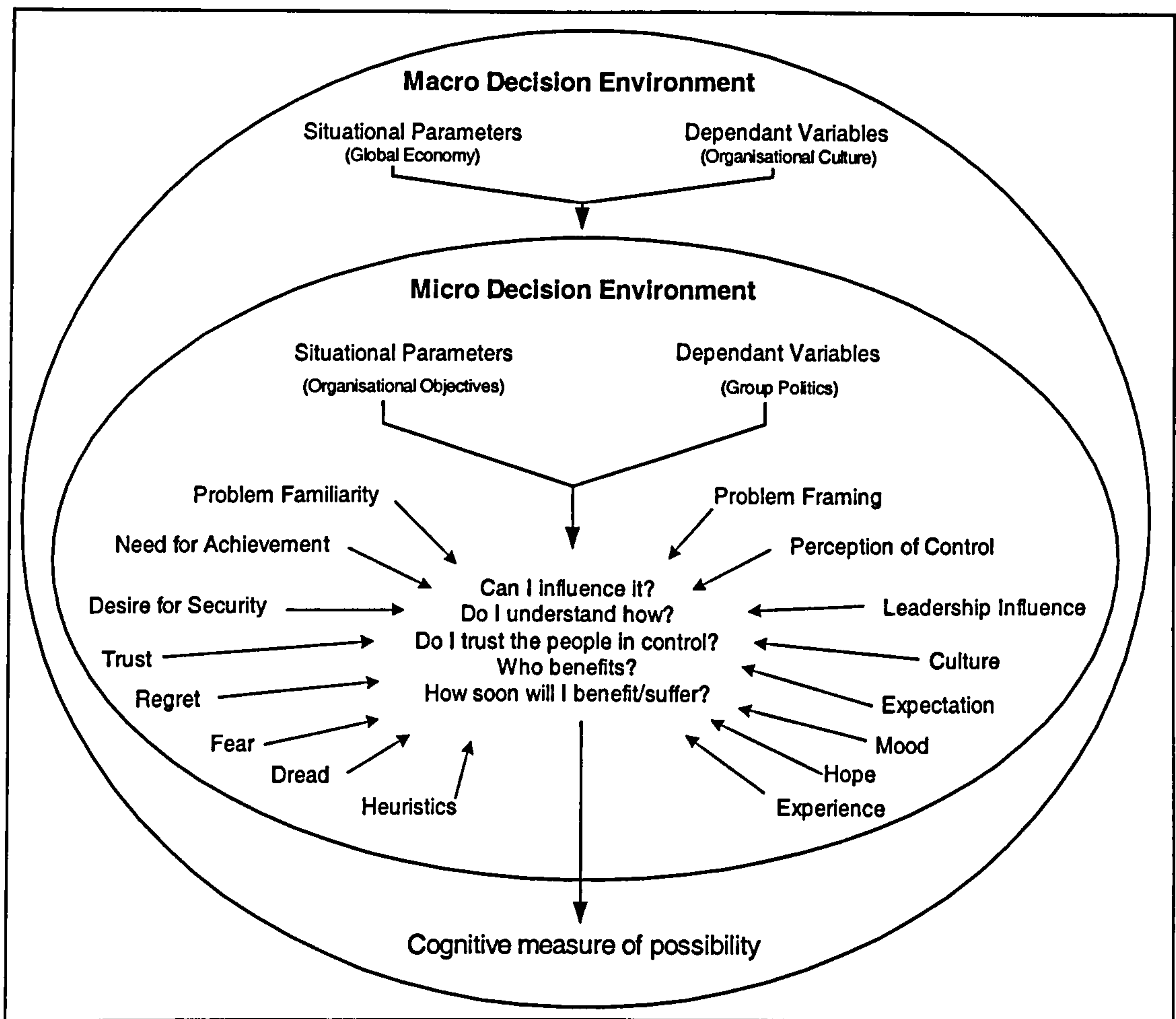


Figure 4.1. Decision environments and influential factors.

Consequently the cognitive measure of possibility may be compared across all individuals to ascertain their preferences for that decision environment. The following discussion will consider the origin and impact of those individual traits at work within the microenvironment.

Harriss (1998) postulates that all our observations are interpreted using information and experience, and therefore the interpretations are subject to influence from theories. He states that there has to be some generalization of circumstance that can be galvanized into theories that enable individuals and groups to learn and understand the nature of their environment. The nature of contemporary decision-making requires the individual to adapt to unique situations that require innovative ideas and solutions. This necessitates that the individual develop rules of thumb; or non-rational heuristics from which to develop a novel solution (Rasmussen, 1987). These heuristics are utilised by the individual to minimise the amount of information required for

consideration before a decision is made (Tversky & Kahneman, 1982a). The three generally accepted heuristics of representativeness, availability, and anchoring (Raftery, 1994) are explored below.

4.3.1 Representativeness

The representativeness heuristic is used to predict the likelihood of event 'X' occurring based upon its resemblance to event 'Y' with which the decision-maker has had prior acquaintance by discerning similarities from events and holding them as universal (Tversky & Kahneman, 1982c). This heuristic is used to group objects into similar classifications, discern the origins of events and to predict future states (Tversky & Kahneman, 1982a). There are several concerns with the use of such a judgemental tool; firstly the comparison and prediction fail to take into account the reliability of the original event. Secondly individuals often ground their assumptions with regards to perceived likelihood upon too few examples dubbed 'belief in small numbers' (Tversky & Kahneman, 1982b; Cohen, 1979). Thirdly favourable descriptions of events lead to favourable predictions of future performance (Kahneman & Tversky, 1982a) akin to the effects of problem framing. Finally individuals often fail to recognise regression to mean tendencies and when they do recognise them they in turn invent spurious causal reasoning in justification (Tversky & Kahneman, 1982a; Loewenstein & Mather, 1990).

4.3.2 Availability

The availability heuristic utilises the most memorable or recent events to base assumptions of possible future events (Tversky & Kahneman, 1982a). The saliency and familiarity of the event add to its availability, consequently the heuristic predicts the frequency of occurrence based upon the strength of association between the current and previous events (Tversky & Kahneman, 1982c). The obvious bias that availability might induce is due to the retrievability of the instance. The saliency with which the event can be recalled will determine the extent of its influence and therefore physiological symptoms will add to the vividness of the event and hence influence the subjective probability of that event reoccurring. Similarly where the individual has no prior experience of the event in question prediction of future possible occurrences is limited to the ease with which the individual can imagine the event.

4.3.3 Anchoring

The anchoring heuristic encourages individuals who start their assessment from differing premises to base their conclusions upon the limited evidence of their point of origin. Tversky & Kahneman (1982a) concluded that groups only considered the first few stages of the problem leading to biases in their answers dependant upon their starting point, a comparatively similar phenomenon to mind models (Johnson-Laird, 1983), as discussed in section 4.4.4. This phenomenon has ramifications in the arena of risk management whereby availability encourages individuals to identify possible future states by their saliency and the anchoring heuristic pre-determines courses of events based upon the event the individual originally identified. Therefore individuals who are prone to consider non-beneficial outcomes will naturally consider worse case scenarios whilst the converse is equally possible.

Munier (2001) finds that the reasoning utilised by risk managers to design risk management practices is often contained within rules of thumb that are emergent from experience and “informal conversations between the risk manager and engineers” (ibid). Consequently these rules of thumb or heuristics need constant updating to remain pertinent (Raftery, 1994). However the it is likely that the individual’s heuristics change in relation to their experience.

4.3.4 Experience and Problem Familiarity

Hale & Perusse (1978) found that individuals assess situations by creating hypothesis and then testing them. As a consequence individuals place far more importance upon information they attained through personal experience than information they received second hand. This can be attributed to the perception of experiential information as more significant and manageable in decision-making and ultimately contributes to the formulation of subjective- probabilities with regards to possible future events (Whiting, 1979). Similarly Edwards & Bowen (in print) found personal experience to be the most dominant method of identifying risks in construction project management teams.

Ellesberg's Paradox assumes a link between experience and risk preference by predicting that individuals will prefer explicit to ambiguous risks (Lopes, 1983). Therefore risks that the individual has had prior acquaintance with are likely to be

more acceptable to that individual than untried and previously un-encountered risks because of their familiarity (Howarth, 1988). Similarly March and Shapira (1992) found that individuals have a tendency to underestimate risks when they have previously experienced a positive experience with them. Consequently there have been many incidents where the outcome history and familiarity with a particular threat has given rise to complacency that has in turn led to accidents, for example Tokaimura uranium processing plant (BBC, 10/11/00) and Sellafield nuclear plant (BBC, 18/02/00). Similarly Glendon (1987) found that individuals identify and rank risks according to their experiences and personal value systems. However Beamish (2000) concluded that individuals accepted and replicated the predominant behaviour of their colleagues even when that behaviour contradicted their own belief/value systems. Roth *et al* (1996) similarly concluded that experience could lead to the suppression of emotional responses to stimuli, amounting to the evolution of coping processes within the individual.

4.3.5 Perception of Control

Langer's (1977) view is that people who feel that they have control over their environment exhibit behaviour that equips them to better handle potentially threatening situations. Predictive tools such as Monte Carlo simulators are often used to impose some perceived control over the decision domain by affording the decision maker a sense of certainty and empowerment inherent within the calculation of probabilistic outcomes that the tool provides (Greene *et al*, 2000). However it is preferable for the decision-maker to believe that they can exert control over the decision domain rather than to believe they have no control so long as the perception resembles the reality of the situation. Unfortunately decision outcomes tend to be interpreted as directly resulting from previous actions, which may lead to the confusion between the operation of skill and fortune (Langer, 1982).

4.3.6 Problem Framing

Cantor *et al* (1982) found that individuals focus their attention on the social aspects of decision domains, "on the behaviours, people, norms, and atmospherics in situations (*ibid*)". Hill (1999) found that construction managers on the same project collaborated to socially construct a perception of their working environment. They realised that

using the word 'chaos' was emotive of situation that was 'out of control' whilst terms such as disorder described a serious occurrence that could still be rectified.

Kahneman & Tversky's (1992, 1979) cumulative prospect theory is a descriptive alternative to expected utility theory, which they considered inadequate to describe risk-taking behaviour. The theory states that people normally view outcomes as gains or losses rather than final states of wealth and welfare (Van Schie & Van der Pligt, 1995). They showed that decision outcomes in terms of gains or losses were open to manipulation by numerical, written and verbal problem framing. Cumulative prospect theory predicts that when problems are framed in terms of possible gains individuals will exhibit risk-averse behaviour, and when problems are framed negatively risk-seeking behaviour will predominate as individuals seek to maintain what they have in the gain domain and to minimise their losses in the loss domain. Cumulative prospect theory clashes with the widely held concept that individuals will undertake risk-seeking behaviour in order to achieve a beneficial objective irrespective of their current position with regards to that objective (Hollenbeck *et al*, 1994; Sitkin & Pablo, 1992; Lopes, 1987).

The perception of threat and opportunity are distinct from loss and gain decision domains (Highhouse & Yuce, 1996; March & Shapira, 1987). The former is perceptual phenomena and the latter a decision-making perspective. Consequently verbal framing manipulations have a strong influence on perceptions of choice alternatives (Highhouse & Yuce, 1996).

4.3.7 Leadership Influence

Situational variables such as "group size, member personality, group traditions and culture, nature of the task, and so forth" make commentary on leadership influence and effectiveness complicated and often untenable (Katzell *et al*, 1970). Nonetheless Grey & Gordon (1978) conclude that those who rise higher within their organisation are relatively happier to live with uncertainty. However Rabow *et al* (1966) found that group leaders are less willing to take risks relative to their fellow group members. Correspondingly Hoyt & Stoner (1968) also found no direct correlation between leadership risk orientation and group decision-making.

Lamm & Kogan (1970) found that leaders are constrained by their responsibility to 'not lose face' in group discussions and are therefore more likely to arrive at a compromise. They have in a sense too much to lose whereas social values may influence decision-making only when leaders or decision-makers are free to move within the decision realm. This is similar to the position offered by Barnlund (1959) who identified a 'face saving' trend in situations where deadlock in group discussion and negotiation arose.

However, what is deemed permissible or acceptable by the subordinates will be derived directly from observed patterns of behaviour exhibited by the senior members of the project team (Clarke, 1997). Consequently observed patterns of behaviour will exert a normative effect upon other team members thus establishing a self-reinforcing and perpetuating group culture. Katzell *et al* (1970) found that leadership 'face saving' was lessened in more compatible groups intimating that group and organisational culture play an influential role in the determination of acceptable risk.

4.3.8 Cultural Values

Empirical approaches to cultural risk can take two dimensions; firstly the longitudinal approach addressing the historical aspects of risk handling such as trends of risk behaviour and attitude that exert a normative affect upon existing group members and new inductees to the groups (Beamish, 2000; Hovden & Larsson, 1987).

Hofstede (2001) defined culture as "the collective programming of the mind which distinguishes the members of one group from another". He continued to liken the affect of culture upon groups to the affect of personality on the individual, adopting Guilford's (1959) definition of an individual's personality as "the interactive aggregate of personal characteristics that influence the individual's response to the environment". The influence upon decision-making instilled by culturally established social norms encourages individuals to pre-suppose degrees of risk being encountered by viewing them through cultural filters (Douglas, 1992). Therefore culture often exerts greater persuasion over an organisation's performance than any other influence (Uher & Toakley, 1999). Therefore group culture influences group member's response to situations; furthermore those responses are not uniform across all groups. Similarly

individuals will adapt to and adopt views, opinions and behaviours that are in contrast to their own (Beamish, 2000; Loewenstein & Mather, 1990).

4.4 Motivation and Risk Acceptance

Predicting the duration and the intensity of the vigour with which an option is pursued necessitates consideration of the motivational aspects of human behaviour when considering an individual's choice amongst alternatives (Atkinson, 1957; Simon, 1967). Whilst the impact of experience, judgement heuristics and culture upon decision-making are considerable they do not encompass the entirety of the influences upon individual choice. Motivational issues such as the need for achievement and the desire for security also influence individual choice and risk preference (Lopes, 1987; Slovic, 1964), subsequently decisions are often based upon emotional responses, both anticipatory such as dread and fear and anticipated such as regret (Mellers *et al*, 1997; Loewenstein *et al*, 2001).

4.4.1 Trust, Mood and Dread

Nakayachi (1998) has concluded that trust plays the most important role in the management of risk. Therefore trust is seen as an issue in deciding risk acceptability and if one trusts the person perceived to be in control of the hazard one might be more inclined to accept it (Kealey, 1999; Hale, 1987; Singleton & Hovden, 1987).

However Langer (1982) found that in order to completely master the environment the individual must control chance events, a view that exemplifies the philosophy that underpins the use of risk management processes.

Whilst psychologists and economists observe a consequentialist interpretation of decision-making under uncertainty; i.e. people play to the perceived consequences of decisions when making them and treat feelings as epiphenomenal it is possible that an individual's feelings may make their decisions for them (Loewenstein *et al*, 2001).

Consequently hope and fear are often treated as a consequence of an action and not the drivers of action (Tversky & Fox, 1995). Dichotomously people that are in a good mood will not risk incurring a loss for fear of losing their good mood, highlighting mood as a driver behind risk incurring decisions (Isen *et al*, 1988; Mellers *et al*, 1999).

Similarly instilling a mood can manipulate an individual's risk preference and perception, i.e. instilling a 'depressive' mood will encourage a more pessimistic view of a situation (Johnson & Tversky, 1983). This intimates that individuals make judgements based upon their mood and that this influence may extend beyond those stimuli that induced the mood in the first instance. Johnson & Tversky (1983) naively acknowledge the impact this may have upon "the susceptibility of lay judgements, and the apparent lack of awareness of this effect" but fail to recognise or acknowledge the potential affect upon professionals charged with risk management. This criticism is evidenced in affect of visceral influences on decision-making. Desires such as the need to sate lust, hunger, thirst and the need for sleep influence decision-makers irrespective of their professional status and are often so intense that they preclude decision-making (Loewenstein, 1996).

Brehmer (1987) reports that cognitive risk seems to have two aspects, dread and how catastrophic the event(s) seem to be and familiarity with the risk; both of which impact upon an individual's emotional state and hence their ability to reason (Cherry, 1979). Experience provides coping mechanisms that protect the individual from the feelings of fear or dread that were experienced with the initial encounter. However individuals may not want to discuss experiences that induce dread or fear but may well recall them overeagerly because they would like to do all in their power to avoid them in the future; akin to a highly motivated fear response (Loosemore, 1998). Therefore dread exerts a strong influential factor that influences the extent to which the individual wants the risk reduced or eliminated (Brehmer, 1987).

4.4.2 Regret

Interestingly Langer (1982) found that individuals feel more confident in solving difficult problems; a legacy of this over-optimism is that the individual experiences regret when they fail to perform to their predicted level. Regret is an anticipated emotion that occurs when an actual decision outcome is less beneficial than the outcome of an alternative decision that was not chosen, or when the actual outcome is less beneficial to the decision-maker than was the pre-decision situation (Mellers *et al*, 1997; Bell, 1982). Nonetheless Mellers *et al* (1997) concluded that individuals often make decisions in an attempt to avoid the perceived worst possible decision outcome.

Bell (1985) found that decisions are not made solely to minimise the maximum level of regret associated with a decision outcome but rather to minimise the feelings of regret when preconceptions are compared against the actual results of a decision. This idea is akin to Savage's (1954, 1951) minimax principle that predicted that people aimed to minimise their maximum level of decision regret, which was criticised by Mellers *et al* (1999) because it "does poorly at describing choice". Bell (1982) concluded that axiomatic violations could be attributed to the urge in individuals to avoid personal blame for the consequences of decisions even if the decisions made were valid and based upon all the available evidence at the time of making the decision.

Hindsight may induce surprise, regret and disappointment at an outcome after a counterfactual comparison by decision-makers. Surprise is closely related to adaptation and occurs when preconceived notions of performance are shown to be unfounded (Loewenstein & Mather, 1990). Similarly individuals may experience regret because they harbour unrealistic expectations of their abilities and exaggerate their control over the environment, consequently predicting overly optimistic outcomes for their futures, (Taylor & Brown, 1988). Moreover, over-optimism increases as the time between asking for the opinion and the task increases (Heath & Jourden, 1997). Langer (1982) has attributed this behaviour to the individuals need for complete mastery of their environment. Subsequently when the actual task performance feedback arrives the individuals seek to maintain their self-esteem by making more realistic interpretations of their behaviour.

However the inclusion and management of such motivational aspects of decision-making and risk preference within structured decision-making processes remains illusive. Concepts such as expectation, regret, trust, mood and other visceral factors such as fear are intangible and not easily communicated or realised. Consequently managing such influences remains impractical and may also be unwarranted. Those factors that make individuals unique also add to the variety and scope of information generated within group discussions. Subsequently the costs of removing such traits of individuality may outweigh the benefits. However educating the decision-makers to recognise their presence and subsequently promoting self-management may reduce the impact of the irrational effects of these influences upon decision-making.

4.5 Group Decision-Making and Communication

Arguably the effects of group communication and decision-making upon the risk management process are an influential factor concerned more with the management of the process rather than the process per se. Nevertheless the structured processes do not accommodate any such managerial responses to group dynamics or acknowledge the impact that these may have. Consequently they go unmanaged and their impact unnoticed.

Whilst groups are used to achieve an inter-subjective objectivity in structured risk management processes, both groups and individuals are equally consistent in their violations of the axioms of utility theory. However groups are inclined to discuss and argue points of contention whereas individuals do not have that opportunity and therefore stimulate more careful consideration of problems leading to a consideration of a wider range of ideas and provided a “more objective and crucial testing of conclusions” (Barnlund, 1959; Bone *et al*, 1999).

Gouran & Hirokawa (1983) have found that communication impacts directly upon the performance of group decision-making. Group members are continuously moving towards a solution by a process of developing group consensus of the options indicating that groups make judgements and hence decisions by the gradual modification of ideas (Scheidel & Crowell, 1964). During group discussions members who are aware of different facts are very often unable or ineffective in communicating and integrating their unique knowledge, therefore group judgements are dominated by commonly held group knowledge (Gruenfeld *et al*, 1996). Consequently the more group members who are aware of a specific piece of information, the more likely it is that the information will be mentioned during discussions. Therefore the more informative data that is held by the minority of group members is less likely to be discussed and as a consequence has less influence. Significantly Asch (1955) has shown that some individuals are prone to influence by group pressure to the extent that they are willing to compromise or ignore their own opinions for the sake of conformity further increasing the possibility that groups will fail to realise and discuss at least some pertinent information. Nonetheless as each individual brings different values to his group, group members question one another's values that in turn encourages the group to become more objective and hence effective as a decision-making unit.

However groups still make errors when the ‘impression of universality’ becomes dominant; when “agreement becomes the criterion for correctness” (Barnlund, 1959). This is a similar observation to Janis’s (1982) ‘groupthink’ syndrome; when a group experiences high cohesiveness the members of the group “express solidarity, mutual liking, and positive feelings about attending meetings and carrying out the routine tasks of the group” (Janis, 1982). This solidarity can lead to the group over estimating its power and morality, encouraging closed mindedness to suggestions amongst group members and increasing pressures toward group uniformity. Group behaviour will then adapt to maintain the group cohesiveness that requires group members not to question their colleagues; as a consequence concurrence-seeking tendencies within the group emerge.

The preceding section has identified that groups are more effective decision makers than individuals, in general making better decisions than the most able group member. Therefore so long as the groups are insulated from becoming overly cohesive and self-supporting they will not exhibit groupthink tendencies. Bazerman (1986) has shown that groups are as open to the influences of judgment heuristics as are their members who should therefore be encouraged to bring their knowledge and experience to group discussions. Such a group environment requires strong effective leadership that is neither punitive nor dismissive.

The effectiveness of group decision-making has been accepted and encouraged in regulatory bodies, in profit and not for profit organisations. However the effects of group culture and social influence have been shown to influence the decisions of individuals to the extent that the group risk preference is greater than the average individual group member’s preference.

4.6 Risky Shift

Wallach *et al* (1962) replicated the work of Stoner (1961) confirmed the risky shift phenomenon using a twelve questions Choice Dilemma Questionnaire (CDQ); the main conclusions of their research may be summarised as follows:

- unanimous group decisions subsequent to discussion exhibit a risky shift when compared with the mean of the individuals initial pre-discussion choices;

- post discussion individual choices also exhibit this risky shift;
- the shift is exhibited in individual decisions for between two to six weeks after group discussion;
- no shift occurs over time without the prior group discussion; and
- members of the groups who are relatively risk-taking are perceived as having influenced the group decisions.

A replication of the CDQ and a replication of the Wallach *et al* (1962) study is undertaken in chapter 5.

4.6.1 Diffusion of Responsibility Hypothesis

Wallach *et al* (1964) proposed that group decision-making introduced a diffusion of responsibility together with pressure towards consensus that acted as the key mechanism for causing the risky shift. The authors concluded that group decision to consensus firstly encourages the group to err on the side of the risky and secondly enables the group representative to feel removed from the decision and therefore blame free in the event of negative consequences. However Vinokur (1971) points out that the evidence supporting the ‘diffusion..’ theory also promotes a dichotomous hypothesis; the ‘assuming of responsibility hypothesis’. This hypothesis predicts that individuals will take greater risks in order to show that they are willing to take responsibility for their decisions to achieve a leadership position whilst also receiving the accolade for the success of the decision-making group. Clark (1971) and Vinokur (1971) determined that there was insufficient evidence to distinguish between the ‘diffusion’ and the ‘assuming’ hypothesis as the preponderant cause of the phenomenon.

Moscovich & Zanoloni (1969) state that individuals are not likely to place themselves in the ‘extremities’ of group opinion, that they prefer to blend and to conform to the average, and also that groups tend to aggregate their responses to the average of the individual responses. The authors criticise Kogan & Wallach’s (1967) assertion that group members ‘bond to a common fate by discussion’ as a tentative assertion which loses its plausibility after the experiments of Bateson (1966) and Flanders & Thistlethwaite (1967) concluding that “responsibility diffusion cannot be a convincing interpretation of risky shift”. The authors prefer the suggestion that the

shift occurs as the individuals considering the problem domain immerse themselves within it and achieve greater commitment thereby postulating that the risky shift is achieved through this normative commitment. Cecil *et al* (1970) concluded that group pressure might account for the risky and conservative shifts found in decision-making groups.

Bem *et al* (1965) sought to extend the generalisation of the 'diffusion' hypothesis for risky shifts in group decision-making to scenarios where the negative consequences of decisions were emphasised. An alternative hypothesis that higher risk takers have greater social significance was discounted by the fact that threat of public exposure of individual preferences was found to result in lower risk taking preferences.

4.6.2 Risk-is-a-Value

Teger & Pruitt (1967) found that there was sufficient reason to doubt the 'diffusion' hypothesis and instead favour the 'risk-is-a-value' hypothesis as offered by Brown (1965). The 'value' theory (Clark & Crockett, 1971) states that there are ideal risk-taking levels, dependent upon the situation, as preferred by a society and its culture. Risk-taking is perceived as socially desirable and each individual would like to think that they emulate that risk-taking position in their decision-making. However when the conservative decision-maker finds that they are somewhat off the group average they alter their position to bring themselves more into line with the socially desired position (Willems, 1969; Levinger & Schneider, 1969). Wallach & Wing (1968) also argue persuasively in favour that risk-taking is culturally more favourable than conservatism whilst also stating that perceptions seem to gravitate towards cultural values. However two of the questions in the 12 CDQ produced a conservative shift in decision-making; this is accounted for in the risk-is-a-value hypothesis by the assumption that society dictates levels of risk in a situational context (Brown, 1965). Stoner (1968) used a CDQ with four questions designed to elicit a cautious shift and concluded that a predominance of cautious attitudes amongst group members would inflict a cautious shift and vice versa favouring the 'value' hypothesis as an explanation for the results of this survey.

4.6.3 Familiarisation

Bateson (1966) offers a cognitive explanation for the risky shift by postulating that the individuals initially more cautious response could be accounted for by their instinct to 'err on the side of caution' until they have more information. However this may be possible in instances where the problem is perceived as complex or offers many possible outcomes. Subsequently acquaintance with the problem and familiarisation via information gathering will allow a more unified decision to be made. However Teger *et al* (1970) concluded that the magnitude of the risky shift after candidate familiarisation with the problem was not consistent enough within their own study to justify its relevance, nonetheless the authors acknowledged that familiarisation has in some instances caused a risky shift. Flanders & Thistlethwaite (1967) also failed to replicate the results of Bateson's (1966) study. Subsequently the weight of the evidence against the 'familiarisation' theory indicates that the risky shift phenomenon is subject of a group process (Vinokur, 1971; Teger *et al*, 1970).

4.6.4 Information Exchange

Brown (1965) noted that as a consequence of the 'value' hypothesis two epiphenomena would have to be present. Firstly decision-makers would have to believe that they were more risk seeking than their counterparts. Secondly for the cultural influence to operate the cultural value of risk-taking must necessitate conversation, flow of information and argument formulation in favour of the position with the greater inherent uncertainty. Brown (1965) termed this the 'information exchange' hypothesis. Kogan & Wallach (1967) and Lamm (1967) replicated Browns' (1965) study conditions and concluded that the information exchange hypothesis did not generate such a significant shift to warrant the hypothesis being deemed the dominant cause.

Madaras & Bem (1968) found that knowledge of fellow group member's relative risk positions, garnered without inter-group discussion, was not sufficient for the shift to arise. However the authors found that the inter-group discussion did bring more pertinent information to light and subsequently they concluded that comparison between the relative positions of each participant was not the cause (the 'value' hypothesis), but the information highlighted as a result of the discussion did result in the shift (the information exchange' hypothesis). The previous theories of 'risk-is-a-

value' and 'information exchange' offer 'affective' explanations for the shift caused by the social influences highlighted as a consequence of the comparison of group member's relative positions.

4.6.5 Leadership

The 'leadership hypothesis' states that risk-takers are viewed by other group members to be leaders and more verbally dominant and persuasive during discussions than other less risk seeking group members (Collins & Guetzkow, 1964; Marquis, 1962).

However Lamm & Kogan (1970) state that leaders are constrained by their responsibility to 'not loose face' in discussions and are therefore more likely to arrive at a compromise than to shift in a risky direction.

This poses the strongest threat to the generality and relevance of the risky shift to decision-making groups where status amongst group members is unequal. Lamm & Kogan (1970) concluded that leaders have too much to loose, therefore social values may influence a risky shift only when leaders or decision-makers are free to move within the decision realm. Subsequently Vinokur (1971) concludes that the 'leadership' hypothesis may be "safely discarded".

4.6.6 Individual Influence

A series of investigations by Rim (1963, 1964a, 1964b, 1965, 1966a & 1966b) reported that the disproportionate risk-taking individual, in group terms, will be an extrovert, have a high need for achievement and be tolerant of ambiguity. The risk-takers theoretical, economic and political interests will be high on their agenda as will their interpersonal values of leadership and recognition; they will be good at manipulating interpersonal relations and be inwardly directed. However this investigation would offer little to explain the risky shift *per se* as Rabow *et al* (1966) and Wallach *et al* (1968) found that persuasiveness and popularity are independent of risk-taking behaviour. They found that the risky shift in male groups "does not derive any degree from exertion of greater general persuasive power by high risk takers" (ibid).

4.6.7 Influence of Instructions

Clark & Willems (1969) and Willems & Clark (1969) concluded that is the preponderance of the instructions offered to candidates taking the 12 CDQ that

actually encourages a risky shift by highlighting the need to “indicate the lowest probability of success they would accept before recommending the potentially more rewarding but riskier option” Wallach *et al* (1962). Clark & Willems (1969) found that when neutral instructions were used instead of the standard instructions no risky shift occurred. However Wallach and Mabli (1970) state that Clark & Willem’s (1969) instructions are ambiguous rather than neutral and as a result lead to an overall conservative view in the group to dominate.

4.6.8 Group Size

Bateson (1966) predicted that as group size increases so should the factor of the risky shift as the group would be increasingly likely to hold at least one person who is going to be able to sway the group in the risky direction. Similarly he states that the longer the group remains together the larger the shift accounted for by the closer affiliation of group members. Similarly prior association may weaken the risky shift phenomena by allowing status systems to be built that would predetermine individual relationships.

4.6.9 Further Considerations

The presence of incentives has been shown to have no impact on choices made by subjects (Beattie & Loomes, 1997) as displayed by Wallach *et al*’s (1964) results when they introduced real losses and gains into the decision-making whilst utilising the same CDQ. Pruitt & Teger (1969) established that a group shift towards risk was manifest when betting was considered. They also established a positive relationship between group cohesiveness and the extent of a risky shift. However the authors highlighted the need for group communication for the shift to occur as group cohesiveness alone would not produce the shift effect. Wallach *et al* (1965) found that group members can recognise the effect of the group discussion process on individual choice preferences irrespective of whether it produces a cautious or risky shift. This encourages the conclusion that the influential individual may be able to increase their impact as they are aware and, as Rim (1966 a) has established, harbour Machiavellian tendencies.

In conclusion Lamm & Kogan (1970) have shown that the ‘value’ hypothesis is the most generic in its application as a causal mechanism but only in groups of equal status. Douglas & Wildavsky (1982) have since argued favourably for a cultural

theory of risk-taking, however Vinokur (1971); Clark (1971) and Wallach and Mabli (1970) claim that the mechanism causing the shift is included within the information exchange hypothesis and much less to do with the comparison of choices as vindicated by the 'value' hypothesis.

Consequently the decision-making groups that populate the structured risk management strategies are prone to the risky-shift effect. However no study has ever been undertaken to establish its relevance to construction management decision-making groups. Therefore to establish whether this phenomenon is a valid concern for construction management a replication of the Wallach *et al*, (1962) test was undertaken as reported in chapter 5.

4.7 Summary

Individual decision makers often fail to exhibit rational decision-making because they are influenced by emotional factors such as dread, fear and hope together with other visceral factors such as hunger and thirst. These influences combine with learned responses to the environment such as heuristics, cultural responses and problem familiarity etc. They aid to further distinguish between normative theories of rational, objective decision-making, as exemplified by structured risk management strategies, and the descriptive theories that reflect the subjective, and non-rational decision-making behaviour of individuals.

Similarly risk management relies upon group input to the process. However a phenomenon, which indicates, that groups may be magnifying the effect of these differences in perception and decision-making preferences remains unnoticed by construction management research. Therefore chapter 5 undertakes a replication of the Wallach *et al*, (1962) study with two primary aims; firstly to identify the impact, if any, of the risky shift phenomenon. Secondly, to provide a model of the decision-making environment in construction risk management that may be compared with the data generated by the case study in chapter 6, to provide an improved risk management process; reported and discussed in chapter 7.

5.0 Group Effect upon Individual Decision-Making Preferences

5.1 Introduction

This chapter describes a replication of the Wallach *et al* (1962) study using the original Choice Dilemma Questionnaire (CDQ). The chapter also outlines the method adopted to implement the current study and examines the results obtained from construction project management decision-making groups together with the analytical statistical tools used. This chapter concludes with recommendations regarding the application of the risk prism and the effects of the risky shift phenomenon upon project management decision-making.

5.2 Discussion

The Wallach *et al*, (1962) study assumes that whilst the questions used within the CDQ are only an approximation of potential 'real life' scenarios they are a close enough approximation to establish the observed phenomena as 'real'. Consequently the CDQ, the subsequent analysis of data and the establishment of the risky shift as a 'real' phenomenon indicate that the original study was very much a positivist approach to identifying and discussing psychological phenomena. Ostensibly, therefore, there is a contradiction in its use to establish an individual perception of risk, which has been argued throughout this thesis, is a subjective phenomenon, and one that cannot be probabilistically quantified.

However, as has been argued within the methodology chapter of this dissertation, the CDQ provides a model of a phenomenon, which will subsequently be tested against the reality of a risk management group discussion in chapter 6. Accordingly the choice of 1 through 10 out of 10 options are interpreted in this thesis to convey subjective non-distributional possibilities of likelihood and not distributional probabilities of occurrence as was considered with all of the previous tests using the CDQ. This notion is founded upon the premise that individuals neither identify nor utilise probabilistic interpretations of risk. Instead they prefer to use linguistic constructs, see chapter 6. Consequently when the groups are discussing their relevant positions with regards to a particular scenario they are reverting to a linguistic interpretation of the

non-distributional possibility that has been transcribed on the CDQ as a numerical expression. This effect can be seen at work in chapter six and is discussed at greater length in chapter 7.

Similarly the questions utilised within the CDQ relate to life style scenarios and not occupation specific scenarios. There are two primary reasons why this will not infringe upon the generalisation of the findings to occupation related behaviour. Firstly it has been argued earlier in this dissertation that there is no difference between the deliberation processes of professionals and non-professionals. Similarly both groups are subject to the previously discussed influences of mood, culture, heuristics etc. Therefore the questions should elicit the same deliberation processes as would be used in any problem deliberation environment.

However it cannot be ignored that the Wallach *et al* (1962) CDQ attempts to objectively record risk, which as has been argued throughout this dissertation, is a subjective phenomenon. Consequently the contradiction in its use may prove to be irreconcilable and therefore the weakness of the CDQ in distinguishing this phenomenon amongst individuals must be borne in mind and will remain a limitation of this research.

5.3 Replication of the Study

Wallach *et al* (1962) and all the prior studies covered in the review have treated the measures used in the CDQ as distributional probabilities expressed by the participants. However individuals are more inclined to express perceived possibilities, as discussed in chapter 3. Consequently were more than one option presented per scenario the participants would have had to assign distributional probabilities when non-distributional possibilities are desired. Therefore the results of prior studies using the CDQ may be more easily explained by considering the nature of the perceived possibility of each scenario as opposed to the probability. This implies that although the values assigned to each option increase after a group discussion they do so not because they are seen as more probable but because they are seen as having an increased possibility of occurrence. Consequently the group members do not consider that there will be more occurrences of that option in the next one hundred scenarios but they do consider that the possibility of occurrence has increased.

5.3.1 Hypothesis and Null Hypothesis

The hypotheses relevant to the present study are:

H1 Group discussion to consensus has the effect of changing pre-discussion individual preferences of construction project management professionals towards uncertainty.

If hypothesis H1 is shown to be valid then the following hypotheses will be tested:

H2 The project management group preference will exhibit a willingness to accept greater uncertainty than the individual pre-discussion preference.

H3 The group discussion to consensus will encourage individual post-discussion preferences to exhibit a similar increased willingness to accept greater uncertainty than the pre-discussion individual preference.

H4 The group discussion to consensus will continue to affect the individual preference of project management group members for up to six weeks after the group discussion.

The null hypothesis is therefore:

H0 Group discussion to consensus has no effect on the pre-discussion individual decision-making preferences of construction project management professionals.

5.3.2 Method

For clarity figure 5.1 illustrates the basic sequence of testing, the terminology used to refer to these stages and the statistical tests utilised to analyse the data that were used by Wallach *et al* (1962) and by the present study.

The CDQ used in this research was the published version of the original Wallach *et al* (1962) study. However the published questionnaire did not replicate the CDQ in the format in which it was utilised in the original study. Therefore the present study

developed the published version to ascertain the most effective way of presenting the CDQ in a controlled test environment.

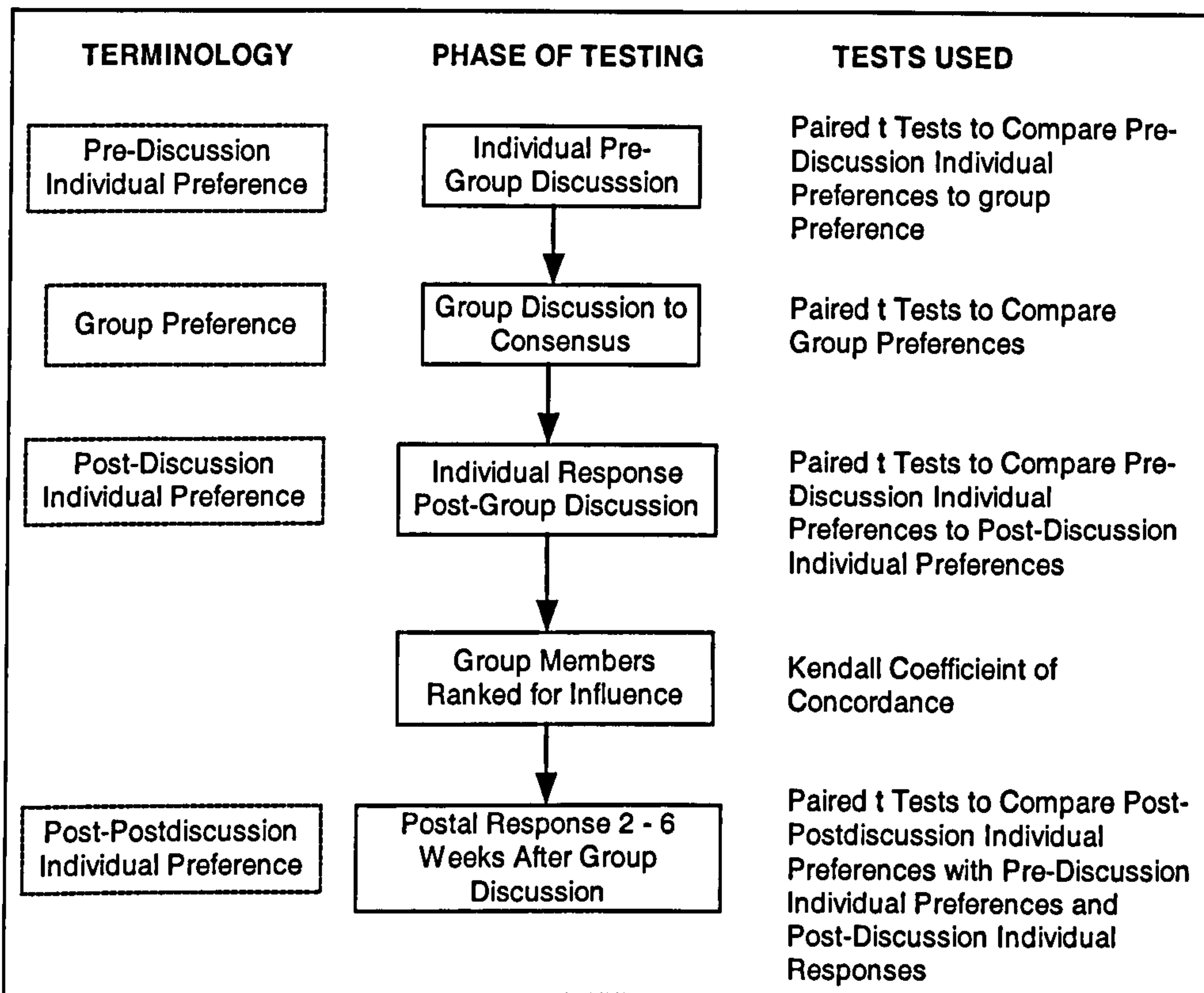


Figure 5.1. Terminology, method and statistical tests used

5.4. Validating the Wallach et al (1962) CDQ

The questionnaire was presented to research students working within the department of Civil and Building Engineering at Loughborough University. They were questioned to ascertain their impressions and criticism of the questionnaire. Comments were most often received relating to the actual instructions to candidates, to the effect that they lacked clarity.

Questioning of the candidates highlighted that the instruction to choose the option that expressed 'the lowest probability of success they would accept' was confused with highlighting an option that the candidates thought most accurately reflected the most probable outcome of the scenario. Secondly, some candidates had found it difficult to comprehend the probability options expressed numerically. To overcome this difficulty the choice options were represented graphically in the form of a pie chart and also numerically. Question 1 taken from the CDQ used in the present study is shown in figure 5.2. The questionnaire was then presented to a different set of research

students together with the original set and their reactions gauged. The revised questionnaire was judged to have been better understood by comparing the research student's initial comments with replies to post-consideration questioning.

As with the original Wallach *et al* (1962) questionnaire the choice options were arranged in numerical ascending and then descending order for subsequent questions. This design element of the original study was intended to counteract any potential probability choice order preference on the part of the candidates.

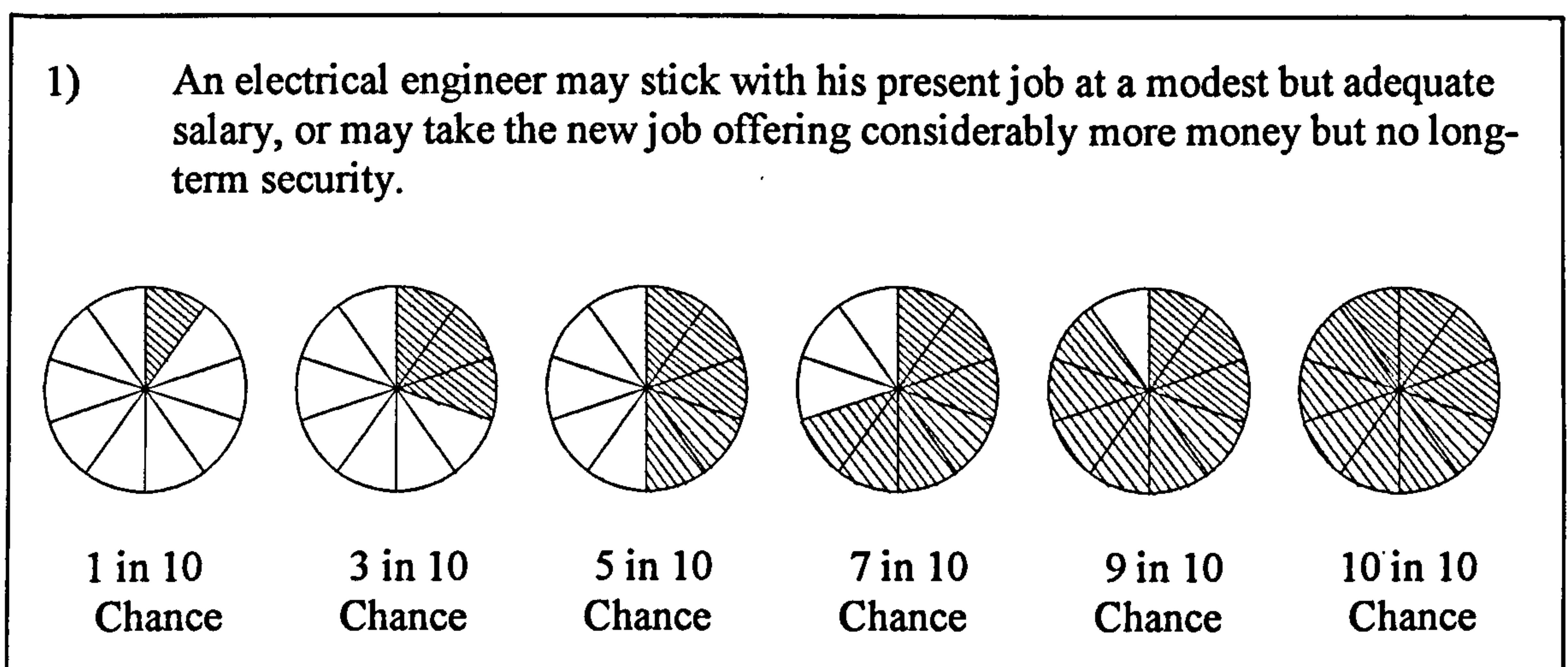


Figure 5.2. Question one taken from the developed CDQ utilised in the present study

5.4.1 Questionnaire Pilot testing

To avoid implementing the questionnaire 'blind', pre-testing was run on three groups of five university research students from the department of Civil and Building Engineering at Loughborough University. The students in these groups had not been included in those who had been canvassed for comments upon the questionnaire during its development. Each of these test groups was tested independently of the others over a period of one week. The candidates, no more than five at any one time, sat the test individually and were instructed not to discuss questions with each other.

The candidates were asked to indicate the lowest probability of success they would accept for each scenario before recommending the potentially more rewarding but riskier option detailed within the scenarios. The probabilities are listed as a 1, 3, 5, 7, or 9 out of 10 chance of success. If the candidates would not choose the riskiest alternative, no matter what the chances of success, they were instructed to choose the

10 out of 10 option indicating that only outcome certainty would be acceptable for this particular scenario.

The conditions and instructions of the Wallach *et al* (1962) study were adhered to as closely as possible during the pilot testing. They were:

1. The central person in each situation must choose between two courses of action, one of which is more risky than the other but also more rewarding if successful.

For each situation you should indicate the lowest probability of success you would accept before recommending that the potentially more rewarding option be chosen.

2. The more risky alternative is always assumed to be more desirable than the safer course if proven successful.

The odds which you select for each scenario should reflect the lowest odds you would be willing to take and still advise the central figure to give the risky alternative a try.

3. There is no time limit. You should consider each scenario carefully, and you may return to an earlier scenario if necessary.

When all the candidates had completed the test individually they were told that they had sat through an initial run to allow them to become accustomed to the test procedure. They were then organised into one group of five and asked to re-sit the same test, this time with the following instructions:

4. This is the same questionnaire you have just completed.

You completed it the first time around to familiarise yourself with the questionnaire and to give yourself some idea of where you stand on each situation.

5. I would now like you as a group to discuss each scenario again and arrive at a unanimous decision for each. This time you may not return to an earlier scenario.
6. When you have arrived at a unanimous group decision please mark that decision on each of your sheets.

The groups were then sent into different rooms to complete the test, each group with an observer to ensure compliance with the instructions. If a group struggled to reach consensus and asked for the intervention of the observer the following standard instructions were read to that group:

Most groups are able to come to some decision if those who disagree will restate their reasons, and if the problem is re-read carefully.

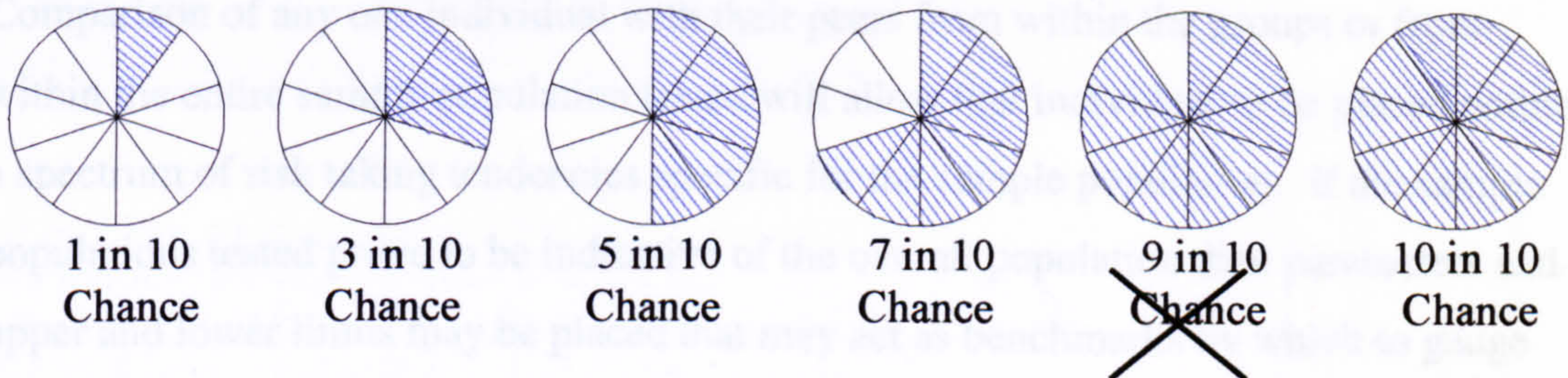
Upon arriving at a group consensus for any one question the candidates were asked to record their own post-discussion preference if they had not agreed with the group preference. These post-discussion individual preferences were recorded on the same questionnaire they had recorded the group preference. Once the questionnaire had been completed the candidates were individually separated from the group and asked to rank their fellow group members in respect of their influence upon the group decision-making process. A score of one was to be awarded to the candidate who had most influenced the group and the remaining other group members were ranked in ascending numerical order in respect of their influence.

The final stage of the Wallach *et al* (1962) study was to re-administer the CDQ to candidates up to six weeks after the group discussion had taken place. It was deemed unnecessary to replicate this element of the original study for the pilot study.

5.4.2 Further Development

Discussion and comments received from the candidates involved in the first pilot test revealed that nearly all candidates had misunderstood the test instructions. In all instances of misunderstanding the candidate confused the instruction to indicate 'the lowest possible probability' with their choice of how successful they thought the riskiest option would be. To counteract this an example question was included with the instructions to the candidates, shown in figure 5.3. The example question was not one of the scenarios included in the original study and had been written specifically for the present study. In the subsequent two pilot test group studies and the industrial studies the candidates were talked through the example question on a flip chart once they had read the instructions to candidates included on the cover of each questionnaire.

- a) A house requiring underpinning may be purchased at a reduced rate well below market level. If the underpinning is successful the house could be sold at a substantial profit, however the structural engineer cannot guarantee the success of the underpinning procedure.



In this example Adam required evidence to assert the probability that the underpinning would be successful nine times out of ten before advising that the riskier option of buying the property be adopted.

Figure 5.3. Example question from the developed CDQ utilised in the present study

5.4.3 Industry Testing

For the purposes of this research two, three-day residential risk management workshops hosted by an international construction company were utilised. Between fourteen and seventeen people attended each workshop, all of whom were employed by the same organisation, had professional backgrounds in a construction discipline but who worked in different geographical of the United Kingdom.

The testing was undertaken at the end of the first day of the workshops. In total forty-two individuals were tested comprising five groups in three separate workshops. This study followed the same instructions and manner of implementation as was utilised by Wallach *et al* (1962) that were also used for the pilot testing of the questionnaire. A copy of the CDQ used to execute this research is included in appendix 'A'.

5.4.4 Interpreting the Results

The preferences expressed by the candidates to the individual questions are scored from one to ten. The lower the score the lower the '*probability of success they accept..*' and the higher the uncertainty regarding the achievement of the desired objective. It is assumed that those individuals who are 'risk-seekers' are those who are happiest to live with uncertainty and will therefore score the lowest. The converse is true for 'risk-averse' individuals. By presenting the candidates with a selection of life style scenarios a broader measure of their risk taking tendencies may be achieved.

Therefore a risky-shift occurs when an individual is happier to live with greater uncertainty than they were previously. In the instance of the present study a risky-shift is shown to have occurred when the mean of the sum of the group pre-discussion individual preferences is higher than the group preference.

Comparison of any one individual with their peers from within the groups or from within the entire sample population tested will allow that individual to be placed within a spectrum of risk taking tendencies specific for the sample population. If the sample populations tested prove to be indicative of the overall population then parameters and upper and lower limits may be placed that may act as benchmarks by which to gauge subsequent candidates who complete the CDQ.

5.5 Analysis

The analysis of the data seeks to test the four hypotheses H1, H2, H3, H4 and the null hypothesis H0 based upon the findings of the present study. The results are then compared with the Wallach *et al* (1962) study. To test these hypotheses a one-tailed, paired *t* test has been employed to substantiate the validity of any difference between the individual and group preference means after each phase of the study (Wright, 1998). Wallach *et al* (1962) used the one-tailed, paired *t* test in the original study.

A complete transcription of the statistical analysis is included in appendix 'B' of this thesis. Comparisons between the present and original studies are summarised below.

5.5.1 Wallach *et al* (1962) results

Wallach *et al* (1962) tested one hundred and sixty seven individuals in the course of their study, all of whom were liberal art students enrolled in summer sessions at the University of Colorado at Boulder. They comprised fourteen all male groups with six members in each and fourteen all-female groups again with six members in each, none of whom were previously acquainted. The present study will only concern its self with the results obtained by Wallach *et al* (*ibid*) for the male groups, as all but one of the forty-two subjects in the present study was male.

The means of the pre-discussion individual preferences for all six members of the groups were calculated for each of the twelve individual questions and also for the complete CDQ. These means were then subtracted from the group preferences for

each of the fourteen groups. The differences between mean pre-discussion individual preferences and group preferences were totalled for the fourteen groups and the mean of this answer obtained tested for significance using a one-tailed *t* test. Table 5.1 shows the results obtained by Wallach *et al* (ibid) for the fourteen all male groups.

Item	Mean difference	Number of groups	t
All combined	- 9.4	14	6.46 p < 0.001
1	- 1.0	14	4.34 p < 0.001
2	- 0.2	14	<1.00
3	- 1.1	13*	2.19 p < 0.05
4	- 1.8	13*	6.18 p < 0.001
5	+ 0.1	13*	<1.00
6	- 1.2	13*	3.35 p < 0.01
7	-2.0	14	9.64 p < 0.001
8	- 1.1	14	1.97
9	- 1.0	10*	3.67 p < 0.01
10	- 0.4	13*	<1.00
11	- 1.1	12*	4.37 p < 0.005
12	+ 0.8	11*	2.34 p < 0.05

*When a number of groups in table 5.1 is shown as less than fourteen it signifies that a group reached a deadlock on that particular question and were unable to arrive at a decision. A negative score in the 'mean difference' category indicates a risky shift whilst a positive score signifies a cautious shift (Wallach *et al*, 1962).

Table 5.1. Table showing the significance of the difference between the pre-discussion individual preference and group preference (Wallach *et al*, 1962)

The results obtained for the overall questionnaire by Wallach *et al* (1962) strongly indicate that for their fourteen all male groups, group discussion to consensus has the effect of encouraging individuals to choose options which offer less certainty of achieving desired outcomes than they had previously chosen as individuals, termed the 'risky shift'.

This risky shift effect is exhibited over ten of the twelve CDQ questions with only question 5 and 12 exhibiting a cautious shift. The authors suggest that this cautious shift is evidence that questions five and twelve are "impure measures of the psychological dimension being tapped by the other ten items" (Wallach *et al*. ibid).

Even considering the cautious shift exhibited by questions 5 and 12 the risky shift is still evident when the questionnaire is considered in its entirety.

5.5.2 The Present Study

The present study tested forty-two industrialists currently employed by the same parent organisation in the construction industry. Of the forty-two subjects tested only one was female. The male to female constitution of the sample should not be considered unrepresentative when the demographics of the construction industry are considered.

The attendees were seated around a horseshoe-shaped arrangement of tables with no seating spaces between one another. This may give rise to reservations regarding the comparison of answers between candidates in the individual pre-group discussion stage of the experiment however none was observed. Upon completion of the questionnaire the attendees remained quiet and seated until the last person had finished and the papers had been collected. This behaviour ensured that no candidate felt rushed to complete the questionnaire.

In the Wallach *et al* (1962) study the researchers ensured that none of the group members were previously acquainted. Throughout the course of the present study it became apparent that some of the group members had previous acquaintance through their employment. Because the subjects were all invited by their employer to partake in a professional development workshop, and also because there were only enough attendees to constitute two groups, it was impossible to distinguish between those individuals who may have had prior working acquaintance with one another.

Therefore group composition was achieved by choosing individuals by their alternate seating arrangement around the table.

5.5.3 Industrial Groups Comparison – Hypotheses H1, H2 and H0

In the present study the overall questionnaire results substantiate the risky shift theory stating that the group effect on the individual is such that the individual will be more inclined to live with increased uncertainty. In the present study the mean difference in the 'all combined' category is -9.2 a very similar result to that obtained by Wallach *et al* (1962) study of -9.4 . In the present study the t value of 5.23 expresses a confidence at the $p < 0.01$ level.

For the individual questions the results between the two studies are slightly different. Whilst the present study shows cautious shifts on questions 5 and 12, it also shows a cautious shift on question 8. The mean difference of + 0.8 on question 8 is however not a strong shift which results in a t score of $t = 0.17$, $p > 0.20$ and therefore lacks statistical significance.

Question 5 in the present study shows evidence of a remarkably stronger cautious shift than did the Wallach *et al* (1962) study; mean differences of +0.1 and +4.2 respectively. The results for question 12 in the present study also show a stronger cautious shift than in the Wallach *et al* (*ibid.*) study, mean differences of +0.8 and +1.4 respectively. Table 5.2 shows the results obtained from the testing of five groups.

Item	Mean difference	Number of groups	t
All combined	-9.2	5	5.23 $p < 0.01$
1	- 0.1	5	0.04 $p > 0.20$
2	- 0.3	5	0.13 $p > 0.20$
3	- 2.7	5	0.34 $p > 0.20$
4	- 2.2	5	0.31 $p > 0.20$
5	+4.2	5	0.30 $p > 0.20$
6	- 1.3	5	0.21 $p > 0.20$
7	- 1.7	5	0.34 $p > 0.20$
8	+ 0.8	5	0.17 $p > 0.20$
9	- 1.7	5	0.21 $p > 0.20$
10	- 1.1	5	0.23 $p > 0.20$
11	- 1.1	5	0.33 $p > 0.20$
12	+ 1.4	5	0.48 $p > 0.20$

None of the industrial groups achieved deadlock in their consideration of any of the questions in the present study.

Table 5.2. Table showing the significance of the difference between the pre-discussion individual preference and group preference for the present study

The remaining nine questions show mean differences similar to the Wallach *et al* (1962) study however, because of the smaller sample size used in the present study the independent evidence they provide is not strong enough to assert the validity of the questions as a true test or validation of the risky shift effect. However when compared with the Wallach *et al* (1962) results the similarity between the two studies is sufficient

to conclude that the results concur. The risky-shift effect has been shown to influence decision-making groups comprising construction professionals.

5.5.4 Pre-Discussion Individual & Post-Discussion Individual Preference Comparison – Hypothesis H3

Wallach *et al* (1962) tested the mean score of their respondent's pre-discussion individual preference against their post-discussion individual mean preference for the complete questionnaire and for individual questions. The results were then tested for significance using a one-tailed *t* test. The instructions to candidates were to indicate their individual answer if they were not in complete agreement with the group consensus of opinion. The Wallach *et al* (1962) results are recorded in table 5.3 below.

Item	Mean difference	Number of groups	t
All combined	- 10.4	14	9.12 p < 0.001
1	- 1.0	14	4.32 p < 0.001
2	- 0.6	14	2.87 p < 0.20
3	- 1.1	14	3.04 p < 0.01
4	- 1.7	14	8.14 p < 0.001
5	+0.1	14	<1.00
6	- 1.1	14	3.79 p < 0.005
7	- 1.8	14	7.80 p < 0.001
8	- 1.1	14	3.54 p < 0.005
9	- 1.1	14	3.99 p < 0.005
10	- 0.3	14	<1.00
11	- 0.8	14	4.36 p < 0.001
12	+ 0.1	14	<1.00

Table 5.3. Table showing the significance of the difference between the pre-discussion individual preference and post-discussion individual preference (Wallach *et al* 1962)

The pre-discussion and post-discussion individual preference comparisons for the present study are shown in Table 5.4. A one-tailed *t* test was used to test for significance of difference in preference. Again the score for the complete questionnaire shows that the shift is significant beyond the $p < 0.01$. However questions 1, 2, 5, and 6 indicate no significant shift whilst questions 8 and 12 indicate shifts in the cautious direction replicating the results obtained for the pre-discussion individual preference comparison with group preference for the present study.

The results obtained for questions 5 and 12 replicate the results obtained in the original Wallach *et al* (1962) test which found that these two questions showed no indication of sharing the “general shift towards greater risk taking found for both sexes” (ibid).

Item	Mean Difference	Number of Groups	t
All combined	- 7.44	5	3.81 p < 0.01
1	- 0.36	5	0.67 p > 0.20
2	- 0.57	5	0.92 p > 0.20
3	- 1.83	5	3.63 p < 0.05
4	- 1.51	5	1.86 p < 0.1
5	+0.02	5	- 0.05 <
6	- 0.61	5	0.81 p > 0.20
7	- 1.47	5	2.46 p < 0.05
8	- 0.55	5	- 1.06
9	- 1.44	5	2.36 p < 0.05
10	- 0.6	5	0.98 p < 0.20
11	- 0.53	5	1.03 p < 0.20
12	+ 1.19	5	-2.68

Table 5.4. Table showing the significance of the difference between the pre-discussion individual preference and post-discussion individual preference for the present study

The results obtained by the present study indicate that group discussion process affects private attitudes as well as affecting the publicly expressed opinion evident in the group discussion to consensus preference. These findings concur with the results and conclusions obtained by the Wallach *et al* (1962) study.

5.5.5 Perceived Influence within the Group

Wallach *et al* (1962) used the Kendall Coefficient of Concordance (KCC) to ascertain the level of consistency between the group members ranking of their peers with regards to their influence upon the group decision-making process. The KCC was applied to each groups influence rankings, the higher the corresponding value of the resultant *W* the higher the level of consensus amongst the group members. Table 5.5 presents the *W* values and subsequent significance for the fourteen all male groups tested by Wallach *et al* (ibid) together with the *W* values and subsequent significance for the five groups tested in the present study.

Wallach *et al* (1962) found that the level of agreement in influence rankings was significant for all fourteen of the male groups. The present study found that four of the

five groups achieved significant levels of agreement but the fifth group did not.

Wallach *et al* (1962) then correlated the perceived level of influence in the group decision-making process and the level of pre-discussion individual preference for each individual.

Group	Wallach <i>et al.</i> (1962)		Group	Present Study	
	<i>N</i>	<i>W</i>		<i>N</i>	<i>W</i>
1	6	.64 <i>p</i> <.05	1	7	.43 <i>p</i> <.01
2	6	.55 <i>p</i> <.05	2	7	.45 <i>p</i> <.01
3	6	.74 <i>p</i> <.05	3	8	.46 <i>p</i> <.01
4	6	.72 <i>p</i> <.05	4	8	.52 <i>p</i> <.01
5	6	.70 <i>p</i> <.05	5	5	.32 not significant
6	6	.50 <i>p</i> <.05			
7	6	.56 <i>p</i> <.01			
8	6	.50 <i>p</i> <.05			
9	6	.62 <i>p</i> <.05			
10	6	.66 <i>p</i> <.05			
11	6	.66 <i>p</i> <.05			
12	6	.55 <i>p</i> <.05			
13	6	.54 <i>p</i> <.05			
14	6	.73 <i>p</i> <.05			

Table 5.5. Significance of consensus amongst group members concerning individual influence in the group decision-making process

Wallach *et al* (1962) established that those who were the highest risk takers were the most influential in the group decision-making environment concluding that it was these participants which were responsible for the occurrence of the risky shift by influencing the other more conservative group members to shift. This theory has been used by Wallach *et al* (1962) to explain the risky-shift phenomenon but has been largely dismissed by subsequent studies as misleading and simplistic. Therefore this element of the original study was not completed in the present study.

5.5.6 Longevity of Group Discussion to Consensus Effect – Hypothesis H4

In the original study Wallach *et al* (1962) sought to establish the longevity of the group decision effect upon individual decision-making. They were able to contact twenty-two of the original eighty-four male participants, twenty-six percent of the original sample, and none of the female participants. The sample of twenty-two, who were approximately evenly distributed over the original fourteen male groups, were again

administered the same CDQ after a time interval of between two to six weeks had elapsed since participating in the group discussion to consensus. This sample group were asked to complete the same CDQ questionnaire, this time by post. The instructions for the completion of the questionnaire were the same as for the original pre-discussion individual testing.

The respondent's pre-discussion and post-discussion individual preferences were subtracted from their post-post discussion preferences and the mean difference calculated for both categories and tested for significance by a one-tailed *t* test. Table 5.6 highlights the Wallach *et al* (1962) results.

The present study replicated this element of the original study and received twenty-three replies from the original sample of forty-two, a fifty-five percent response rate. Again the comparison between pre-discussion and post-discussion individual preferences with the post-post discussion individual preference were tested for significance by one-tailed *t*-test. The results are also shown in table 5.6 for comparative purposes.

	Post – Post Mean	Pre – Post/Post Mean	t	Post – Post/Post Mean	t
Wallach <i>et al.</i>	54.6	-12.3	4.92 p <0.001	-1.6	Non-significant
Present Study	72.6	-0.91	0.4	5.35	1.98 p <0.05

Table 5.6. Comparison of the means of the post-post discussion individual preferences with the pre discussion individual and the post-discussion individual preference means for both studies

There is a significant discrepancy to be found in the comparison of the present study's results and those of the original study. Wallach *et al* (1962) found that the effect of the group discussion on individual decision-making lasted for a period of up to six weeks after the group discussion to consensus had taken place. The post-post discussion individual preference exhibited greater affinity with their post group discussion preference than with their individual preference before the group discussion had occurred. However, the present study found that the individual decision-makers reverted to their original pre-group discussion preference rather than maintain any influence of the group decision discussion to consensus process. The present study has found that the risky-shift is not maintained over a period of two to six weeks and

intimates that the effect may be only transient on groups of professionals who have had prior acquaintance.

5.6. The Risky Shift Effect

The original Wallach *et al* (1962) study concluded that group discussion to consensus had the effect of encouraging the group to accept greater uncertainty than the individuals would accept pre-discussion. The present study found that group decisions made by construction professionals exhibited a willingness to live with greater uncertainty than did the mean of the individual decisions of the group members and concurs with Wallach *et al* (1962) and substantiates the hypotheses H1 and H2. The null hypothesis H0 is therefore rejected.

5.6.1 Influence of Group Consensus upon Individual Decision-Making

In the original Wallach *et al* (1962) study the post-discussion individual preferences were found to exhibit a tendency to adopt a riskier position; i.e. one with greater uncertainty than was present in the original individual pre-discussion preference. These findings were also replicated in the present study of construction management decision-making groups substantiating hypothesis H3.

5.6.2 Maintenance of the Risky Shift Effect

Wallach *et al* (1962) found the effect of the group decision to consensus process continued to influence the individual decision makers over a period of two to six weeks after participating in the group discussion. The present study indicates that the individual preferences made by the construction professionals returned to their pre-discussion position after a similar time span of two to six weeks has elapsed since the group discussion process. Therefore the present study did not concur with this element of the original Wallach *et al* (1962) study therefore rejecting hypothesis H4.

5.6.3 Influence of the Individual upon the Group Decision-Making Process

Wallach *et al* (1962) established a positive relationship between “degree of risk taking in pre-discussion individual decisions and the extent to which group members are perceived by one another as influencing group decisions” (*ibid*). This conclusion has been shown to be erroneous by subsequent authors who have replicated the study, (Vinokur, 1971; Rim, 1963). Rim in a series of papers (1963, 1964a, 1964b, 1965,

1966a, 1966b) established a detailed psychological profile that describes the most influential person within the group decision-making process. Rim (*ibid*) founded his theory upon his replications of the original Wallach *et al* (1962) study, using an abridged version of the CDQ and additional psychometric tools. Inclusion of Rim's (*ibid*) additional psychometric tools were beyond the scope of the present study and hence the correlation between pre-discussion individual preference and influence within the group decision-making process was not undertaken for this study. The issue of causation with regards to the risky-shift' is considered in chapter six.

5.7 Conclusions

The present study using construction project management professionals has established that group discussion to consensus encourages groups to live with greater uncertainty than would the individuals that comprise the group thereby indicating that individual preferences for uncertainty may be manipulated.

5.7.1 The Risky Shift

The mechanism causing the post-discussion change in individual preference does so by altering the perception of the problem domain by some or all of the group members. It is the communication and perceptual processes that must be examined in order to better understand these processes and to be able to offer guidance on how to educate individuals in their decision-making skills. These issues are reported in chapter 6, the case study investigation.

5.7.2 Concluding Comments

From the research already undertaken using the Wallach *et al* (1962) CDQ group/social culture has been identified as playing a vital role in the decision making processes of status equal groups, influencing an individual's perception with regards to risk and inducing a group decision risky shift.

This research provides a model that can now be compared against the data accumulated via the case study reported and discussed in chapter 6. The second stage of the research using groups of construction professionals to identify and understand the mechanism(s) that facilitate the change of risk preference and perception.

6 Case Study Investigation

6.1 Introduction

The methodology and rationale supporting the case study have been discussed in chapter 2. This chapter therefore describes the practicalities of data collection and the purpose of the case study investigation. The findings derived from the case study investigation of construction risk management decision-making groups are presented together with the data, the method of data collection and analyses the results.

The intention of the case study was two fold. Firstly it was designed to highlight the purpose of the organisations introduction of a risk management strategy and to see if this concurred with a previously detailed interpretation regarding the purpose of those strategies; namely to they seek to objectify risk. Secondly the case study was designed to identify the way in which individual perceptions of possibility were influenced within the process of group discussion as identified in the previous chapter that highlighted the effect of the risky shift phenomena on construction management professionals.

6.2 Case Study Approach

The collaborating industrial partner was attempting to introduce a new bespoke risk management strategy into their organisational processes. The introduction centred on training workshops the purpose of which was to introduce the employees to the new strategy and to educate them as to its implementation.

The implementation of the phenomenological-oriented case study adopted the three-stage approach shown in figure 6.1. By utilising data generated in an organisational learning climate, as opposed to using staged 'experimental' events, the likelihood of capturing data that exhibited actual responses was increased. It is possible that as the employees were attending a taught programme they might envisage a conception of right and wrong in terms of deliberation of problems and formulation of answers motivating them to avoid providing 'incorrect' information. This effect of their taught environment may have been exacerbated by the presence of a researcher who remained present within the room during the group discussions. Therefore to avoid unduly

influencing the intuitive decision-making processes of the observed groups the approach to data collection was designed to minimise contact between researcher and subject. The method of data collection and group composition is discussed below.

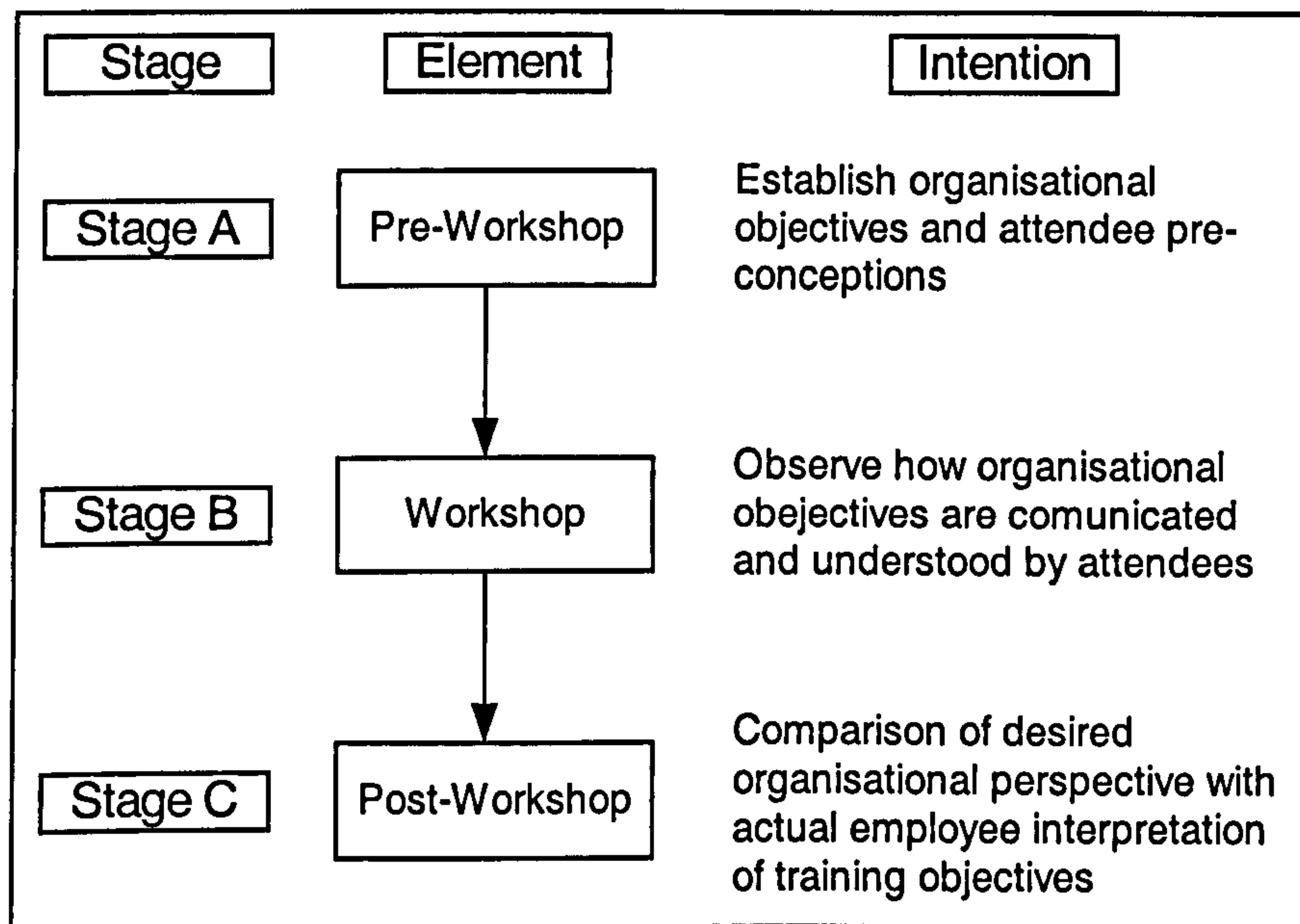


Figure 6.1. Three-stage case study methodology

6.2.1 The Training Workshops

The employees attended two-day residential project risk management workshops hosted by the organisation, the purpose of which was to communicate a desired organisational strategy for risk management. The aim of the training workshop is to educate the attendees to manage the project risk management process. The attendees were randomly divided into two groups, four members in each, by the workshop instructors. At pre-defined stages throughout the workshop they were set certain tasks, five in total, focused upon a fictitious home office extension project. The groups were assembled to ensure that neither was solely populated by individuals who had previously worked together. As discussed previously in section 3.4.5 the risk management process of identification and assessment constitute the more subjective stages of the process and consequently the case study research concentrates solely on those two dimensions. The tasks utilised for this research are reproduced in figure 6.2 together with the task 'brief'. The remaining un-used tasks concentrated on the derivation of a management strategy and the use of Monte Carlo simulation. However neither of these two tasks would add anything of value to case study that could not be identified within the examination of those previously mentioned stages of the process.

At the end of each task the groups were required to present their work in front of the assembled attendees. The presentation materials together with a recording of the group discussions were collected for analysis and form the basis of the findings presented here.

You want to build a single-story extension to your own house for you to use as an office to work from home. You have a budget of £20,000 and a target completion date of six months from today. You haven't started anything yet! Carry out the following steps in syndicates at the end of the relevant lecture sessions.

Part 3 - 45 minutes

Using brainstorming identify a maximum of 30 correctly named risks associated with the project, against the project objectives and risk management plan you defined earlier. Using the following structure, identify a maximum of 5 risks per section, leaving "Whole Project" to the end to account for any risks you feel should be in the project, but not covered elsewhere:-

- a) Whole Project , b) Planning Permission, c) Finance, d) Building Work,
- e) Decorating & f) Moving In

Part 4 - 45 minutes

Assess the probability and impacts against the time and cost impact categories you have defined for each identified risk, and plot risks on a PI Grid to allow you to rank them in order of importance. Identify the top 5 risks (Opportunities and Threats).

Figure 6.2. Attendee brief

Mini-disk audio recorders, placed as unobtrusively as practicable within the two group discussion rooms, were used to record the group conversations. In total ten recordings of group sessions were made, five of each group over the two-day period of the workshop. Only the recordings from each group that contain the discussions with regards to the two tasks detailed in figure 6.2 are being used in this research. As both groups were aware that their discussions were being recorded for analysis the possibility that the presence of these recording devices compromised the 'purity' of the data collected must be considered. However no comment was made by any of the group members to the effect that voluntary censure was being considered or was advisable during the recorded sessions.

The two groups completed their tasks in separate meeting rooms both of which were furnished with flip charts and pens. The presentation materials were recorded on these flip charts, which were subsequently collected and duplicated for partial inclusion within this research. The group discussions were transcribed using the methods detailed in chapter 2, and are reproduced in part within this chapter. Permission was

received by all participating group members for their discussions to be recorded for use within this research. The anonymity of the collaborating organisation and the group discussion participants has been maintained throughout this research. The group discussions under consideration in this research are included in their entirety in appendix 'D'.

6.2.2 Transcription Glossary

Table 6.1 provides a glossary of symbols used in the transcription of the group discussions as recommended by Hutchby & Woofit (1998) and is replicated here to assist in the analysis of the provided transcription segments.

Symbol	Description
(0.5)	The number between the parentheses indicates the time elapsed in tenths of a second.
(.)	Indicates a pause in conversation of less than two tenths of a second or less
=	Equals sign indicates one sentence 'latching' onto the following of the same speaker
[]	Open square brackets indicate an overlapping sequence of conversation
(())	Double parentheses indicate a non-verbal activity or a transcribers comment
-	Dash indicates the sharp cut off of the preceding word or sound
:	Colons indicate the stretching or continuation of the previous sound or letter. The more colons the greater the length of the continuation
!	An exclamation mark indicates an emphatic tone
()	Empty parentheses indicate the presence of an indiscernible fragment
<u>a</u> :	Marked falls in pitch are indicated by underlining the letter preceding the colon
a:	Marked rises in pitch are indicated by underlining the colon
<u>under</u>	Underlining indicates speaker emphasis
CAPITALS	Capitals indicate a fragment of noticeably louder speech than the surrounding speech
° °	Degree signs indicate a fragment of noticeably quieter speech than the surrounding speech
> <	Greater and less than signs enclose speech that was noticeably quicker than the surrounding speech

Table 6.1. Transcription notation glossary (Hutchby & Woofit, 1998)

Individual lines of the transcribed text can be identified by their preceding three-part code. For example the code G987fa refers to the Green team transcription, denoted by the initial letter G, line 987, denoted by the three figure number following the initial letter, spoken by group member 'fa', denoted by the two letters following the three figure number. Table 6.2 details the professions of the group members.

6.2.3 Attendee Pre-conceptions of the Risk Management Strategy

The department responsible for the organisation of the training workshops provided a list of contact details of those individuals who were due to attend. All of the named individuals on the list were contacted one week prior to the workshop date and

interviewed over the telephone to assess their knowledge of the organisations bespoke risk strategy and their expectations, if any, of the workshop.

	<i>Profession</i>
ID	Red group
aa	Senior QS
ba	Contract Manager
ca	Contracts Engineer
da	Chief Engineer
	Green Group
ea	Project Manager
fa	Chief Surveyor
ga	Project Engineer
ha	Technical Integrator

Table 6.2. Group member professions

Unfortunately work commitments and other unidentified circumstance resulted in only eight of the prospective twelve employees attending. From those eight only five were named on the initial attendee list. Therefore it was impossible to collect sufficient data to ascertain the level of prior awareness and knowledge of the strategy held by the two groups.

6.3 Summary of Findings

Analysis of the information provided by the group discussion transcriptions and the subsequent findings are detailed below. The primary finding of this case study investigation is that the risk management strategy provided a framework within which identified risk may be recorded and managed but did not take account of the subjective nature of the risk management process, therefore:

1. the risk management strategy did not offer any mechanism by which individual perceptions could be ascertained, managed or normalised.

As a consequence individual subjective perception and hence identification of risk is not addressed and as a result the group decision-making suffered from the following:

2. the groups were often unable to calculate meaningful probabilities of occurrence and in the main opted for 50/50 propositions;

3. cohesive group members often failed to question the validity of proffered estimates of probabilistic likelihood;
4. less cohesive group members often questioned the validity of proffered estimates of probabilistic likelihood that in turn led to fewer 50/50 options being chosen;
5. individual group members would use a rhetorical strategy in order to gain acceptance from other group members for a proposition;
6. often only one proposition was considered at the expense of considering other options; nonetheless
7. both groups managed the risk identification process effectively.

The evidence for these findings is now presented and discussed in turn below.

6.3.1 The Risk Management Strategy

The following is a synopsis of the organisation's bespoke seven-step risk management strategy shown in figure 6.3.

- Define business and project objectives – set the scene for the risk management process.
- Define risk management plan – the risk management plan defines the risk management process, which is then incorporated into the executable project plan.
- Identification – qualitative identification of the risks, both opportunities and threats, associated with the current project.
- Assessment – qualitative and quantitative assessment of the probable likelihood of occurrence and potential impact in terms of financial impact and time of the identified risks.
- Planning – determination of responses to the potential risks in order to minimise the threats and maximise the opportunities
- Management – management of the seven-step strategy
- Feedback – experiential knowledge is recorded to allow the evolution of the strategy.

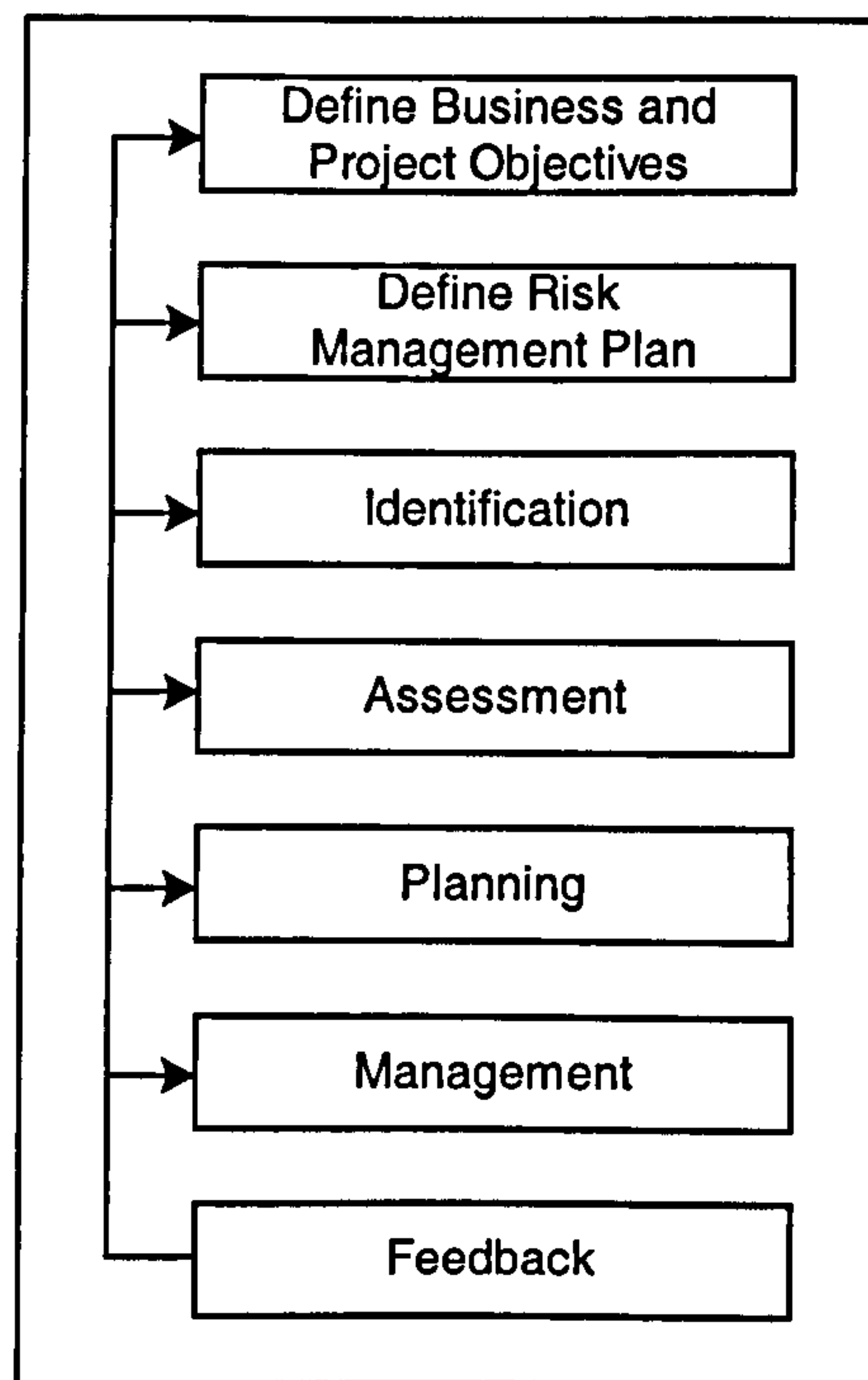


Figure 6.3. The seven-step risk management process

The organisations risk management strategy adheres to the same identify – assess – manage generic stages as the risk management processes identified in section 3.4.4. The main difference in this instance is the organisations additional explicit requirement to ‘define the business and project objectives’. However the difference would appear to be superficial as the instruction is simply made explicit whereas it would not be possible to execute the risk management process without first doing so. Similarly the instruction to ‘define the risk management plan’ is cosmetic as it would not be possible to execute the process without having initially defined a plan. However the explicit inclusion in the organisations strategy enhances the bespoke identity of the process and highlights the branded nature of the approach.

6.3.2 Purpose of the Risk Management Process

A semi-structured interview with the senior manager responsible for the implementation and provision of the risk management strategy and training was undertaken. The purpose of the interview was to identify and ascertain the explicit aims of workshop/training programme and also to establish the organisational strategy for promoting the concept of the organisations bespoke risk management strategy, as discussed in section 2.6 to satisfy items A1 and A3 detailed in table 2.3. The interview was recorded on mini-disk and an analysis of its content is included within appendix C.

The interview analysis suggests that the 'drivers' behind the instigation of the organisations risk management approach are three fold:

- a) it is intended to replace the disparate approaches that existed previously with a comprehensive, objective and generic approach that may be used globally throughout the organisation;
- b) the approach is intended to represent the company's diversification from the mainstream of its competitors by exhibiting a progressive and matured approach to risk management to its customers; and
- c) the changing nature of the organisations customer interface have necessitated a prescribed risk management approach.

The approach as it currently stands is identifiable by its seven step 'branded' structure that represents formalised, current best practice within the organisation. This approach provides a standardised terminology, lexicon and generality that will enable the organisation to communicate internally between divisions and departments. A primary organisational objective was to design a generic risk management strategy that could be incorporated into the various departments own working practices and processes that would be seen as an integral and necessary feature of the overall construction process. This involves educating the employees in the philosophy and the processes of the organisations preferred approach to risk management. The initiative stresses individual accountability that is supported by an objective view of risk afforded by the risk management strategy. It has been acknowledged that previous approaches towards risk management within the organisation were disparate and that whilst employees were aware of risk they had not been 'educated' in a formalised and structured approach to its management.

The initiative has been running for approximately four years and the delivery team are finding that approximately three quarters of the attendees arrive with an understanding of the premise and the language used within the risk management framework. The opinion of the senior manager who gave this interview was that approximately ninety nine percent of the attendees leave the workshops with an 'understanding' of risk management and the organisations preferred approach. Only ten percent show any interest in continuing or implementing their risk management training. However as

there is no available evidence to support the existence or use of a prescribed and thorough manner of post-workshop interviewing it is difficult to ascertain how these figures are derived.

In summary the organisations view is that it has designed a 'comprehensive' and 'objective' risk management strategy that will enable risks to be 'seen' by their employees. The cultural change accompanying this view communicates that the organisation is not afraid of risk and uncertainty and is inclined to accept risk if they are to be rewarded in turn. This initiative was partly designed to provide a framework within which risks to the organisation arising from their diversification of interests may be effectively and objectively managed. However as they are not inclined to recruit risk managers from outside of their organisation there is uncertainty as to whether they realise that the initiative only provides a framework and does not educate the risk managers to identify risks they do not have the knowledge to recognise.

6.3.3 Failure to Address Individual Preferences

Although the organisations objective is to introduce a 'comprehensive' and 'objective' risk management strategy that will enable risks to be 'seen', the strategy currently only provides a method for recording and identifying the organisations risks. In essence the strategy is an engineered response to a perceived organisational need that amounts to little more than a normative tool designed to control the manner in which employees undertake an organisational process. The structure of that process is well defined and controlled but has been done so without due consideration to the process inputs or outputs such as the behavioural issues and cognitive issues as identified by Vlek & Stallen (1980) other than on a superficial and mechanistic level. Similarly the strategy fails to manage the individual's impact upon the process by not identifying or stressing the need to discuss the assumptions upon which identification of risks and predictions of probability are made.

The process of assumptions analysis is covered within the training workshop material and forms a component of the taught aspect of the workshop. However its use is restricted to ensure that no area of uncertainty is overlooked. Consequently no mention is made of the need to address assumptions when assessing probabilities and impacts or the assumptions upon which the identification of risk is made in the first

instance. Figure 6.4 replicates the two slides used within the workshop materials to discuss the topic of assumptions analysis.

To illustrate this point, any assumption that a project will have a problem with the delivery of materials, for example, may be recorded and later assessed for potential impact. The strategy does not identify or encourage the need to discuss any prior assumptions that uphold the notion that there will be a problem with delivery of materials in the first instance. Similarly the importance of clarifying assumptions that underlie any estimates of potential impact, in terms of both likelihood and severity, are not addressed.

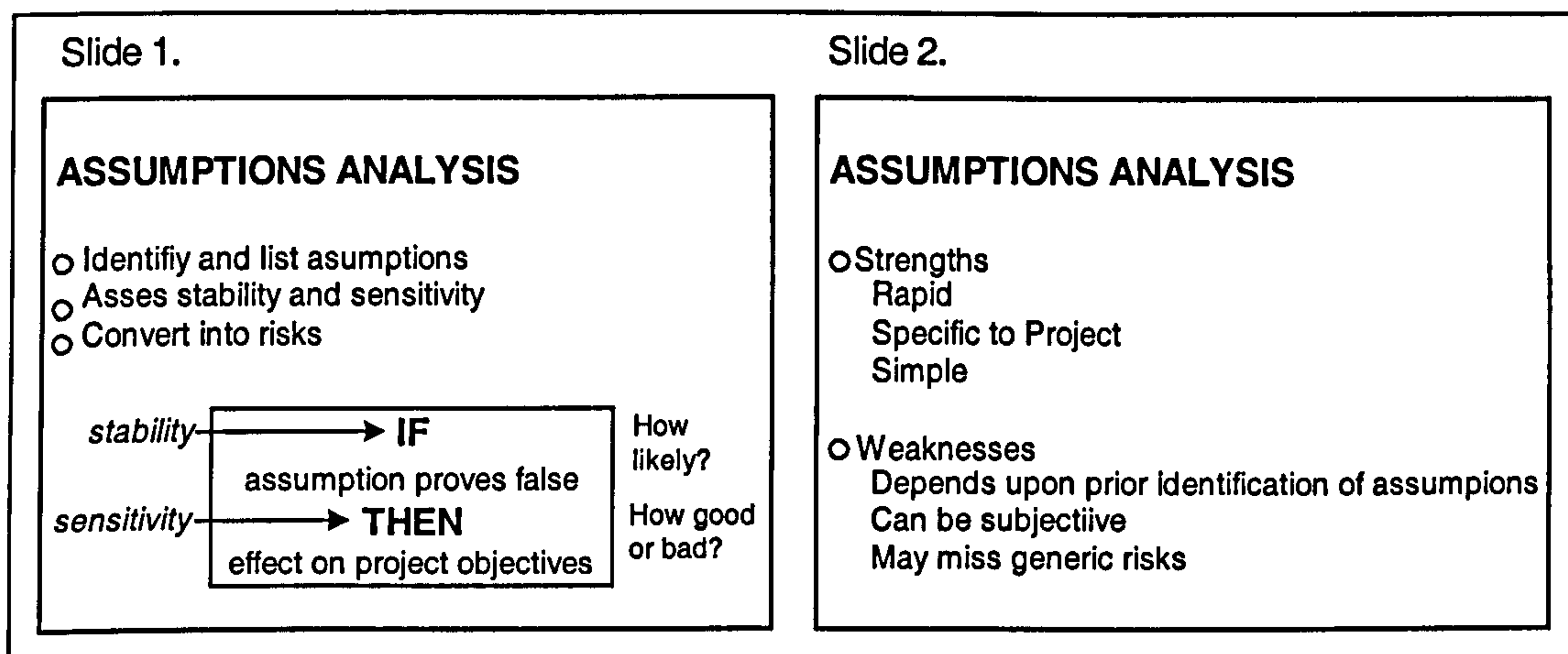


Figure 6.4. Assumptions analysis

This omission amounts to one of the primary weaknesses of the organisation's bespoke risk management strategy. In essence the strategy fails to address issues such as bias, experiential knowledge, motivation, group influence or individual behaviour towards uncertainty, all of which are evidenced in an individual's assumptions. These issues have been explored and discussed in detail in section 4.5 (see Harriss, 1998; Tversky & Kahneman, 1992, 1982a,b and c, 1979; Raftery, 1994; Loewenstein, 1996; Hsee & Kunreuther, 2000; Chater & Oaksford, 2001; Munier, 2001; Beamish, 2000 and Bruine *et al*, 2000).

These omissions from the taught aspect of the workshops are compounded by inclusion of the organisation's preferred technique for risk identification, which does not specifically include or encourage assumptions analysis, an integral aspect of the

RAMP (1998) risk management process. Rather it is focused upon the singular use of brainstorming for identification and the recording of risks in a prescribed and standard format. Figure 6.5 replicates the workshop slide used to communicate the organisation's 'common' preferred technique to risk identification, (the empty parenthesis on figure 6.5 indicate that the name of the organisation has been omitted to maintain anonymity).

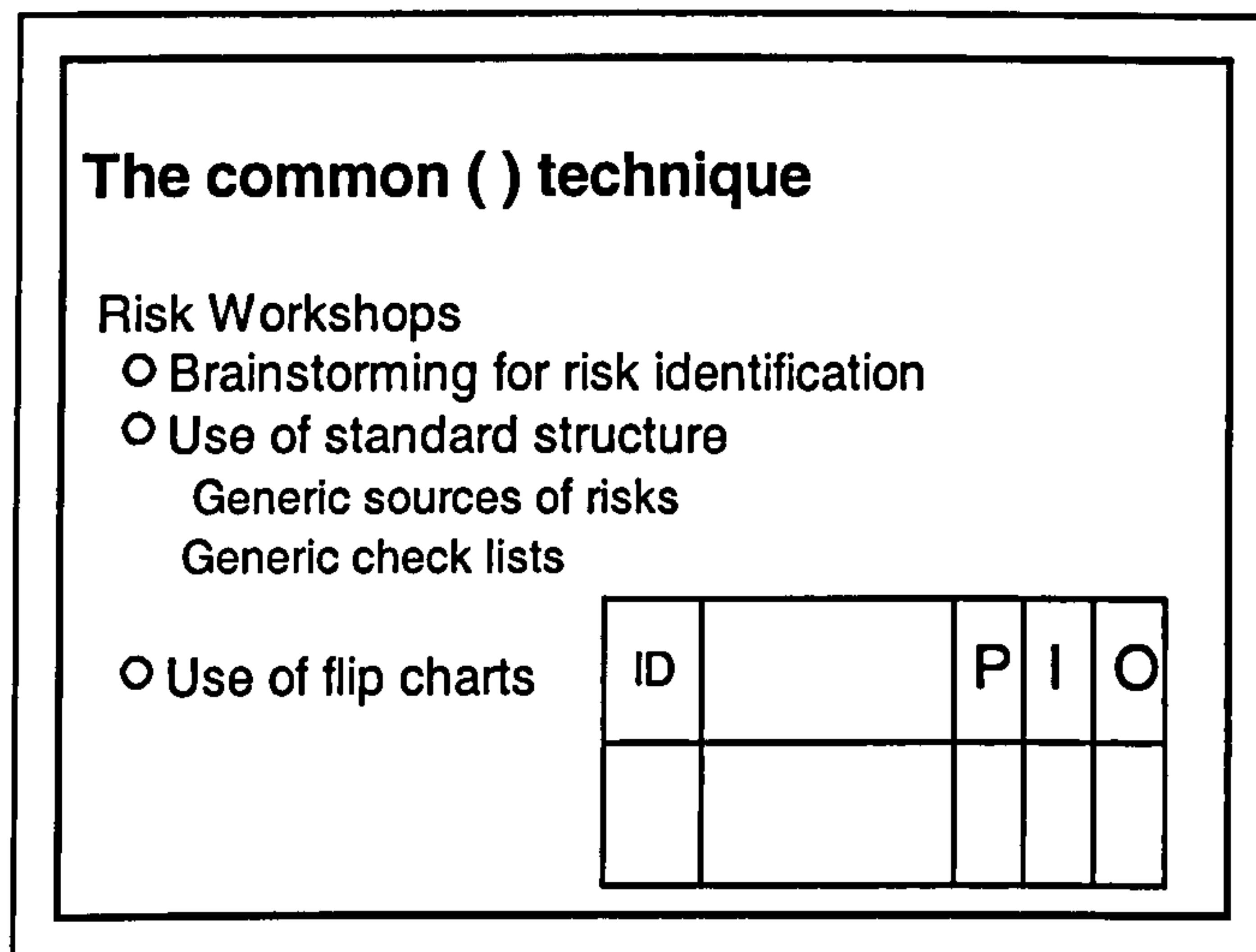


Figure 6.5. Preferred organisational technique

The use of brainstorming is encouraged in an atmosphere of status equality amongst participants, without the questioning of identified prospective risks. However no opportunity is afforded the participants to question the validity of the inclusion of risks before they are assessed for probability. Consequently, whilst an individual may be able to justify the inclusion of a risk, via the use of a rhetorical strategy, questioning will only arise if the group composition encourages it, as is discussed in section 6.3.5 (see Janis, 1982). Nonetheless, risk assessment in terms of potentiality and impact is undertaken both qualitatively and quantitatively. There is no guidance on qualitative assessment, which is left to the descriptive abilities of the individuals.

Conversely the quantitative aspect of risk assessment is focussed upon the use of Monte Carlo simulation. Once a simulation has been run using the identified and qualitatively assessed risks the strategy encourages the risk management team to challenge the results. Figure 6.6 reproduces the workshop slide that highlights the basis of that challenge.

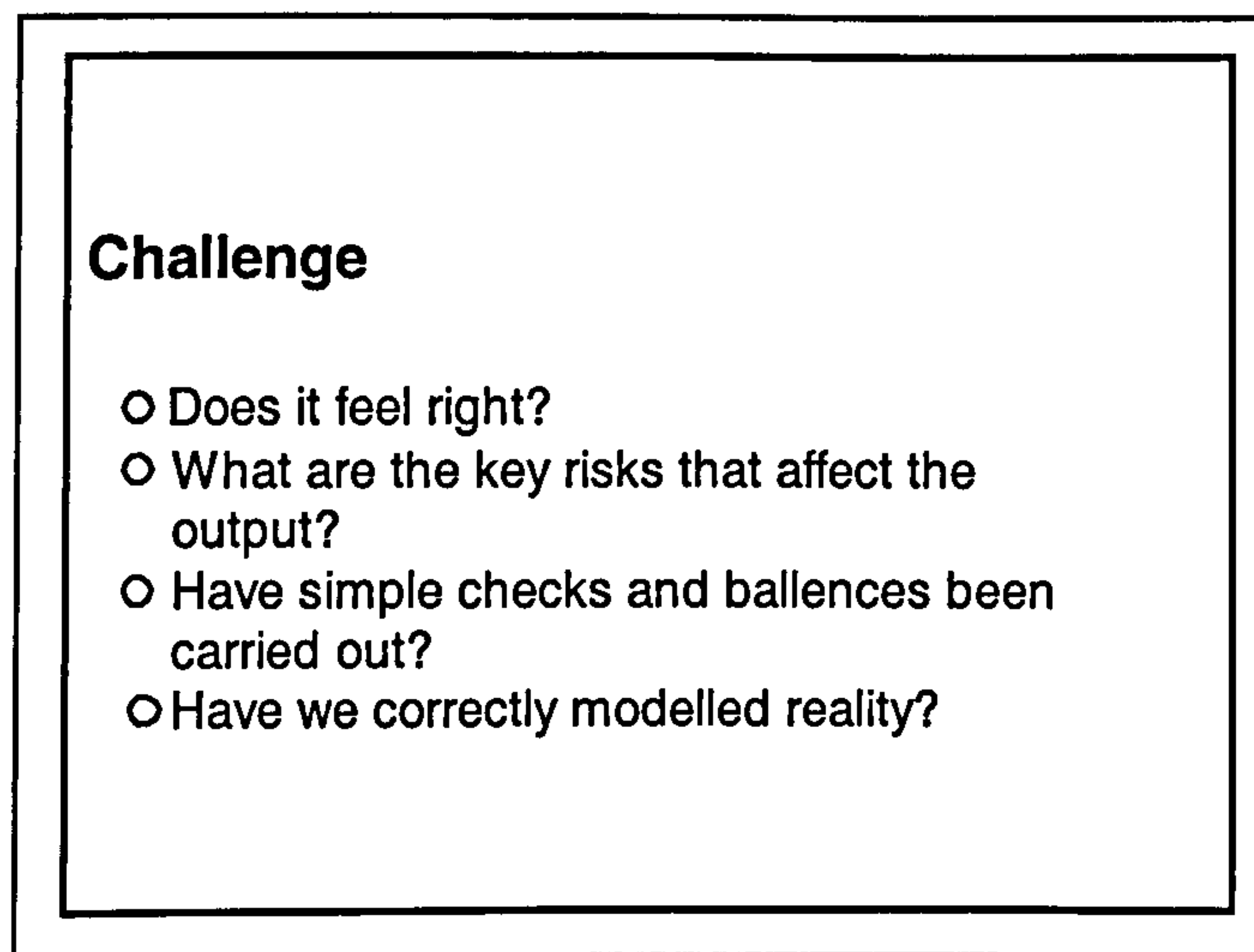


Figure 6.6. Challenging the quantitative results

The foundation of the challenge upon the results of the qualitative assessment is explicitly gut feel; “Does it feel right?” The risk management strategy provides no mechanism by which individual perceptions are gauged or assessed but ultimately retains the need for the use of intuition and experience in the assessment of potentiality and impact of risk. Whilst the second two points in the slide are valid and prudent the final remark is worthy of comment.

“Have we correctly modelled reality?” is indicative of the organisations desire to objectively control and influence uncertainty. Whilst it may be an academic trait to highlight the specious nature of this intention, the effect that it may have on the risk management team is not to be underestimated. Greene *et al* (2000) have shown that often such methods of quantitative assessment are used to externalise the risk management process and thus afford the individual using them a sense of distance from the eventual outcome. In such a case the risk management process may become a placebo for the organisations unwillingness to acknowledge the nature of its operating environment as previously discussed in section 2.2.4. The following slide, figure 6.7, illustrates the organisations interpretation of its bespoke risk management strategy.

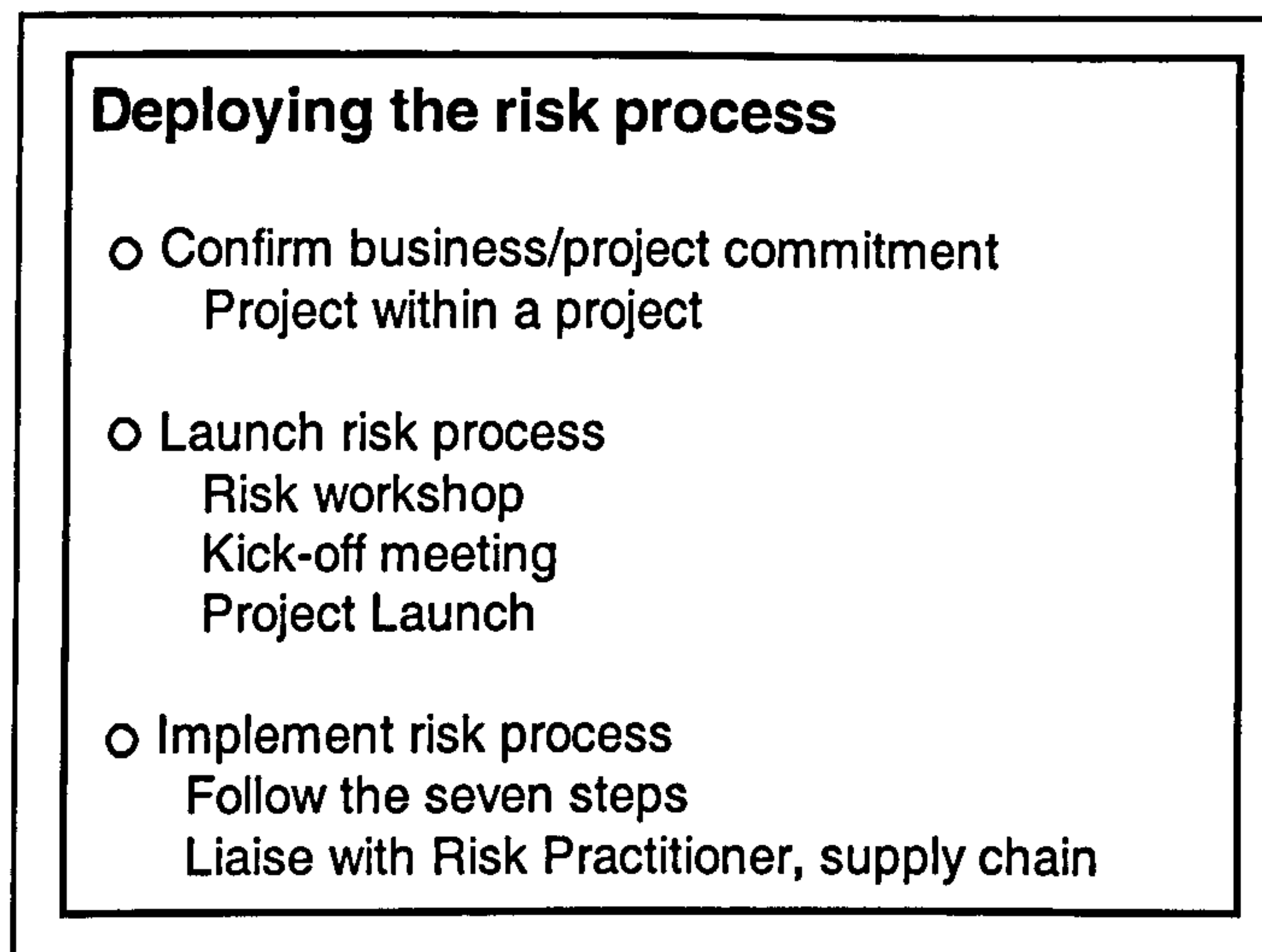


Figure 6.7. Deployment

The language used to communicate this interpretation conveys a sense of militarism: “Deploying the risk process”, “Launch the process”, and “Implement risk process”. Use of these terms expresses a hard-edged certainty that could encourage one to believe that what is carried out within the risk management framework is an objective, concrete interpretation of reality, an objective it is unlikely to achieve for because of the complex nature of contemporary construction projects (Cambel, 1993; Gregoire & Progogine, 1989; Edwards & Bowen, 1998). Refer to section 3.9 for a more complete discussion.

6.3.4 Probabilistic Propositions and their Derivation

At the outset of the risk management assessment stage the groups are required to ascertain and record what they consider to be the cost and time impacts to their respective projects. These impacts are recorded on a pro-forma probability/impact chart designed by the organisation for use specifically within the bespoke risk management process (figure 6.8). The pro forma chart expresses minor opportunities and insignificant threats as improbable occurrences with a less than ten percent chance of occurrence and so forth. Opportunities and threats are expressed as negative and positive figures respectively. The groups must initially equate financial and time impacts to the threat and opportunity ‘bands’ for their respective projects for each of the five categories of probability. The following extracts from the transcribed group discussions suggest that the group members are unable to discern the numerical expression of probability, a phenomenon discussed by Bruine *et al* (2000).

PROBABILITY			IMPACT							
		%	OPPORTUNITY		COST £000'S	TIME DAYS	THREAT		COST £000'S	TIME DAYS
1	Improbable	<10	-1	Minor			1	Insignificant		
2	Could Happen	10 – 30	-2	Significant			2	Marginal		
3	As likely as not	30 – 50	-3	Substantial			3	Serious		
4	Probable	50 – 70	-4	Very Substantial			4	Critical		
5	Highly Probable	>70	-5	Exceptional			5	Catastrophic		

Figure 6.8. Probability/impact chart.

Instead the group members rely upon the verbal expressions within the probability/impact chart. Shackle's (1969) potential surprise offers one explanation for this phenomenon by predicting that individuals prefer to use the notion of the possible rather than the probable. Consequently the use of verbal expressions of 'could happen' and 'as likely as not' reflect the perceived possibility rather than the objective probability inherent with the particular decision domain. Consequently the subsequent calculations in the assessment stage of the process are fundamentally flawed because they are based upon the notion of the possible, a subjective interpretation borne of experience and intuition, which is no basis for frequentist probability calculations (Christensen, 1979). Similarly the evidence suggests that the expressions 'could happen' and 'as likely as not' are not discriminated between within the group discussions and are interpreted intuitively as inferring one and the same option. It is suggested that these two phrases whilst intended to express probabilities of 10 – 30% and 30- 50% respectively are actually intuitively interpreted as verbal expressions of a 50/50 possibility option. Consequently this allows the group members the freedom to express possibilities of likelihood that are interpreted by the process as practically meaningless probabilities of equal likelihood. Table 6.3 details the identified group risks and their respective probabilities as identified by the two groups. The figures noted under the headings 'P' in the table are the numerical pro-forms of the probability values and correspond to the adjacent risks.

RED TEAM		GREEN TEAM		
ID	Risk Description	P	Risk Description	P
	Planning Permission		Planning Permission	
1	Failure to obtain planning permission	2	<i>P.P (planning permission) not Granted</i>	2
2	Restrictive permission, i.e. size, use, location	2	Ground conditions not suitable	2
	<i>Additional requirements, i.e. landscaping, drain upgrading, fire escape, additional access</i>	1	Delay	2
	Finance		Finance	
4	Bank restrictions on loan	2	Finance (loan) not granted	3
5	Turned down for loan	1	Interest rate changes	3
6	Unexpected windfall, i.e. granny dies	4	Interest rate drops	3
7	Interest rates alter (A) up (B) down	3 3	Alternative fund arrangement	2
	Building work		Building Work	
8	Delivery times of materials	3	Availability of materials	1
9	Builder unable to start on time	2	Labour Availability	2
10	Weather Conditions exceptional	2	Adverse weather	3
11	Below ground problems – could require piling	2	Work Acceleration	3
12			Access	2
	Decorating		Decorating	
13	Building not drying out	3	Wife changes mind – colour	3
14	Long delivery on carpet	2	Interface of building and decorating work	2
15	Building drying out too quickly – cracks	2	DIY	3
	Moving In		Moving In	
16	Final connections to utility services, i.e. telephone	4	Utility provision	3
17	Restricted access	1	Furniture delivery	3
18	Postponed delivery of furniture	2	Will it fit?	2
	Whole Project		Whole Project	
19	Portacabin	2	Use Individual sub-contractors	3
20	Share additional space for rent	3	Tax benefit potential	2
21	Convert garage	2	Company sponsorship	2
22	Family problems due to stress	3	Circumstance changes (redundancy)	2
23	Increased property values enables upgrade	2		

Table 6.3. Comparison of Green and Red group expressions of probability

The red group identified twenty-three risks, twelve of which were ranked as ‘could happen (2)’ and six as ‘as likely as not (3)’. The Green team identified twenty-two risks, eleven of which were identified as ‘could happen (2)’ and ten of which were identified as ‘as likely as not (3)’. The Green teams identification of almost an even split between the two options bears some resemblance to a phenomenon described by Bazerman (1986) who noted that when asked to predict the results of a series of a fictitious coin toss the respondents almost always presented an even split between heads and tails, the only two options available. This result is similar to the regression to mean tendency whereby individuals expect an equal ‘spread’ of outcomes, a fact not upheld by the science of probability (Slovic *et al*, 1982). This may explain the

predilection to use the 50/50 options. The following text explores the proposition that group members often failed to question the validity of an individuals verbally expressed prediction of likelihood as a causal factor for 50/50 choice options.

G1034fa. yeah (.) ok (.) yeah (.) labour availability (0.8) er:m (3.7) it could happen
 G1035ha. [yeah]
 G1036ea. it could happen
 G1037fa. [yes it does
 G1038ea. it's a two
 G1039ha. two

This passage of text concerns the Green groups' discussion of labour availability. In this instance the group express their estimation of probability with the phrase 'it could happen'. None of the group members express actual percentile probabilities however in line G1037 fa implies that "it does" happen. Therefore the group members know that it does happen, but relying solely upon their intuition and experience they acknowledge that 'it could happen'. It is arguable that this equates to a 50/50 proposition even though the probability/impact chart defines this as a 10 – 30% chance of occurrence because of the notion that the phrases 'could happen' and 'as likely as not' evoke. Similarly the group fail to identify, verbalise or discuss the causes that they perceive may lead to problems with labour availability. The group remain oblivious that they may all be working from differing experiential backgrounds and therefore discussing (sic) the problem from different premises. The following is another example from the Red group.

R938da. builders work (2.3) delivery times on materials (0.3)
 R939aa. phew ((audibly breathes out))
 R940da. well that's as likely as not could happen (.)
 R941aa. that could happen (0.4)
 R942da. er:m (.) as likely as not though is it
 R943aa. yeah
 R944da. is it a three
 R945ca. yeah give it a three
 R946da. give it a three
 R947aa. yeah: i think so (0.9)

On line G940da the phrase "as likely as not could happen" is used. This confuses the two options 'of could happen' and 'as likely as not' and highlights the lack of meaningful difference between them when considered as verbal constructs. However the group agree that it is 'as likely as not' without any discussion of their individual assumptions regarding the nature of the risk. The following text is example of the Green groups failure to address their potentially differing assumptions and premise.

G1073ea. erm: adverse weather (1.2)

G1074ga. i'd say a three (0.6)

G1075ea. it is yeah (.) it's as likely as not isn't it (2.8) now (1.4) the impact (1.7) i- i basically think =

G1076fa. [yeah]

[yeah]

On line G1074 ga opines “i'd say a three”, using the communicative numerical value of the chosen likelihood as a pro-form for the complete verbal expression. On the following line, G1075, ea responds, “it's as likely as not isn't it” preferring to use the verbal construct of likelihood. Both group members avoid using the numerical percentile expression provided in the probability/impact chart when communicating probabilities. Although only three examples from the text are provided here at no time do any of the members from either group use a numerical percentile expression of probability in the one and a half hours that they spent considering the likelihood of occurrence of their identified risks. This tendency to use verbal expressions of probability may be attributed to the group members' non-rational as opposed to objective interpretation of the decision domains, a theory proposed by Howarth (1988).

Therefore whilst percentile numerical expressions are provided within the probability/impact chart they are never utilised and reliance is placed upon the use of verbal constructs of probability in order to communicate individual interpretations of decision domains.

6.3.5 Effect of Group Member Relationships on Probability Assignment

A limiting factor with the group performance hypothesis of this research is that only two groups were studied. However there are marked differences between how the two groups both discussed potentiality and the overall spread of values attributed to their identified risks.

Of the two groups the Green group showed almost an even distribution between the probabilities awarded to their risks, eleven were deemed, ‘could happen’ and ten ‘as likely as not’. On the whole the green team exhibited a more cohesive group structure than the Red team who scored twelve risks as ‘could happen’ and six ‘as likely as not’. In this research group cohesion was measured by the number of occasions on which the group members rejected a proffered measure of potentiality, in essence how often they disagreed with one another. A study of the transcribed group discussions

highlighted nine occasions when the Red group showed any signs of outright disagreement when discussion likelihood of occurrence compared to only two occasions for the Green team. The most explicit examples are shown below.

R758da. right (.) additional requirements ie landscaping (1.4) well again that's going to be a two =
 R759da. = isn't it (.) it could happen they could ask us (1.7)
 R760aa. i think that's er: (.) a bit higher than that
 R761da. as likely as not
 R762aa. hm::
 R763ba. but landscaping drain upgrading i think that is highly unlikely
 R764da. wel- well we can still put something
 R765aa. you think that's unlikely
 R766ba. yeah
 R767aa. do ya (3.8)
 R768ba. well f- for a small extension i agree if it was a big one
 R769da. that's right you see (.) you see people who build extensions and leave builders =
 R770ba. [but not for a little extension like this one]
 R771aa. [right ok then]
 R772da. = rubble around their houses
 R773aa. [put it a one; then (.) put a one; then

In this example three Red team members disagree about the likelihood of additional requirements being imposed by the local authority. They do not negotiate a value rather they present their opinions and the most valid argument holds. The initial position is set in line R759da to the effect that "it could happen". A counter position is offered in line R760aa but without the use of a rhetorical strategy. A third position is established in line R763ba that is questioned in line R767aa. The originator of this third position, 'ba', uses a rhetorical strategy in line R768ba to 'set a scene' with regards to the problem to which agreement is found in line R769da. The original scene is complemented in line R769da and completed in lines R770ba and R772da. Throughout this discourse 'ba' and 'da' contribute to create a scene by which 'aa' can see that his original position may be unfounded and consequently he alters his position to concur with them. This may be explained by 'aa' acquiescing to group social pressure rather than pursuing his position further. Alternatively the position forwarded by his two colleagues may have given him reason to doubt the veracity of his own initial position. Nonetheless in both instances the group entered into a discussion regarding the issue at hand and unanimously agreed having persuaded one of their members to alter his original position. The following scenario is a typical passage of conversation taken from the Green group as follows.

G1034fa. yeah (.) ok (.) yeah (.) labour availability (0.8) er:m (3.7) it could happen
 G1035ha. [yeah]
 G1036ea. it could happen
 G1037fa. [yes it does
 G1038ea. it's a two
 G1039ha. two

In this passage of the transcript there is a sense of apathy regarding the issue under discussion; the three participating group members simply agree amongst themselves “it could happen” without recourse to discussion of any kind. The majority of the Green group discussions were of this nature with only two notable exceptions, one of which follows below.

G1276ea. = shall we go for the minus five
 G1277fa. it wouldn't do any harm would it (.) it's going to be the biggest opportunity that =
 G1278fa. = you will have
 G1279ea. >PUT IT this way you couldn't be proven the other way could ya<
 G1280fa. no
 G1281ea. >you couldn't be proven < (.) that it's a minus four (.)
 G1282ha. we are talking about decorating (3.4)
 G1283ea. oh i tho- yeah yeah
 G1284ha. we are not going to save five grand on decorating are we ha ha ((laughs))
 G1285fa. [yes (.) we've go t- to be]
 G1286ha. on decorating

In this instance whilst two of the group members are in agreement in lines G1276ea – G1281ea inclusive, they are proven to be incorrect in their assumptions in line G1282ha. This shows that group member ‘ha’ is willing to point out the group errors if he is aware of them whilst also showing his desire not to make errors. Therefore the group will reassess its position if shown to have cause to do so. Noticeable throughout the transcriptions of the Green teams discussions is the willingness of group member ‘ea’ to use rhetorical strategies, or scene setting, to communicate his perspective to the group. Accordingly he seems to be the most influential and ‘leading’ member of the group. No subsequent analysis of this hypothesis has been undertaken as it is the author’s belief that a more comprehensive study utilising psychological measures is required to establish any one group member as the most influential in the group decision-making environment (Rim, 1963, 1964a, 1964b, 1965, 1966a & 1966b; Katzell *et al*, 1970).

Similarly Red group member ‘ea’ appears to be an influential member in terms of his willingness to question outright his fellow group members. Although not

confrontational his attitude is one of devils advocate, albeit perhaps unwittingly. The following are examples of this behaviour taken from the transcribed group discussions.

R776da. [we'll give it a one (0.4) er::m

R777aa. and if it happened what would happen then (.)

R778da. we:ll (.) if it happened it would cost us a few quid to put it right

R779ca. [()]

[yeah

R780aa. marginal

R866da. we're a big company but on the other hand we said we would do it ourselves (.)

R867aa. and if they did what would it be then (.) critical]: (0.8)

R868da. [hm::] c- could have serious implications

R869aa. no well we've just said on the other that-

R870ca. [are we just talking about from the one place here (0.7)

R908da. = would go up (.) and that it would go down (1.1) so we are talking three for up and three=

R909da. = or less than three for down

R910aa. no i think it's more for going down int it

R911da. yeah (.) so we could have it three minus three perhaps (0.5)

R984da. up to:: (1.3) a three >which is a serious one< (.) just over a week

R985ca. yeah

R986aa. i wouldn't say it's serious i would say it's marginal really (1.4) two to four days out of a =

R987aa. = six months

R988da. [but what happens if we go-

R989aa. [what

R990da. what happens if we go over our six months period (3.6)

R991aa. w- what does happen (1.9)

R1069ca. only if it's frost you could be held up for a week at a time

R1070da. [but bu- but would we be liable (.) we are saying that we would be liable (1.2)

R1071aa. ah no the builder is liable because i challenged that if you recall (1.0) i'm not sure the =

R1072aa. = builder can be liable

In all of the above examples 'aa' forces the group to reconsider their position and defend their position by asking 'what if' questions. This can be construed as a pivotal role in the group dynamic because it requires the group to reconsider their choices and options, a role highlighted by Janis (1982) as one of the preventative measures in avoiding groupthink, see section 4.7.2. No member of the Green team would appear to fulfil such a role.

The conclusion is that the Green team exhibited some of the traits of highly cohesive groups, such as concurrence-seeking tendencies, as detailed by Janis (1982) that encouraged them not to question one another's position for the sake of maintaining the group dynamic. Similarly Sitkin & Weingart (1995) have highlighted the role that risk

propensity plays in limiting the search for information. This may be evidenced within the group discussions by the apparent willingness to accept the first option that is disclosed. However the questioning nature of the Red group, specifically 'aa's role of 'devils advocate', amounted to a less cohesive group relationship but arguably facilitated more reliable results in terms of the risk management process.

6.3.6 Consideration of Singular Rhetorical Strategies

An emergent feature of the transcribed group discussions was the use of rhetorical strategies in order to gain agreement by other group members for a particular proposition. The tactic would seem to be to verbalise a conception of the decision domain that is conducive to an individual's position in order that the remaining group members can 'visualise' and will therefore be able to concur with that position. The following text concerns a discussion regarding the impact of labour availability.

G1062ea. well ((breathes the word out)) (2.5) i think it's a three as well because:
 G1063fa. yeah
 G1064ha. [yeah]
 G1065ea. i can't come i've got a job (.) yeah
 G1066ha. yeah
 G1067ea. it's going to be another two weeks before i finish that job (.) >because six months is =
 G1068ha. [yeah] [yeah]
 G1069ea. = ridiculous< (.) once you think about it really (1.2) yeah (.) normally builders i can't =
 G1070ha. [yeah]
 G1071ea. = come this week it's going to be another three weeks the the three covers it i think
 G1072fa. [yeah yeah] [yeah (1.5)]

In this example 'ea' utilises a rhetorical strategy to describe the hypothetical behaviour of a builder with which the other group members agree. No group member questions this proposition and consequently whilst there appears to be no agreement as to the length of time the builder will be absent, the group are in agreement as to the potential impact. This is similar to the mind models proposition made by Johnson-Laird (1983) which predicts that when faced with a problem only one model of the circumstances surrounding the problem is constructed and considered at the expense of formulating and considering other counter models. This 'strategy' ultimately leads to sub-optimal solutions being identified. Consequently the use and consideration of singular strategies can be deemed, in Howarth's (1988) terms (refer to section 4.4.2), non-rational. This may be explained by the fact that no group members are certain of what will occur; therefore a plausible (sic) option is derived. However in most instances the

preferred strategies would appear to be spurious; the following extract of conversation from the Green group is an example in point.

G1321ea. = moving in (.) utility provisions (1.1) now i think this is as likely as not really the =
 G1322ea. = probability of that happening (.) you know what they are like these new utility..
 G1323fa. [oh yes]
 G1324ea. it's not like the old bt where it was spot on=
 G1325fa. yeah
 G1326ha. [yeah]
 G1327ea. = and the old gas board (.) these other companies offer you hundred quid less a =
 G1328fa. [yeah]
 G1329ea. = year but you get less of a service
 G1330fa. course you do yeah
 G1331ea. so i think
 G1332fa. i think it er: (.) is quite likely (.)
 G1333ha. as likely as not yeah

In line G1322ea reference is made to a shared, common experience by the use of the phrase “you know”. The originator of this ‘scene’, ‘ea’, projects a personal experience directly ‘onto’ the other group members by using the phrase “you know what they are like” making it a shared group experience. However this phrase may have a two fold purpose, whilst it may project an experience it may also be questioning its own validity by inviting disagreement from the group. Consequently as it would appear to be a group dynamic to rarely question or disagree the experience is accepted and the likelihood gauged accordingly. The following example highlights the Red groups culpability in this regard.

R951aa. we're talking about four to five four to six (.) six days here (1.5)
 R952da. yeah
 R953aa. if the material doesn't come in four to six days:
 R954ba. well we've only got-
 R955aa. [it's got to be serious and we can't start
 R956da. yeah (1.0)
 R957aa. if we don't get the material we can't start for four to six days (0.5)
 R 958ba. yeah
 R959da. [so it's three
 R960aa. [that's what we are saying (.) three times three i would have thought = (1.1)
 R961aa. = and all we can do is hope he can make that up (0.6)

In line R951aa an assumption is made that the materials will not arrive for between four to six days to which agreement is made in the subsequent line R952da. The potential impact of such an occurrence is then calculated upon this assumption. In this example the group members' assumptions are made explicit, i.e. the materials will be between four to six days late, but the underlying validity of these assumptions are not questioned. It is interesting to note that in this example group member ‘aa’ is the

individual setting the 'scene' and no other group member would appear to be willing to take over his role of 'devils advocate' in this scenario. The next example is one taken from the Green group who are discussing the issue of restricted access to their property.

G1139ea. access er::m (2.9) could happen (1.0)

G1140fa. hm: (3.2)

G1141ea. [erm:]

G1142ga. well if you couldn't and you you had to take down a fence or you had to get permission =

G1143ga. = from a neighbour

G1144fa. yeah.

G1145ea. yeah (.) i think your threat is: (.) marginal (.) money wise

G1146fa. hm:

G1147ha. hm: (0.8)

G1148ea. what you're gonna have it's gonna be a fence

G1149fa. yeah

G1150ha yeah it's gonna be-

G1151ea. it's an arse but you can lift it up

G1152fa. yes

The issue of what constitutes a restriction is addressed in line G1142ga stating that "you had to take down a fence or you had to get permission from a neighbour".

Consequently in line G1145 group member 'ea' takes on a pseudo advisory role by offering "i think your threat is" and again in line G1148ea he states that "what you're gonna have is". In this extract of conversation 'ea' momentarily distances himself from the group to adopt an advisory role; the role of a pseudo expert in matters of access. In both the first example of this section as well as the current example the effect on the group could be one of achieving elevated status. Where first hand experiential knowledge is projected onto the group they perceive the 'projector' as having knowledge in these matters that the rest of the group members do not. Similarly where the group perceive the position of invited 'expert' or 'advisor' elevated status is also achieved.

In the previous examples all estimates of threat and impact are based upon singular presumptions. In the following example from the Red team the original 'scene' is set in lines R962da with an estimate of "up to a week". In the following line R963aa the original proposition is countered with a fuller rhetorical strategy to which some agreement is given in line R966ca and even embellished upon in line R968ca.

However in lines R969da – R971da inclusive the original proposition is re-stated but with greater depth to the extent that a 'scene' is established to add further veracity.

R962da. >BUILDER< unable to start on time (.) so that could be again up to a week (2.0)
 R963aa. a:: well i would say it's improbable if we've chosen the right builder (.) we've =
 R964da. [or even two weeks]
 R965aa. = discussed it with him you know
 R966ca. it's not a great start from his point of view is it
 R967aa. a-
 R968ca. [we've agreed a date
 R969da. [i would say it could happen though (.) because he he- might =
 R970da. = have turned round to him and said (.) you know (.) look you've got defects on my=
 R971da. = property and if you don't fix them i aint going to pay you any more money at all
 R972aa. ok lets loo-
 R973da. [yeah so it could happen
 R974ba. °yeah°
 R975da. could happen

When group member 'aa' attempts to further question the position in line R972aa he is interrupted and an 'agreement' made in line R973da. In this instance the 'scene' being constructed in line R963aa is a personal one. The originator neither projects his experiences onto the group nor does he distance himself from the group in an 'advisory' capacity, consequently he is unsuccessful in 'selling' his position to the group; they remain unconvinced and instead offer a rebuttal in line R969da. Also a point to consider is that the position offered in line R963aa was in direct conflict with the original position established in line R962da.

6.3.7 Risk Identification

Both groups effectively managed the risk identification process. Each was given the same amount of time to identify their project risks and the same prompt list containing five categories of risk as follows:

- planning permission;
- finance;
- building work;
- decorating;
- moving in; and
- whole project.

Figure 6.5 shows the organisation's preferred manner of risk identification. In both groups the members used each other's suggestions as platforms from which to embellish on and proffer further suggestions. This was accomplished in spite of the

fact that neither group used a facilitator for the brainstorming sessions, as is encouraged by the risk strategy. Table 6.4 contains the identified risks that were common to both groups replicated directly from the group's presentation materials.

RED TEAM		GREEN TEAM
ID	Risk Description	Risk Description
	Planning Permission	Planning Permission
1	Failure to obtain planning permission	P.P (planning permission) not Granted
	Finance	Finance
2	Turned down for loan	Finance (loan) not granted
3	<i>Interest rates alter</i>	Interest rate changes
4	(A) up (B) down	Interest rate drops
	Building work	Building work
5	Delivery times of materials	Availability of materials
6	Builder unable to start on time	Labour Availability
7	Weather Conditions exceptional	Adverse weather
	Decorating	Decorating
8	Building not drying out	Interface of building and decorating work
9	Building drying out too quickly – cracks	
	Moving In	Moving In
10	Final connections to utility services, i.e. telephone	Utility provision
11	Postponed delivery of furniture	Furniture delivery
12	Restricted access	Will it fit?

Table 6.4. Comparative risk table

In total forty-five risks were identified twelve of which were identified by both groups and from the remaining risks eleven were unique to the Red group and eleven unique to the Green group as shown in table 6.5. In short, whilst both groups were working within the same time limits, with the same information and prompt lists they managed to identify a total of thirty-three risks. Eleven of those would have gone unrecognised without the benefit of being able to compare and contrast the two identified lists.

These results highlight the subjectivity of the risk identification process and the role that experience and intuition play; arguably two factors that significantly influence risk identification (see chapter 4). In the current study the organisation had no understanding of the experience or knowledge that each group held and consequently the groups performance in both the identification and assessment tasks reflected this. It may be argued that there was no need to assemble groups in such a regard for the purposes of a training workshop, however it should be borne in mind the degree of seriousness that the organisation places upon these training sessions.

RED TEAM		GREEN TEAM	
ID	Risk Description	ID	Risk Description
	Planning Permission		Planning Permission
1	Restrictive permission, i.e. size, use, location	12	Ground conditions not suitable
2	<i>Additional requirements, i.e. landscaping, drain upgrading, fire escape, additional access</i>	13	Delay
	Finance		Finance
3	Bank restrictions on loan	14	Alternative fund arrangement
4	Unexpected windfall, i.e. granny dies		
	Building work		Building Work
5	Below ground problems – could require piling	15	Work Acceleration
		16	Access
	Decorating		Decorating
6	Long delivery on carpet	17	Wife changes mind – colour
		18	DIY
	Whole Project		Whole Project
7	Portacabin	19	Use Individual sub-contractors
8	Share additional space for rent	20	Tax benefit potential
9	Convert garage	21	Company sponsorship
10	Family problems due to stress	22	Circumstance changes (redundancy)
11	Increased property values enables upgrade		

Table 6.5. Table of risks

Once the attendees have completed their training they are considered project risk managers and may be called upon to fulfil this role in the workplace. Therefore the workshops constitute the only dry run the employees will have before engaging in the actual process of risk management on a live project. Consequently these risk managers may be called upon at any time to assemble a group of professionals to participate in a live risk management process. The criteria for inclusion in such a group amounts to availability or 'having done something like it before'.

6.4 Summary

Because all of the above examples are drawn from a training workshop and not a real project-working environment, an argument may be forwarded that the groups are circumventing the process of assessment. They may be doing this by making assumptions regarding the nature of the hypothetical example in order to expedite the assessment process. However the conclusions are supported by well-established theories that are themselves grounded in actual behaviour and not experimental design and thereby assisting to validate the observed group behaviour in this research as a valid construct.

The organisations bespoke risk management strategy does not manage the individual, their decision-making or their preferences with regards to uncertainty and risk. However the strategy does manage the structural process of risk management by providing a framework within which the risk management processes are to be conducted. In conclusion it would appear that either the organisation is unaware of the need to manage individual perceptions, or alternatively the organisation may be aware of that need and have a desire to do so but are failing because of the reasons stated above.

The use of rhetorical strategies has been highlighted as a method by which individuals can exert their influence over their fellow group members. However this strategy also provides an explanation for the functional mechanisms motivating the risk-is-a-value hypothesis (Teger & Pruitt, 1967). The assumption is that the rhetorical strategies engender a group understanding and consequently the prevalent, or most accessible proposition, becomes the accepted group norm. However societies prevailing cultural response to given situations may still motivate the formulation of rhetorical strategies.

The use of the strategies may be a learned response on behalf of the construction professionals. Section 3.6.5 has shown how prescribed solutions to problems are often not available construction managers (Gunning, 1999, 1996) as a consequence of the complexity and uncertainty associated with contemporary construction projects (Williams, 1999). Therefore the rhetorical strategies are based upon some experiential knowledge, utilising judgemental heuristics, but are misplaced in the sense that they are utilised to formulate answers to problems with which the decision-makers have no actual experiential knowledge. Bounded rationality would appear to offer a plausible explanation for their formulation. The theory states that individual decision-makers minimise uncertainty by making assumptions etc (Simon, 1957); this maybe the case in this instance, however in some cases the assumptions may be incorrect and misleading. Consequently the heuristics and experiential knowledge utilised in their formulation are being misapplied.

The reasoning behind the acceptance of the strategies lies within the formal and everyday (Chater & Oaksford, 2001) quasi rationality, interpreted as consistently substandard and non-maximising behaviour exhibited by an individual (Raftery, 1999).

This implies that acceptance of the strategy is aided by the individuals language in their search for information and solutions, as reflected in the mind-models theory.

The conclusions drawn from the analysis of the transcribed group discussions that will assist in formulating a risk management strategy and that take account of individual perceptions and preferences are discussed in chapter 7.

7.0 Discussion

7.1 Introduction

Risk is irreducible from uncertainty; it only exists as a potentiality in terms of both impact and likelihood. However structured risk management strategies view risk as an objective reality established by virtue of their rational interpretation of the decision environment. These contemporary risk management strategies follow the generic processes of identify, assess and manage; the output of which are probabilistic interpretations of the decision realm. However the risk management strategies fail to consider the propensities of individual decision-makers with regards to risk and uncertainty, their motivations or their intuitive interpretation of the decision environment. Therefore a dichotomous view of risk is expressed by the perceptions of individuals and their intuitive interpretation of the decision environment.

7.2 Research Questions

At the outset of the research following two questions were set:

What is the cumulative effect, if any, of factors such as mood, motivation, rationality and complexity upon individual and group decision-making?

The first question may be addressed by examining the philosophy of risk. Firstly risk is irreducible from uncertainty (Hertz & Thomas, 1984) and has been shown to be an individual reaction to the unknown. Hence risk and uncertainty go hand-in-hand in expressing an individual's interpretation of their environment with regards to the perception of an unwarranted outcome (Beck, 1986). However individuals are susceptible to psychological phenomenon such as motivation, mood, desire and culture (Mellers *et al*, 1999; Douglas & Wildavsky, 1982). These factors drive the individual's perception of their environment with regards to their needs, wants and desires, therefore they impact upon the type of information and the way that the search for information is undertaken. Consequently individual decision makers may not always want the same as their peers in terms of decision outcome. Therefore they must rationalise these wants amongst the group to achieve group objectives that are acceptable to the majority. The second question is re-stated below:

How do individuals manage the information required to interpret their environment?

Individuals create 'short cuts' and establish 'types' which enable them to categorise some of the vast amount of information available to the decision makers from within their environment (Tversky & Kahneman, 1981). These heuristics etc. aid the decision maker by allowing them to make inference and comparison between present and past events which in turn negates the need to investigate the present environment in its entirety (Kahneman & Tversky, 1972, 1979, 1982a, 1982b, 1984). The problems arise with this process when the decision makers make spurious and unwarranted associations that are either incorrect or misleading. Also, as the derivation of these 'short cuts' is based upon individual experience and knowledge they differ between decision makers and so lead to conflicting views of group environments and the establishment of group objectives. The risky shift (Wallach *et al*, 1962), as described in chapters 4 and 5, has shown how some individuals are willing to alter their perception of their environment if sufficient information is made available to them (Teger & Pruitt, 1967). These differing opinions and interpretations may be considered using the analogy of the risk prism, not all prisms refract the 'light' in the same way. The following discussion highlights the way in which this research has attempted to rationalise these differing perceptions via the introduction of a new risk management process.

7.3 Purpose of Risk Management Strategies

The use of risk management strategies is founded on the belief that they add structure and objectivity to the process of risk management. However the framework of that strategy only adds to the auditable nature of those processes contained therein and does not objectify risk. The strategies do allow the participants to identify with, and to position themselves within, a defined process for the execution of the organisations risk management function. However the risk management strategies fail to accomplish the following:

- they fail to address the individualistic nature of risk identification and assessment;

- they do not differentiate between the possibilities identified by participants to the process and the probabilities required to execute a distributional analysis of the decision environment;
- the mechanics of the process are often flawed as they fail to elucidate on, or make explicit, the assumptions that drive the participants view of the decision domain; and
- the processes make no real attempt to manage the group dynamics or group performance within the risk management strategy.

The following discussion examines these failings in the strategies and concludes with an improved risk management process.

7.3.1 Assessments of Likelihood

Individuals do not naturally identify with distributional probability theory; even those with higher degrees often make assertions that contradict the axioms of probability theory (Bruine *et al*, 2000). These individuals express their perceptions of likelihood in terms of what is possible as opposed to what is probable. Consequently the following observations may be made which when considered will allow the conception of an improved risk management process.

Participants to the risk management process assign possibilities to the identified risks but these values are interpreted as probabilities by the strategy and the subsequent risk simulations. For probability theory to function an exhaustive list of potential future states must be identified (Shackle, 1969). Accordingly when the risk identification process is undertaken it is assumed that an exhaustive list of risks has been compiled, which are subsequently assigned a value that reflects their likelihood of occurrence. However when the values assigned to the individual risks are totalled they generally exceed the value of 100%. This is in an axiomatic violation of distributional probability theory, i.e. that when all the values are totalled they must sum to 1.0 or 100%. This leads to the assertion that the contributors to the process treat each risk as a discrete event independent of the others. Firstly this is in part attributable to the desire of risk management strategies to identify only the most important risks, or those with the greatest potential impact, which negates the need to establish an exhaustive list of potential outcomes. Secondly the causal dependencies and relationships

between the identified risks are often too complex to identify and are therefore ignored; as a result the participants to the process treat the identified risks as independent events. Consequently the participants attribute non-distributional values to those risks that reflect the possibility and not the probability of occurrence allowing the individual's affinity with the subjective possible as opposed to the objective probable measures to be expressed. However whilst the risks are assigned non-distributional measures they are treated as distributional probabilities by the subsequent process of assessment via simulation.

If the parties to the risk management process were asked to identify an exhaustive list of potential outcomes and assign values to them in accordance with the axioms of distributional probability theory those risks would exhibit two primary features. Firstly the assigned values would have to sum to unity and secondly as individual events they would be assigned significantly lower values of likelihood of occurrence as prescribed by the need to be distributional (Shackle, 1969). Nevertheless the identified risks are treated as the events most likely to occur; the remainder of those risks that would sum to unity when added to that risk are seen as unimportant by virtue of the lower values they would be assigned and are not considered. The structured risk management strategies therefore truncates the process by assuming that those identified risks are most likely because of the objective distributional probabilities assigned to them by that process. Whereas in reality they are simply the risks identified by the participants within the process that are considered highly possible, i.e. non-distributional, with assigned values that reflect this.

7.3.2 Group Effect on Assessments of Likelihood

The group discussion effect reported in chapter 5 that resulted in increased risk taking, the 'risky shift' (Wallch *et al*, 1962), may be reinterpreted if the values assigned to those risks are treated as possibilities and not probabilities. The participants offer opinion within the group discussions that reflect what is seen as possible to the individual. They do not present any evidence to support their claims other than verbal accounts of their own subjective interpretation of the decision domain, see chapter 6. The individuals will recount examples that reflect their relative positions with regard to their need for certainty. However the previous discussions recited above and in chapter 3 highlights the nature of subjective perceived likelihood.

Consider the nature of gambles, and in particular national lotteries. If those willing to gamble truly understood the odds against a win, rationally speaking they would not gamble. However many do gamble arguably because they believe that it is entirely possible to win, a notion that is not expressed as a probabilistic likelihood but as an intuitive, motivated desire; consequently this behaviour is seen as irrational and not objective.

The use of rhetorical strategies by group members, as discussed in chapter 6, to convince others that their individual position is valid may encourage other group members, and hence the group, to choose inherently more uncertain options. This transposition of individual perceptions, as conveyed in the strategies, to group decisions, as achieved by consensus, may account for the risk-is-a-value explanation of the risky shift phenomenon (Clarke & Crockett, 1971). The participants choice options may then be considered to express the following; 'if it were possible that I may be successful I would accept the option' and not 'my chances are 'x' out of ten for success'. However if the participating group members were offered more than one potential outcome within the CDQ it is not unwarranted to assume that they would also assign higher non-distributional values to other options. Therefore if the subjects discussed numerous other potential outcomes they would assign equal weightings of '8 out of 10' expressions of possibility to more than one, which would not be practicable if they were considering the probabilities of success.

7.3.3 Derivation of Subjective Possibilities

The subjective interpretations of likelihood are derived from experiential knowledge and where that is unavailable information from the immediate environment is utilised to inform the decision-making process (Tversky & Kahneman, 1981). Those experiences recounted by individuals in group discussions may add to the knowledge of the individual that in turn alters their font of knowledge with regards to decision-making, if what is being communicated is deemed pertinent and of value to the recipient.

As individuals mature they learn and acquire experiential knowledge (Adams, 1995), consequently it is unlikely that they would ever find themselves in a position where they have little or no knowledge with regard to the decision at hand. This is made

possible by the individual's use of heuristics and other decision/learning tools that allow them to generalise between situations. However these 'tools' often encourage decisions, as conveyed by descriptive theories of decision-making, that are deemed irrational because they make inference and suggestion that may not be relevant to a perceived objective and rational interpretation of the decision-realm as advocated by the normative theories.

7.4 Improved Risk Management Process

The primary aim of the research, below, expressed the need to address individualistic responses to risk and uncertainty.

- A1: Establish a risk management process that addresses the impact of individual and group reactions to risk and uncertainty.

Consequently the recommended improvements to current risk management processes are not necessarily concerned with the process per se, but more concerned with the execution of that process and the reliance placed upon its output. Figure 7.1 shows the contemporary risk management process as discussed previously in section 3.6.1.

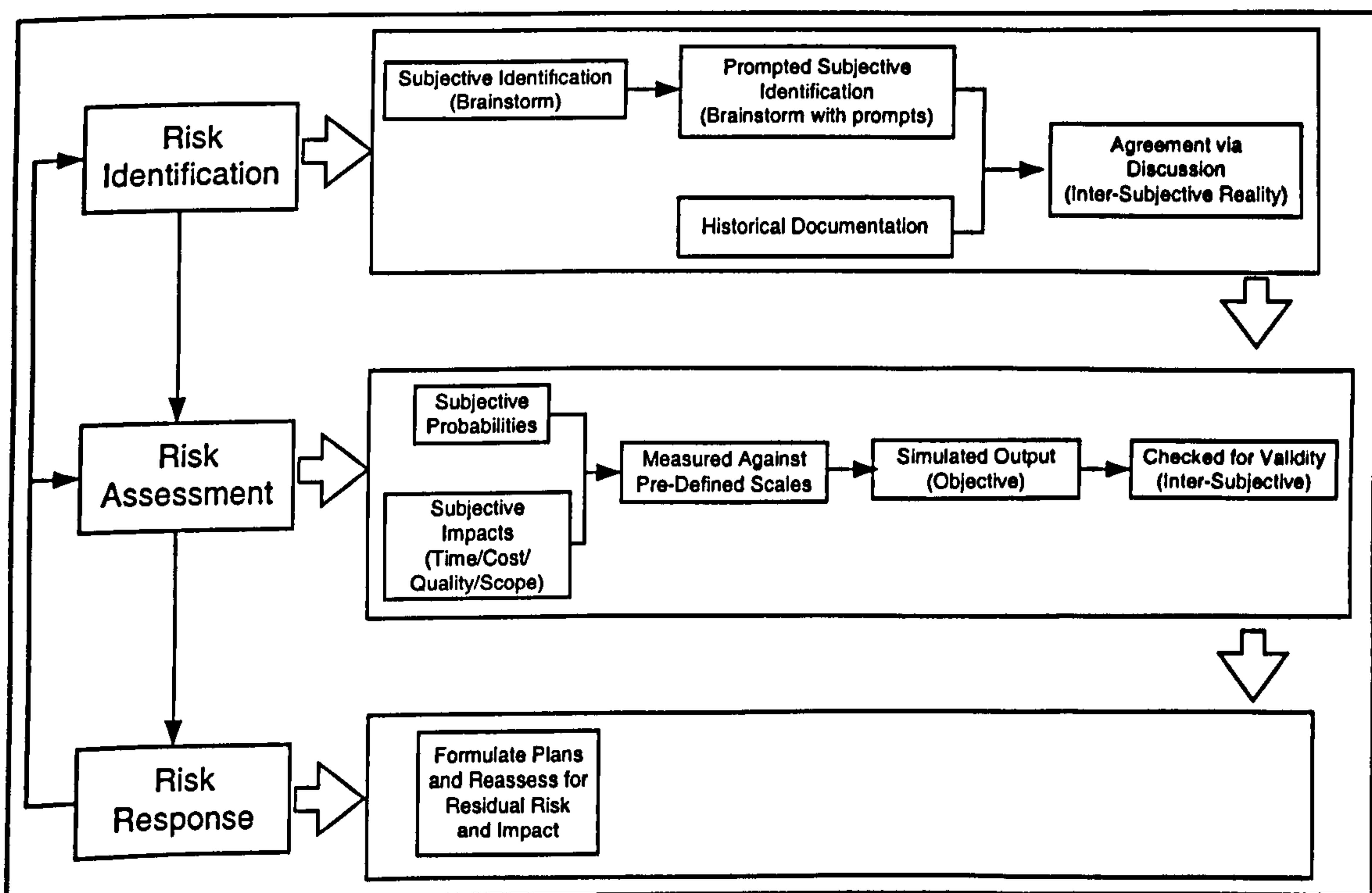


Figure 7.1. Contemporary risk management process

The process relies upon the unrealistic notion that all participants to the process share the same interpretation of the decision environment and are rational and objective in their deliberation of it. The proposed process in figure 7.2 acknowledges the differences in the participants understanding of the decision environment and seeks to rationalise these by encouraging those participants to discuss and present their interpretation to the decision-makers before commencing the risk identification or assessment processes. This process must encourage the recording and discussion surrounding each participant's assumptions about the environment. One method of doing so is by using 'rich pictures' to present their interpretations and hence assumptions to the other decision makers (Rosenhead & Mingers, 2001).

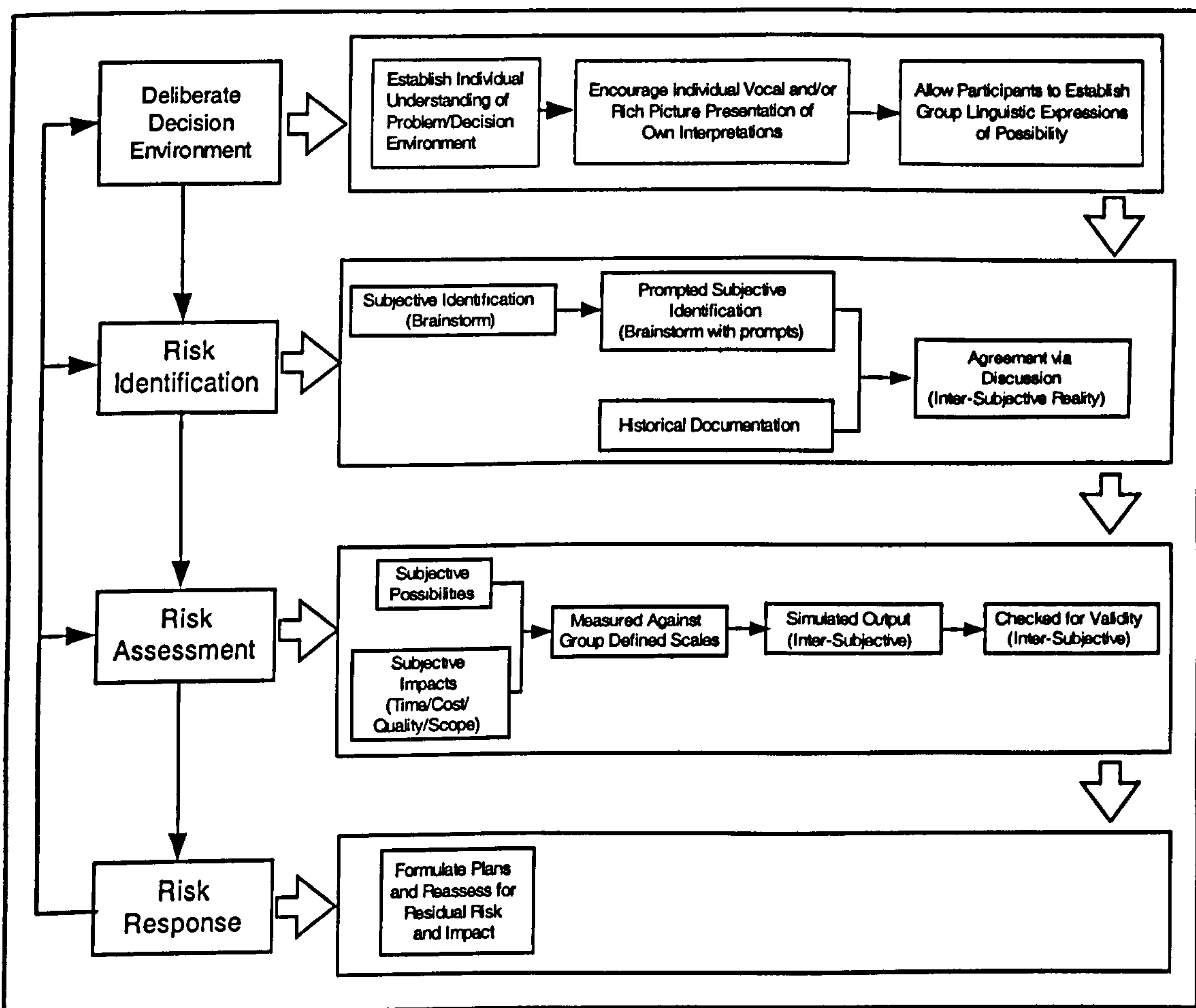


Figure 7.2. Proposed risk management process

Also the proposed process highlights the need to allow the group members to construct their own linguistic interpretations of possibility. The case study highlighted how the group members preferred to use the provided linguistic constructs rather than the numerical probabilities. However this thesis interpreted the linguistic constructs as

ones conveying notions of possibility as opposed to probability. Consequently the group members were using the provided constructs that in actuality meant different levels of possibility to the different group members; “words carry different connotations for different people” (Rosenhead & Mingers, 2001).

Therefore the proposed process encourages the group members to construct a group lexicon of terminology to convey their interpretations of possibility. This may be achieved by group discussion of their individual interpretations and recording those within the discussion documents for reference throughout the deliberation process. Figure 7.3 shows the effect of these changes utilising the risk prism.

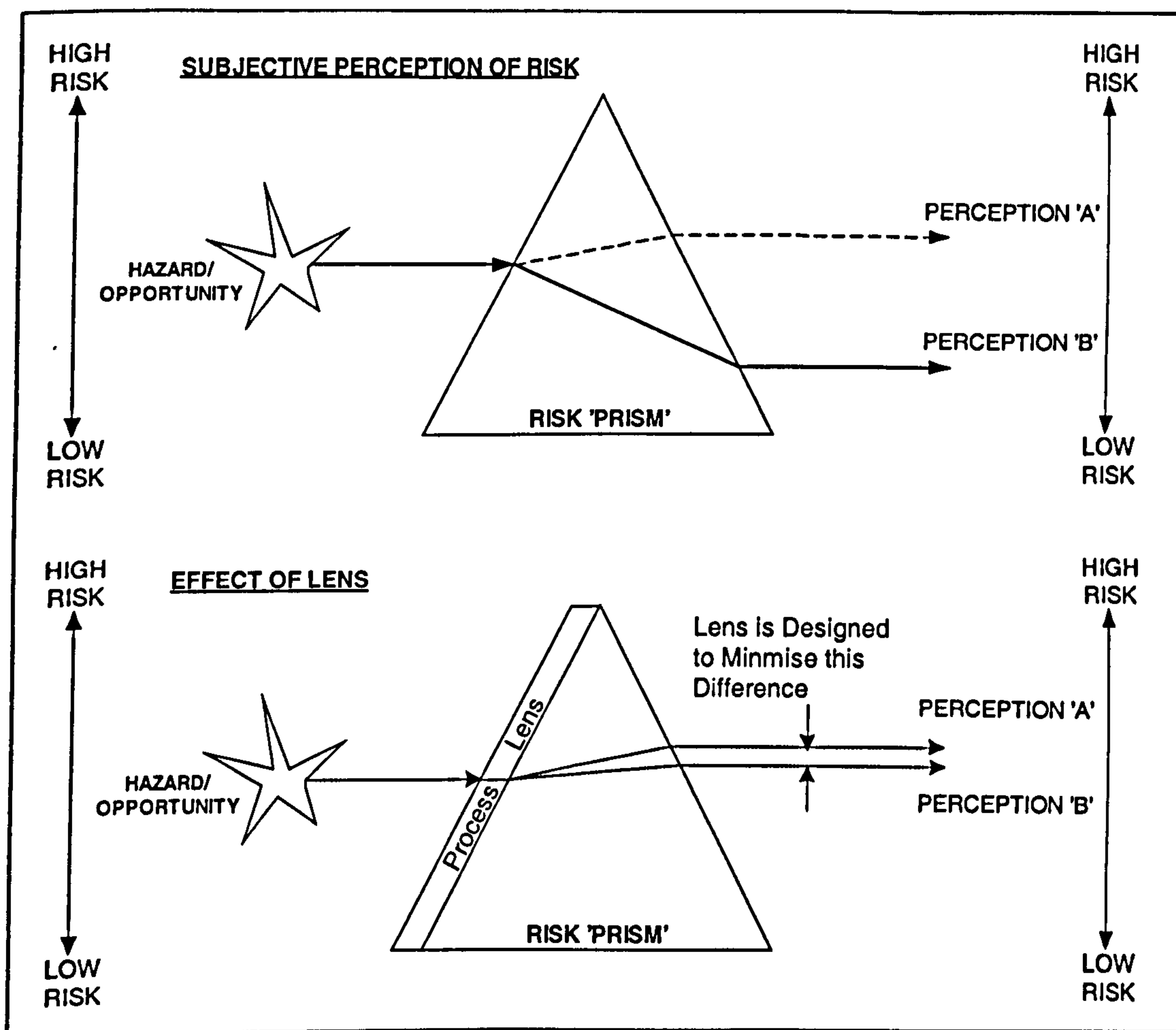


Figure 7.3. Risk prism with lens

The changes in the process, those sub-processes that encourage assumptions and interpretations to be rationalised, act as a lens at the front of the prism focusing those perceptions into an area of common group understanding of the decision/problem

environment. Consequently the high/low risk measure in figure 7.3 conveys a group inter-subjective interpretation of the decision/problem environment as opposed to an objective perspective of the risk and uncertainty that the decision makers face.

The functionality of the final change relies upon what use is made of the output of the risk management process. Currently the simulated outputs are deemed to be objective and definite and as a consequence too much emphasis is placed upon those outputs; therefore the proposed process encourages the use of possibilities as a currency for simulation. However as the contemporary processes are doing this already, albeit under the misunderstanding that the output conveys probability of occurrence, the improvement to the current process is one of education of those who seek to utilise those outputs.

8 Conclusions, Recommendations and Further Research

8.1 Introduction

This chapter reports the performance of the research with regards to the achievement of the research aim and objectives. The conclusions and recommendations are discussed in light of their limitations together with recommendations for risk management practitioners.

8.2 Performance Against Aim and Objectives

The achievements of the research are compared below against the aim and objectives identified at the outset of this research.

8.2.1 Aim

The research aim was to:

A1: Establish a risk management process that addresses the impact of individual and group reactions to risk and uncertainty.

The attainment of the three principle objectives discussed below was critical to satisfying the principle aim of this research, consequently the relationship between the aim and objectives is a reciprocal one. The following discussion in this section briefly outlines the manner in which the objectives were satisfied and the results of those investigations. The conclusions and recommendations included in this chapter combine to satisfy the principle aim.

8.2.2 Objective O1

O1: Ascertain the contemporary position of risk management strategies and determine the impact of individual and group reactions to uncertainty upon the execution of the risk management process.

Objective O1 has been achieved in three parts. Firstly the acknowledged attributes of individualistic behaviour towards uncertainty and risk were identified from an extensive literature review, chapter 3. The review highlighted the theoretical basis of

individual and group reactions to uncertainty and risk. Subsequently the implications of these findings were tested in chapter 5 by replicating the Wallach *et al* (1962) study. This section of the research established the effect and implications of individual perceptions, preferences and group culture on the decision preferences and behaviour of those group members, both individually and collectively. The study replicated the original study, the risky shift, and verified that construction project management decision-making groups were inclined to live with greater uncertainty than were the members of those groups. The literature review had identified a number of potential causal factors that contributed to the risky shift. Subsequently the case study, described in chapter 6, identified the strategies employed by group members in order to communicate their perspective and to influence their fellow group members. These conclusions add to our understanding of the dynamics of group discussion within construction management decision-making groups further addressing the objective outlined in O1.

8.2.3 Objective O2

Research objective O2 was to:

- O2: Conceive an approach that allows individual uncertainty preferences, perceptions and assumptions to be rationalised in a group decision-making environment.

Figure 7.2 details the proposed amendments to the identified contemporary risk management processes. The amendments are concerned with encouraging group members to become acquainted with one another's assumptions with regards to the nature of the decision environment and the meaning inherent in their expressions of possibility. Also the approach recommends that possibility, and not probability, be used as the 'currency' for communicating perceived risk and risk management outputs.

8.4 Summary of Research

The use of risk management strategies in construction project execution has had some of its weaknesses exposed, namely the failure of such strategies to consider the role of the individual within the risk management process. Consequently this research has undertaken an investigation to ascertain and understand the nature and impact of

individual decision makers upon the risk management process and how this may be addressed. The attributes and influences upon individual decision-making, risk and uncertainty perceptions and preferences have been explored and discussed in some detail. From those the 'risk prism', a metaphor for the perception and preference of uncertainty, was developed to illustrate the manner in which these decision-making attributes operate.

An investigation was undertaken to replicate the 'risky shift' phenomenon in decision-making groups populated by construction project management professionals. The results of this investigation ascertained the influence of the group environment upon construction management decision makers, namely that individuals were influenced to accept greater uncertainty in a group decision environment.

A case study investigation of an organisation's attempt to introduce a new risk management strategy was undertaken from which an enhanced understanding of the group discussion and decision-making environment was ascertained. The findings drawn from the case study combined with the data gathered from the risky shift experiment and the literature reviews have produced the following conclusions and recommendations.

8.5 Conclusions

The following discussion details the conclusions derived from the present research.

8.5.1 Risky-Shift Phenomenon

The results of the Wallach *et al* (1962) study have been generalised in an organisational specific work environment. It has been observed that construction management decision-making groups are subject to influence from the risky shift phenomenon. This conclusion implies that construction management decision-making groups are living with greater risk and uncertainty than are the individual construction and project managers that comprise the group. The findings also suggest that construction management decision-making groups are liable to be influenced by issues such as group composition. It should therefore be possible to design a risk management strategy that acknowledges the attributes of individualistic behaviour

towards uncertainty and risk and one that also conveys a desired perspective of risk and uncertainty.

8.5.2 Use of Rhetorical Strategies in Group Discussions

During group discussions regarding risk identification and assessment individuals would resort to the use of a rhetorical strategy. The strategy was employed to convince the other group members of the validity of their proposition by explaining often-hypothetical situations to the other group members that conveyed the desired position. However prima facie acceptance of these strategies would appear to rely upon group composition.

8.5.3 Use and Acceptance of 50/50 Propositions

Groups opt to use verbal constructs of probability rather than numerical percentile expressions during group discussions. Similarly the studied groups were often unable to discern a meaningful difference between the prescribed forms of options available and instead opted for 50/50 expressions of likelihood, effectively expressing ignorance of the decision-environment.

8.5.4 Role of the Devils Advocate in Group Discussions

The inclusion within the group of an individual who is prepared to question the accuracy of the group's propositions enhanced the group decision-making process. The questioning individual, or devils advocate, encouraged their fellow group members to ask 'what if?' questions which in turn forced a reconsideration and discussion of the proposition in question.

8.5.5 Risk Identification and Group Composition

The two groups who undertook the risk identification process showed marked differences in the nature of the identified risks. As the groups were assembled with no regard for their experiential knowledge etc concern remains that the risk identification process is not being managed effectively.

8.6 *Recommendations to Risk Management Practitioners*

This research has highlighted the subjectivity of the risk identification and assessment processes. Therefore the assumption that outputs from the employed risk management

strategies are objective need to be re-assessed in light of the conclusions detailed within this thesis.

The previous findings and conclusions suggest that the following may be adopted to construct the organisational lens that will allow the risk perceptions and assessment to be normalised:

- adopt the proposed risk management strategy that includes the 'Deliberate Decision Environment' process;
- encourage assumptions analysis at all stages of the risk management process;
- allow the groups to create verbal constructs of possibility and disregard numerical percentile expressions;
- interpret the out puts of the risk management strategies as possibilistic interpretations of the decision environment;
- educate employees of their own heuristics and decision-making 'short cuts'; and
- include devils advocates within each risk management decision-making group.

These recommendations are bounded in their applicability by the following limitations inherent within this research.

8.7 Limitations of this Research

This research, its conclusions and recommendations are restricted in their application by the following limitations. Firstly the thesis has incorporated a contradiction within its methodological execution by using the Wallach *et al* (1962) CDQ to test for what has been argued is a purely subjective phenomenon. The methodology explained herein has gone some way to explain this apparent contradiction however it remains a seemingly irreconcilable problem; namely how to establish, record and examine individual, subjective perceptions.

Secondly the scope of the research was limited to one organisation operating within the construction industry. Therefore it is possible that the observed effects are generalisations of a culture specific to the participating organisation. This potential

effect cannot be discounted and requires a further replication of this research within differing organisations to assess the validity of the findings and conclusions.

Thirdly only two groups with four members in each were observed in the case study investigation thus limiting the generality of the conclusions derived from the research. Consequently this research project and the conclusions are intended to be used as a point from which to start a more thorough investigation to ascertain the validity of its findings. Therefore this research constitutes a pilot study that will allow greater focus for subsequent studies by providing a focus for their instigation. It is also hoped that this research will foster a wider discussion amongst the construction management research fraternity on the topics and issues raised herein.

Finally, the conclusions derived from the case study investigation are essentially subjective. However the evidence upon which all conclusions are drawn is presented for analysis. Nonetheless it is impracticable to comprehensively present the information and data collected which undoubtedly assisted in the derivation of a number of the conclusions. This is attributable primarily to the confidential nature of the cooperating organisations bespoke risk management strategy. Nevertheless the methodology included within this thesis will allow a replication of this study to be undertaken.

8.8 Further Research

This thesis presents the data and subsequently derived conclusions of an investigation in to group decision-making within the discipline of construction project risk management. The research has detailed a number of previously unidentified means by which construction management decision-making groups communicate subjective values and preferences for the purpose of influencing their fellow group members. However further research is required for two purposes, firstly:

- 1 to establish the generality of these findings; and secondly
- 2 to develop them into usable tools for the management of construction project decision-making groups.

Therefore the following recommendations may assist in satisfying these two criteria.

8.8.1 Communication of Probabilities

Comparative research should be undertaken to test the effectiveness of verbal constructs and numerical percentile to communicate a desired level of risk and uncertainty. Furthermore this verbal construct should be developed with specific regard for the group who will be considering its application to ensure that the intention is communicated to the group in the language that the group helped to compose.

8.8.2 Management of Group Discussions and Decision-Making

An 'informed' individual should be placed within a decision-making group with instructions to communicate a pre determined perspective to ascertain whether purposeful manipulation of group perceptions is possible or viable. Comparison should be made with control groups who have studied the same decision domains but without the inclusion of an informed individual.

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APPENDIX A

Questionnaire

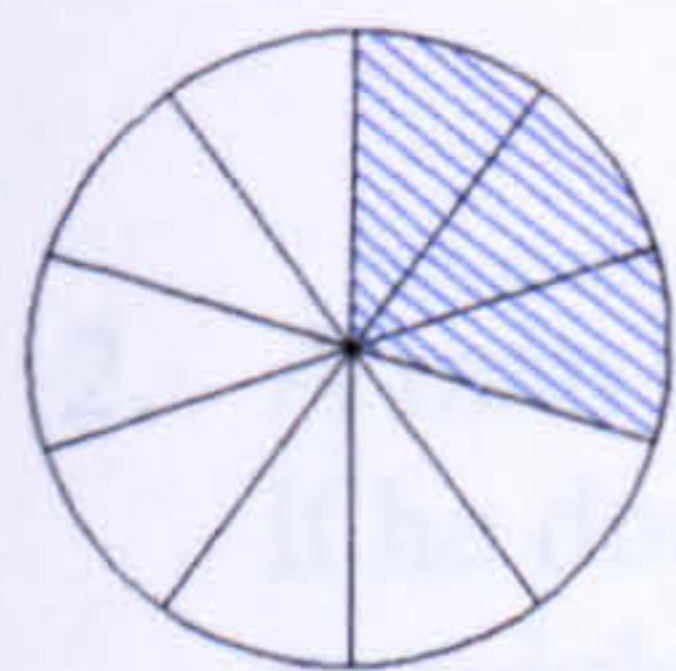
ID:

For each of the following scenarios (1 - 12) please indicate the lowest probability of success you would accept before recommending the potentially more rewarding but riskier option.

The probabilities are listed as a 1, 3, 5, 7, or 9 out of ten chance of success. Strike through with your pen the option which best represents the number of times you would require proof of its' success before recommending the riskier option.

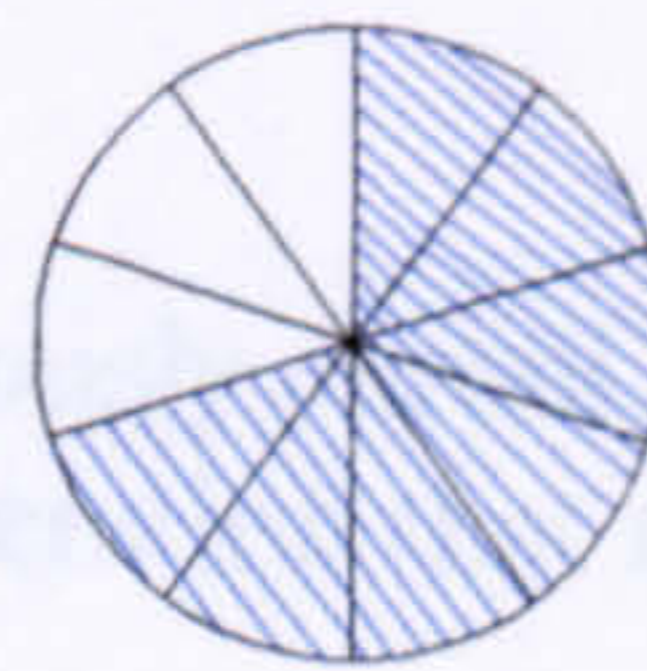
If you would not choose the riskiest alternative, no matter what the chances of success, please highlight the 10 option.

Explanatory Note



This circle depicts a three in ten chance of the riskier option succeeding

3 in 10
Chance

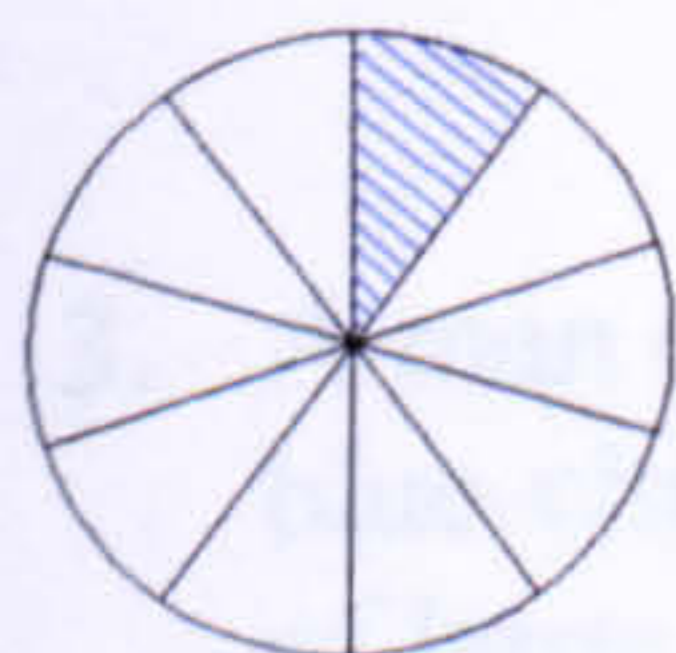


This circle depicts a seven in ten chance of the riskier option succeeding

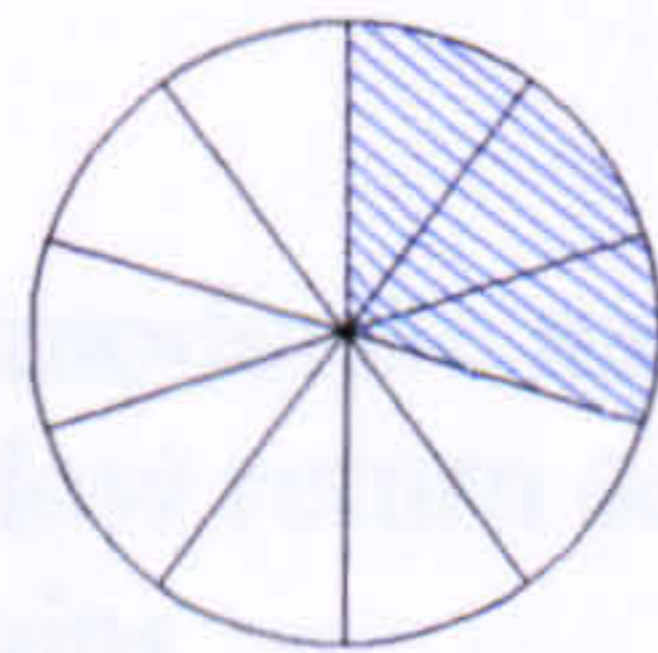
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Example Question

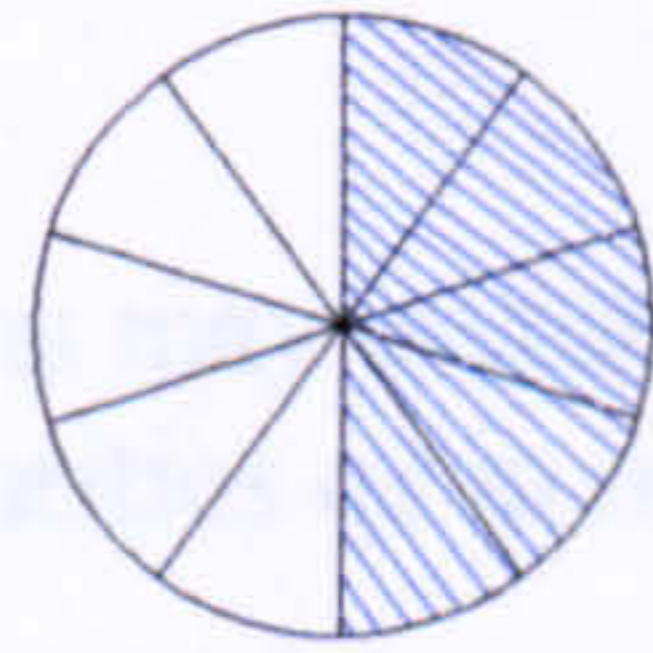
- a) A house requiring underpinning may be purchased at a reduced rate well below market level. If the underpinning is successful the house could be sold at a substantial profit, however the structural engineer cannot guarantee the success of the underpinning procedure.



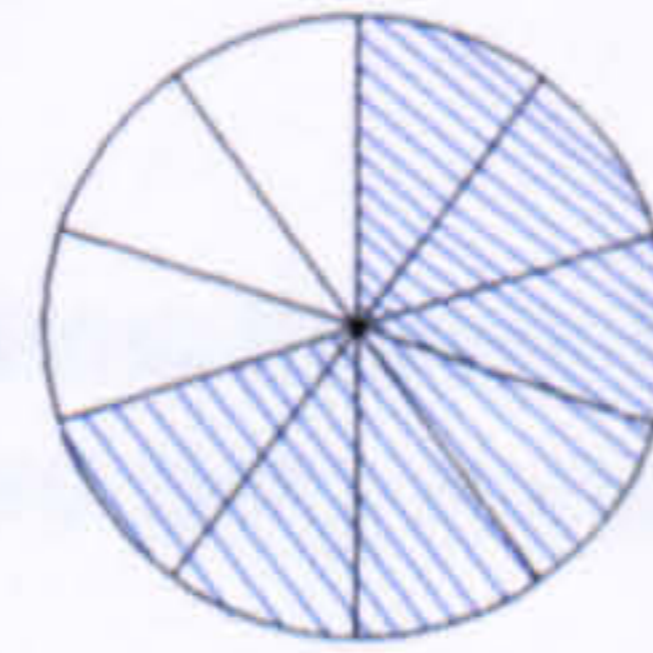
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Chance



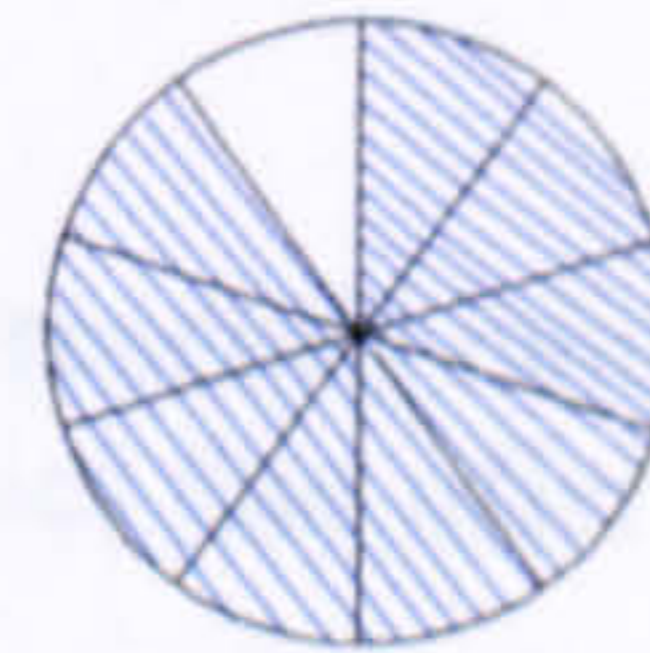
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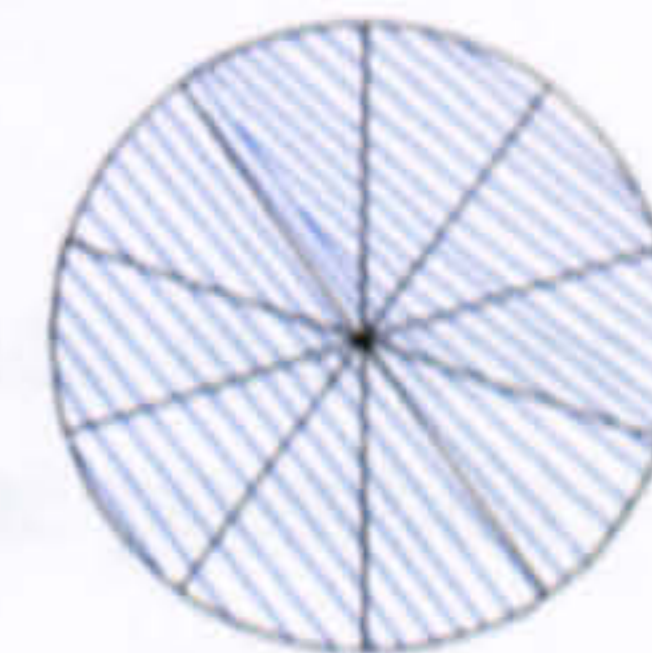
5 in 10
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7 in 10
Chance



~~9 in 10
Chance~~



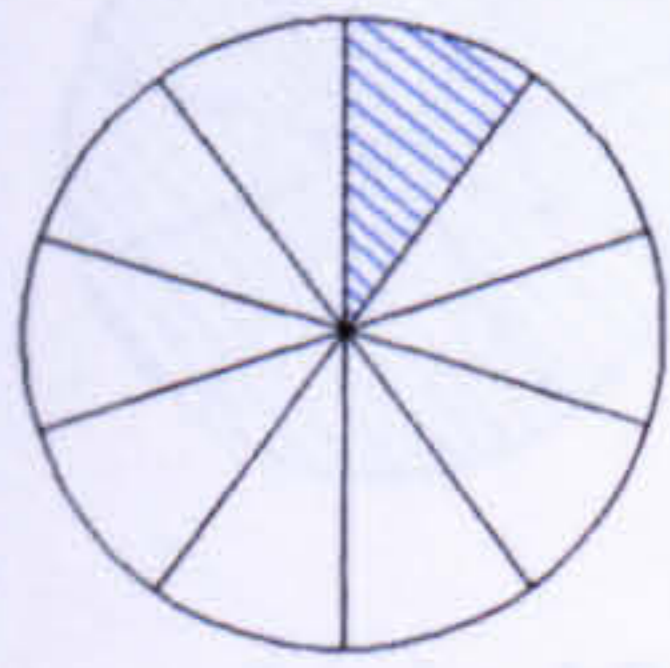
10 in 10
Chance

In this example Adam required evidence to assert the probability that the underpinning would be successful nine times out of ten before advising that the riskier option of buying the property be adopted.

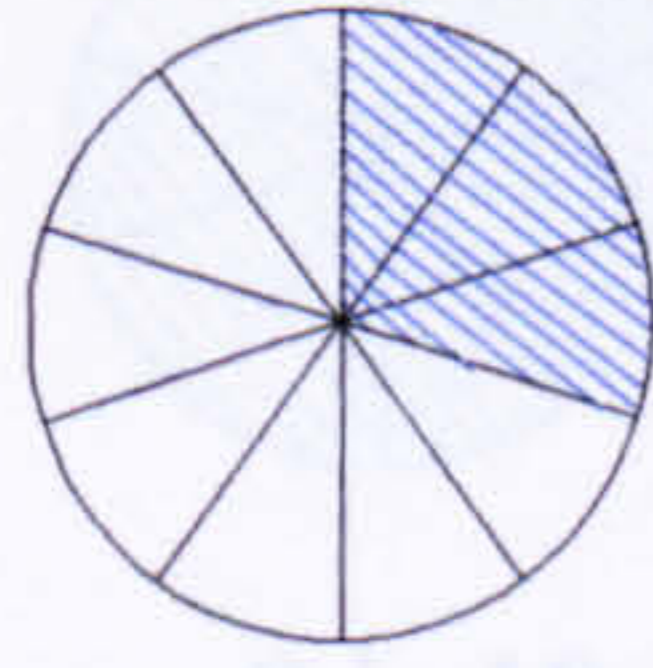
The questionnaire begins on the following page.

4. A captain of a college football team, in the final seconds of a game with the college's traditional rival, may choose a play that is almost certain to produce a tie

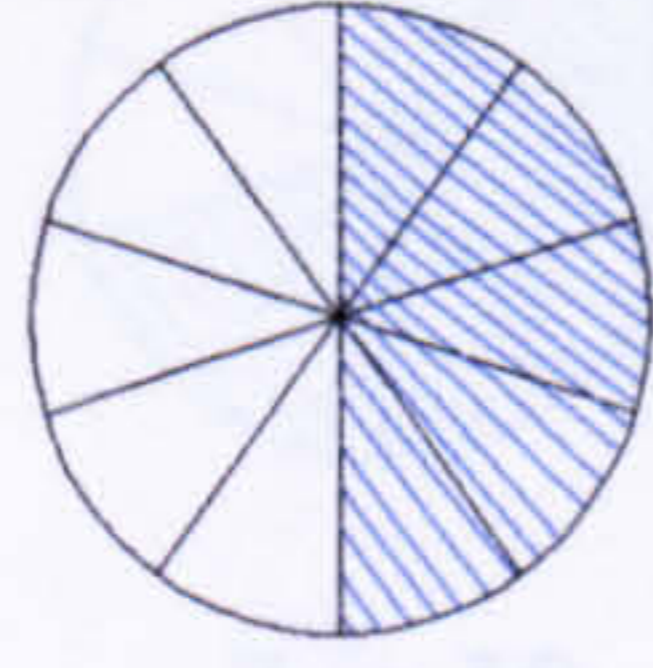
1. An electrical engineer may stick with his present job at a modest but adequate salary, or may take the new job offering considerably more money but no long-term security.



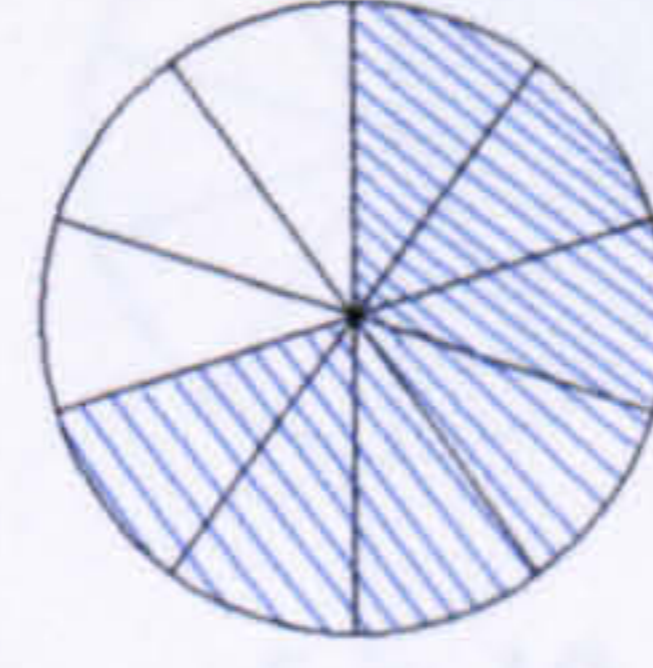
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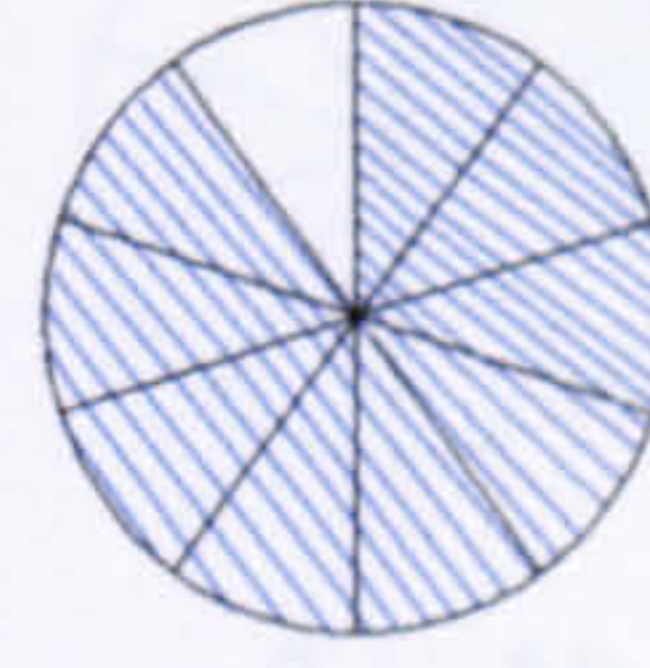
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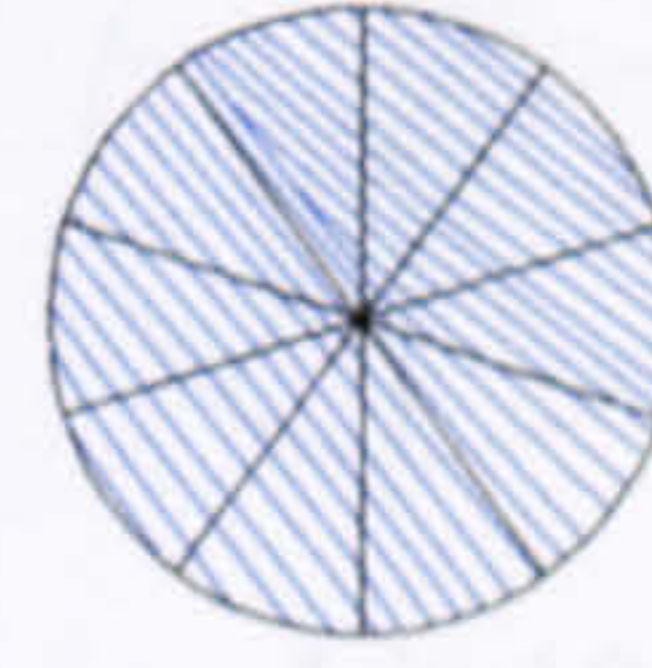
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7 in 10
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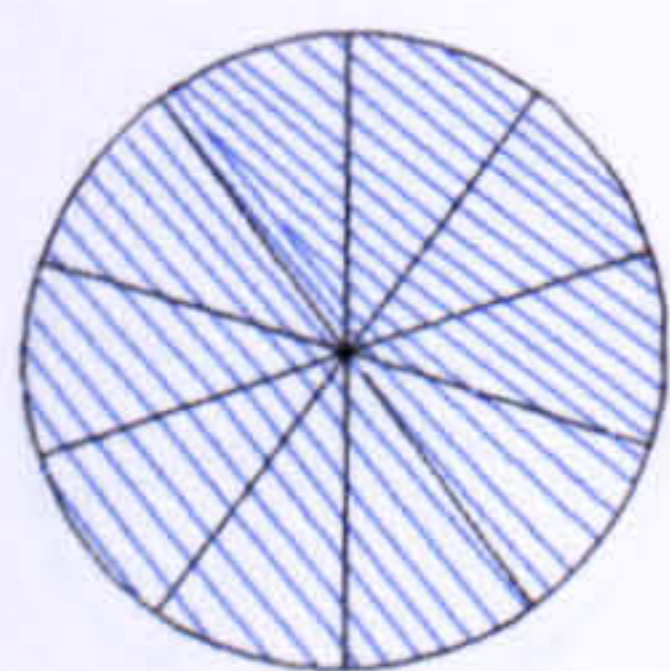


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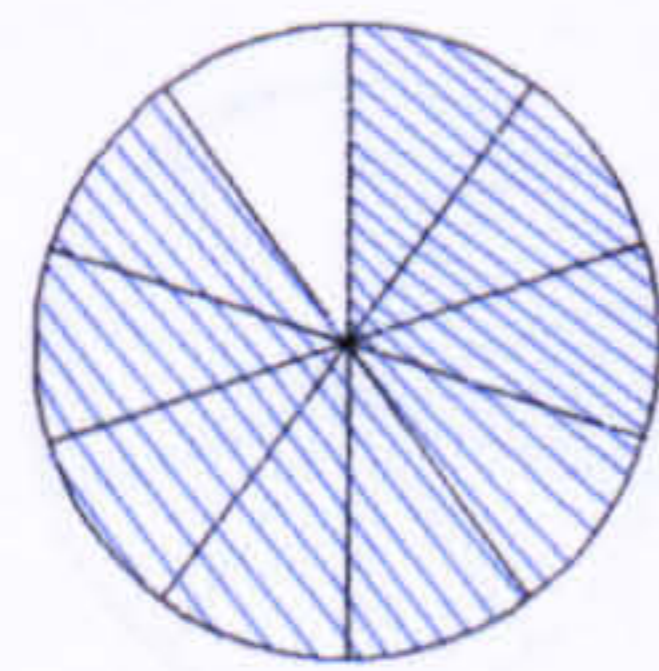


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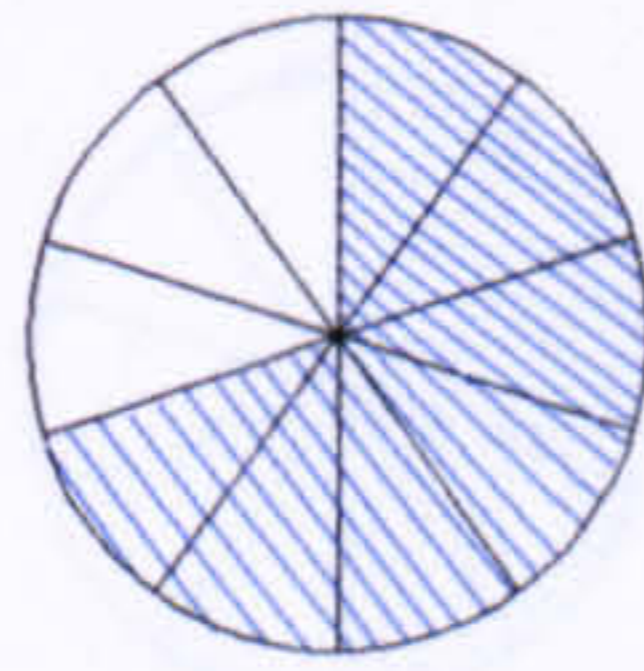
2. A man with a severe heart ailment must seriously curtail his customary way of life if he does not undergo a delicate medical operation that might cure him completely or might prove fatal.



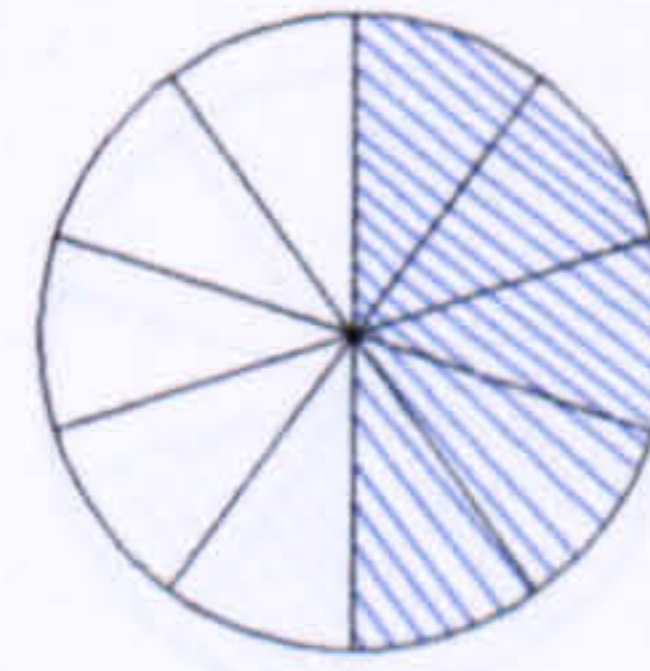
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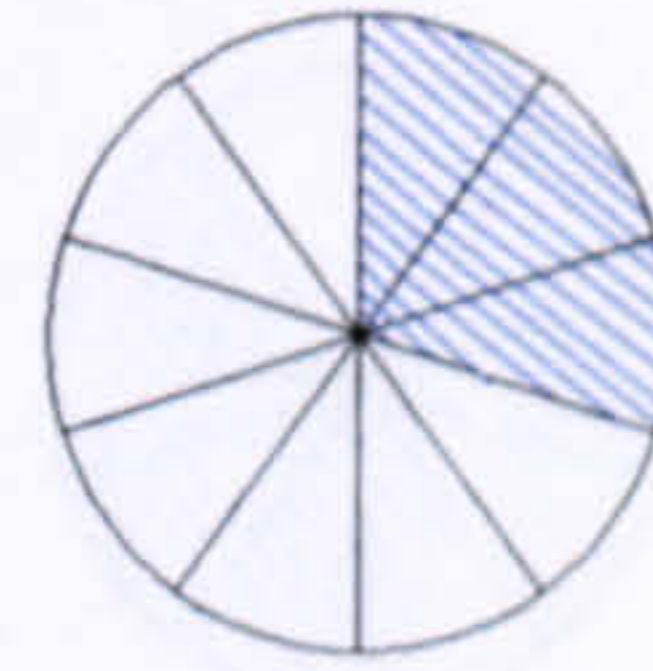
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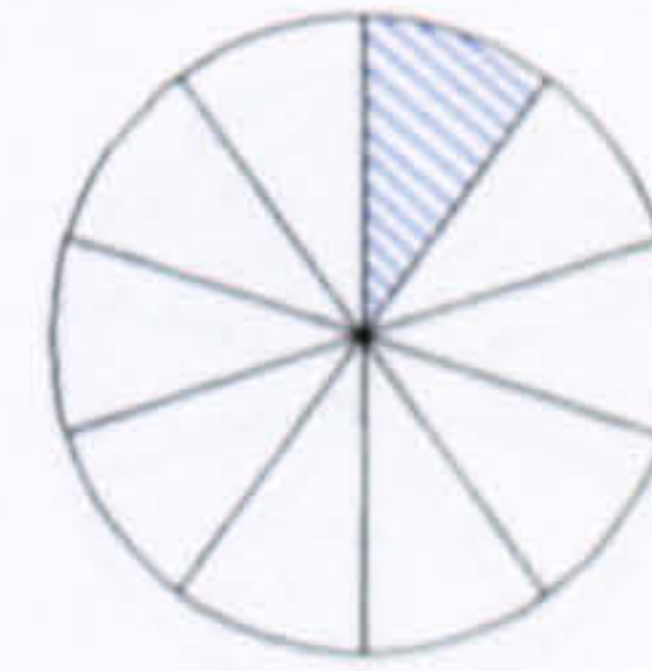
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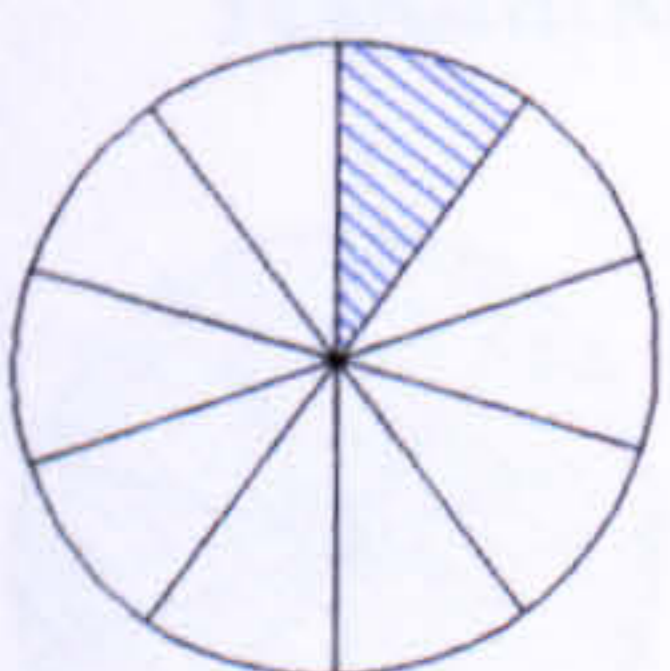


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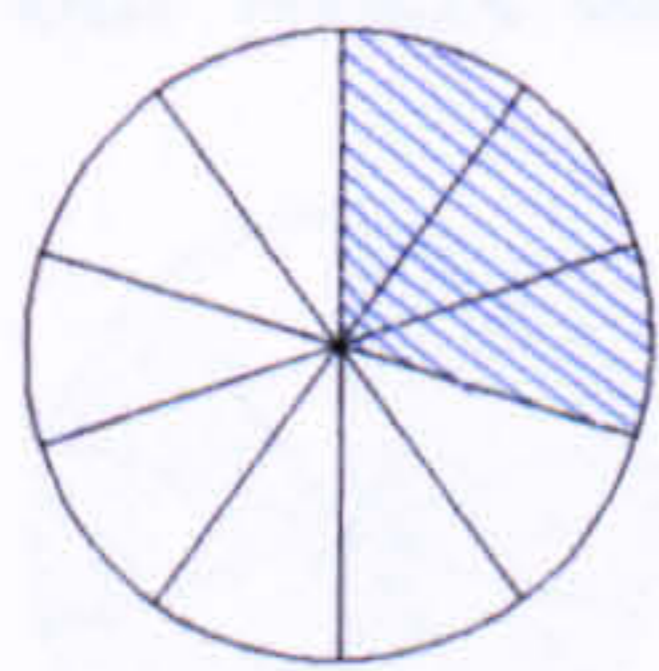


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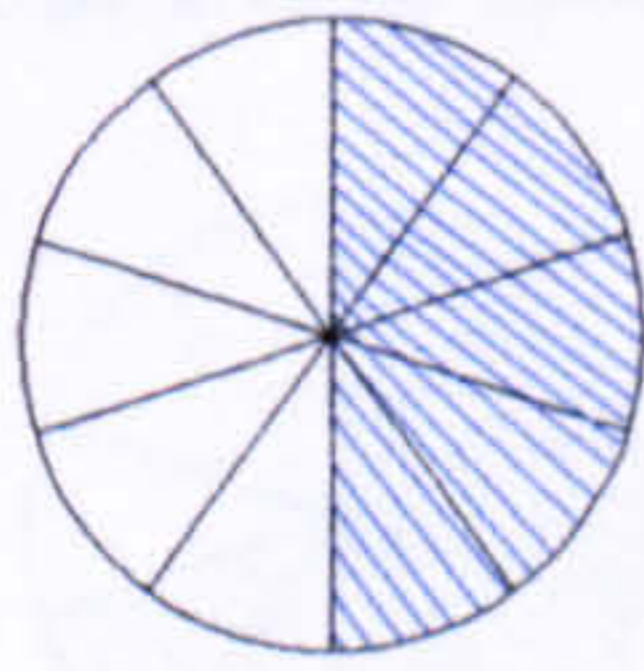
3. A man of moderate means may invest some money he recently inherited in secure blue-chip low return securities or in more risky securities that offer the possibility of large gains.



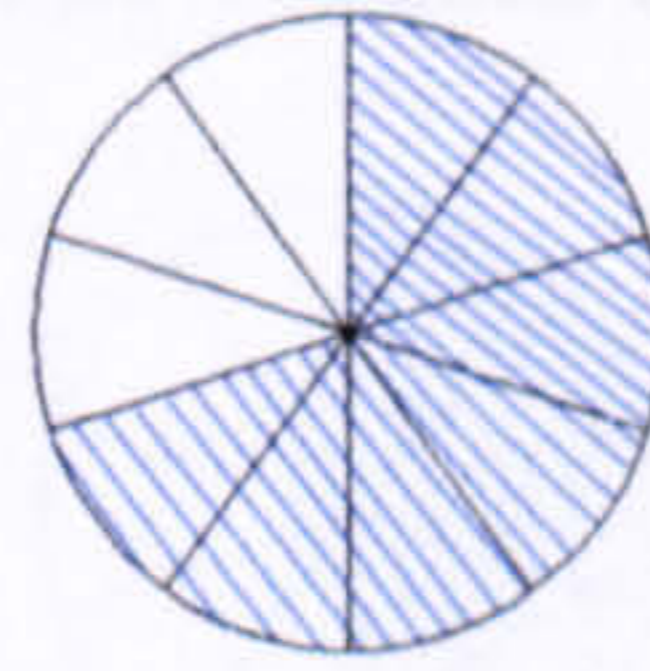
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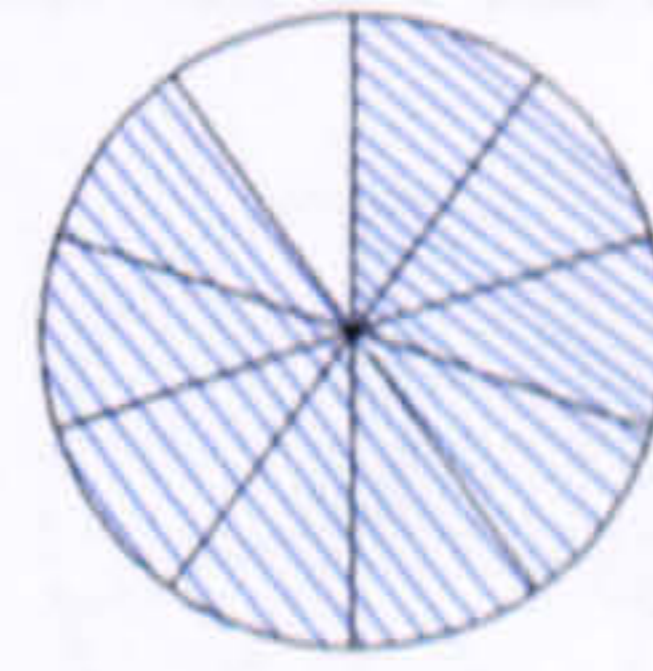
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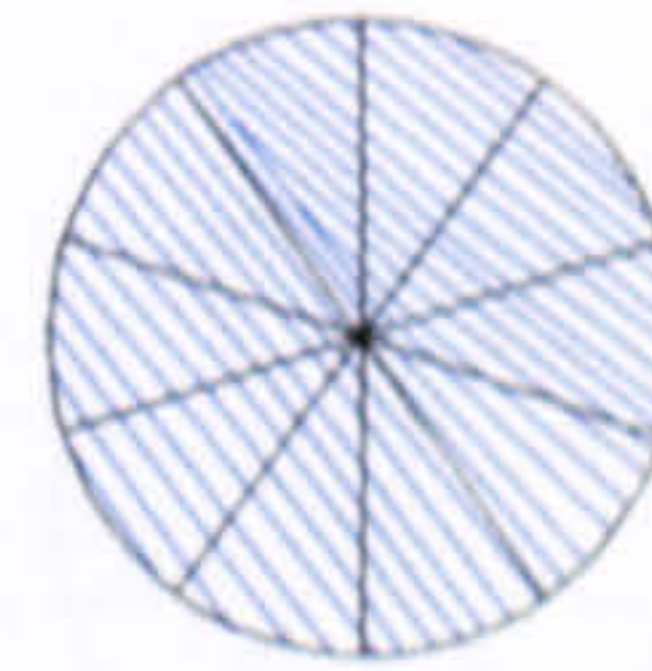
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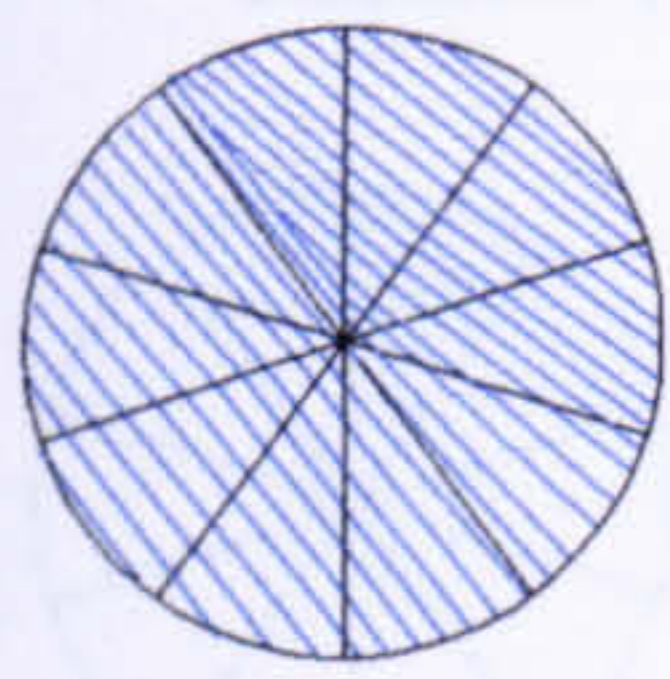


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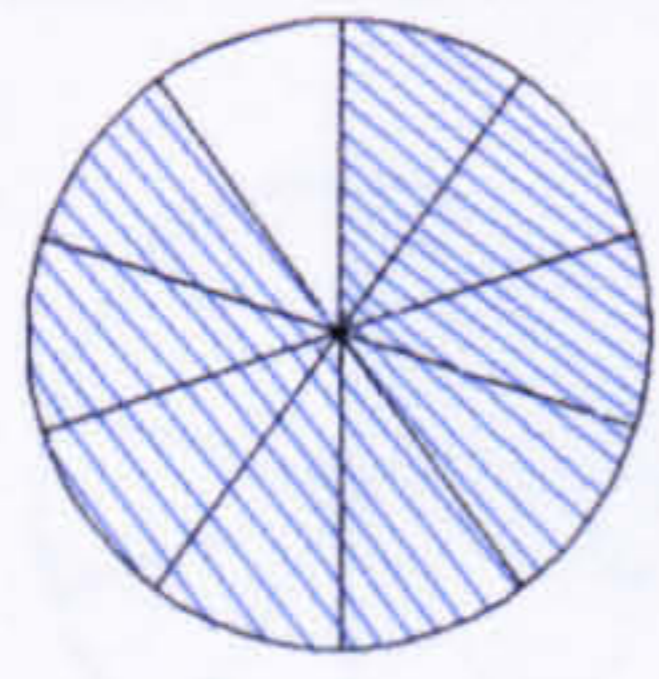


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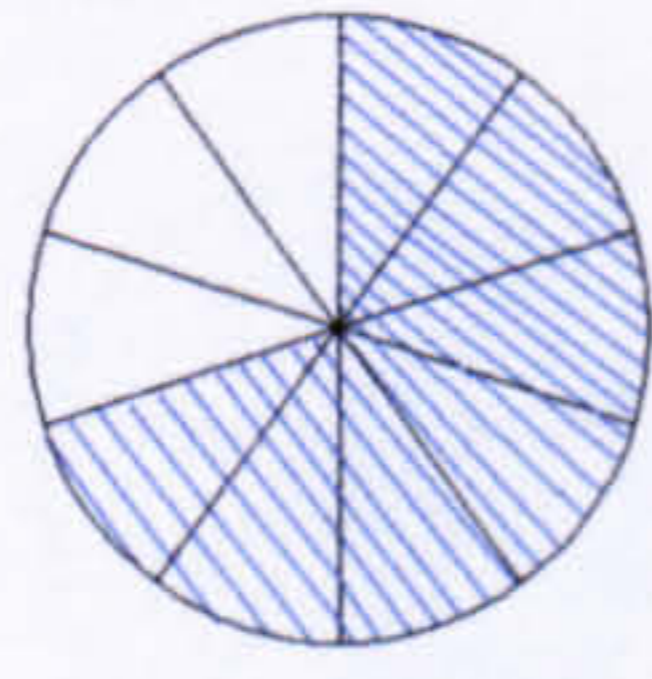
4. A captain of a college football team, in the final seconds of a game with the colleges traditional rival, may choose a play that is almost certain to produce a tie score, or a more risky play that would lead to victory if successful, sure defeat if not.



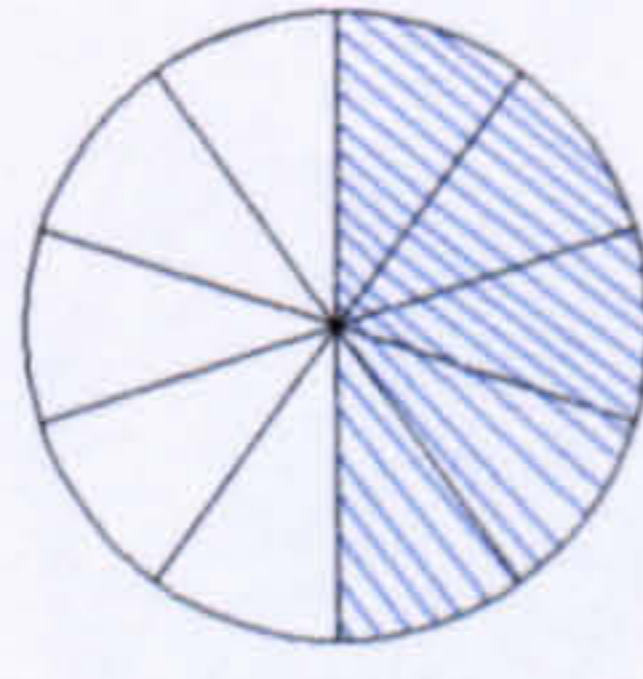
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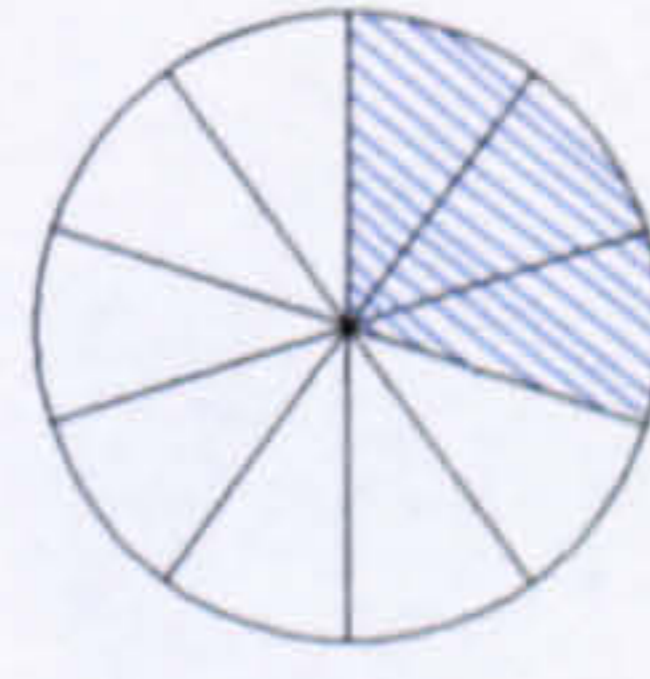
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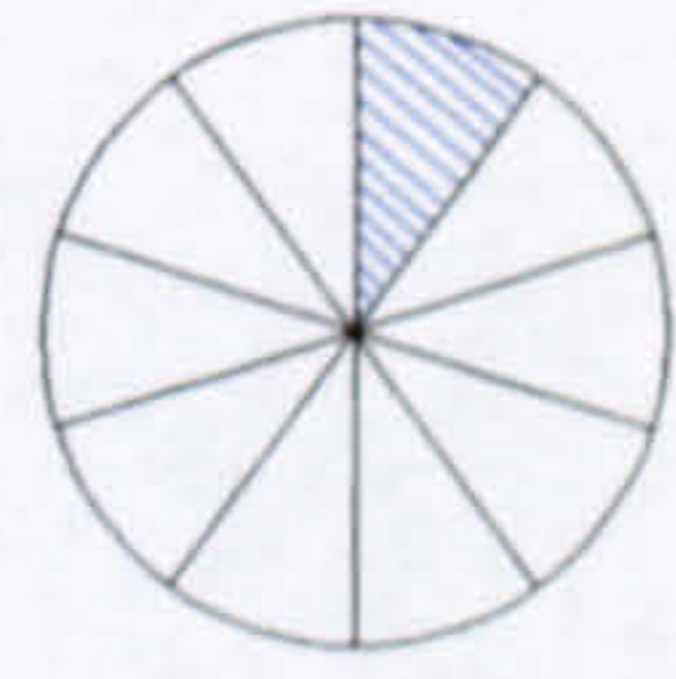
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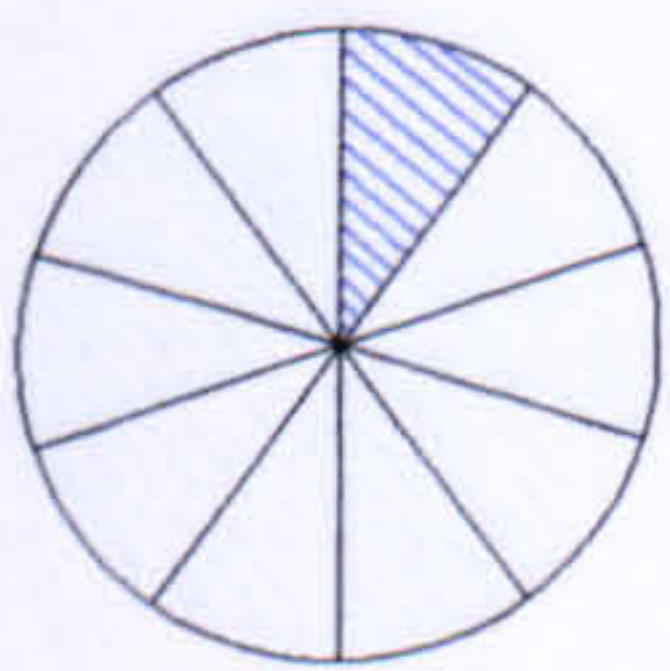


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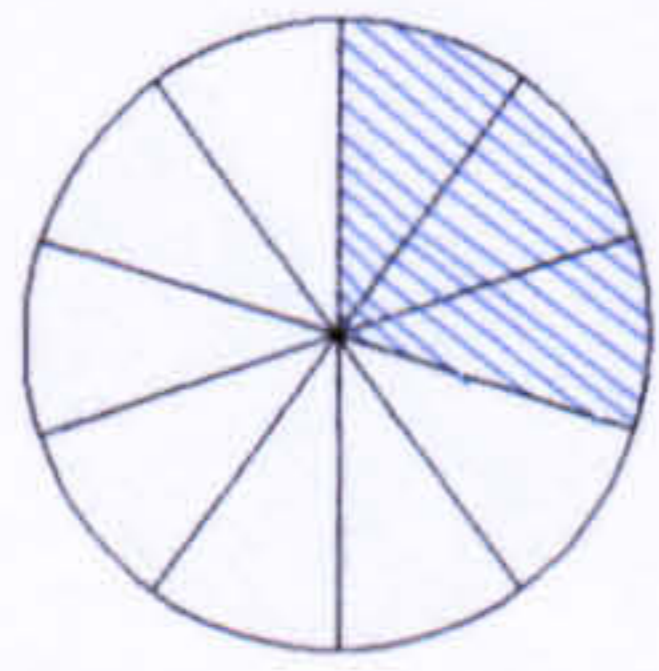


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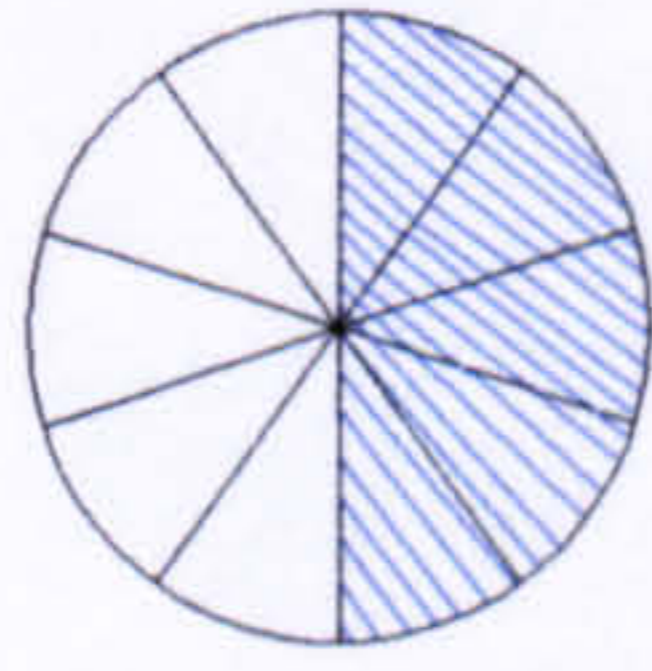
5. The president of a UK based corporation which is about to expand may build a new plant in England where returns on the investment would be moderate, or may decide to build in a foreign country with an unstable political history where however, returns on the investment would be very high.



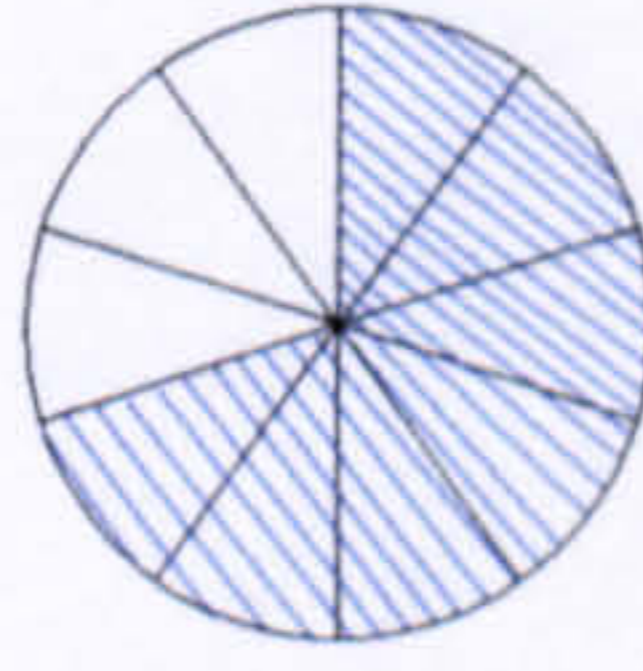
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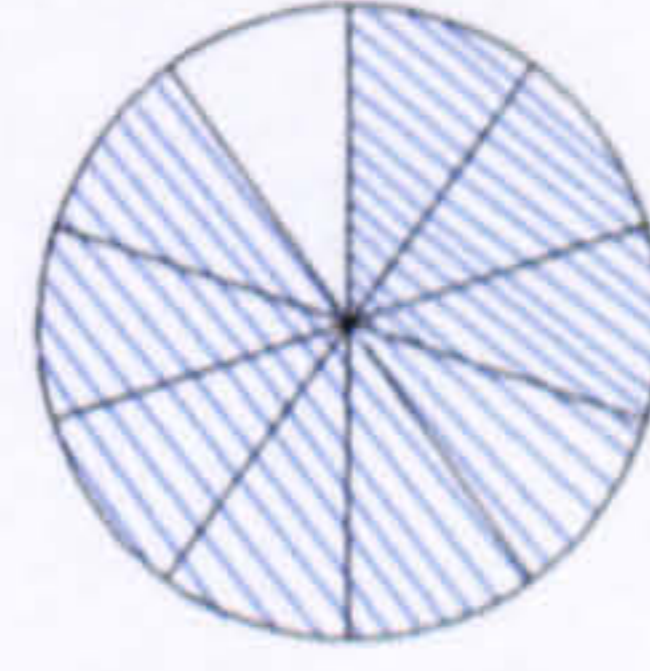
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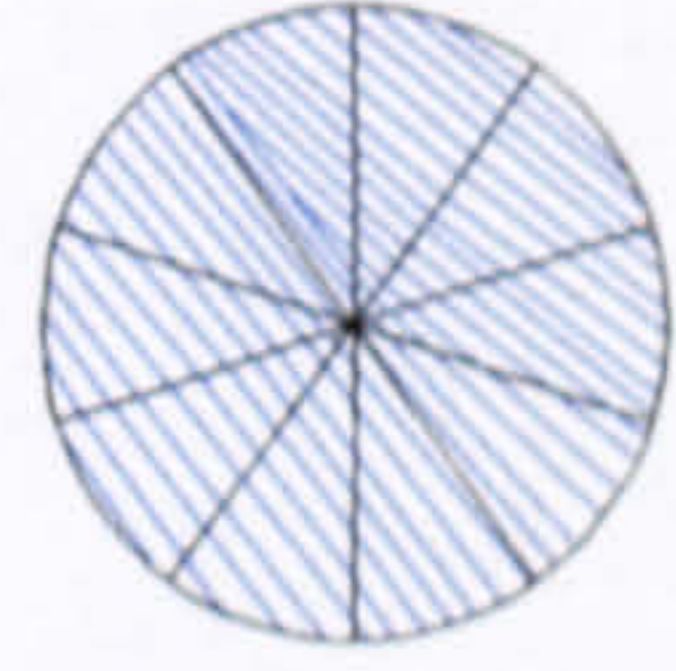
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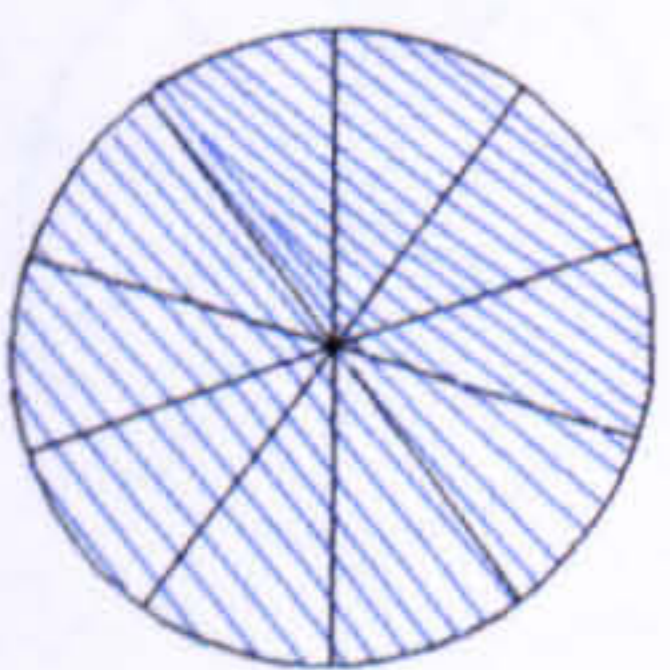


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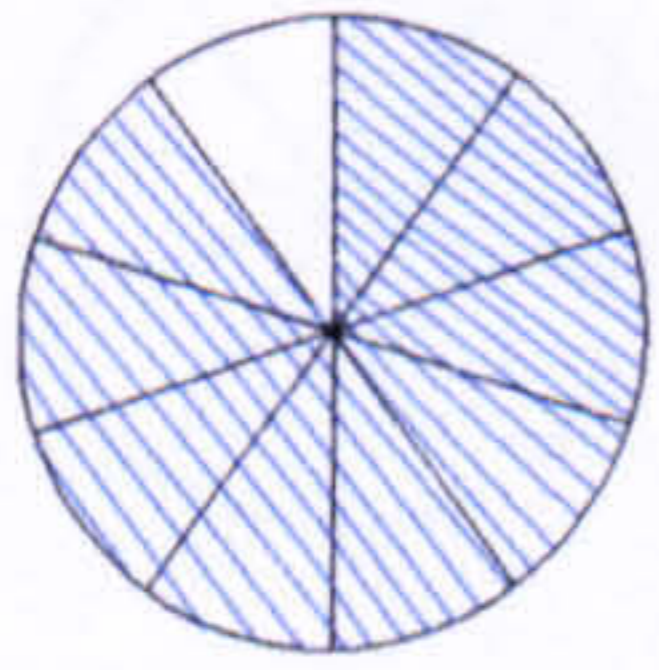


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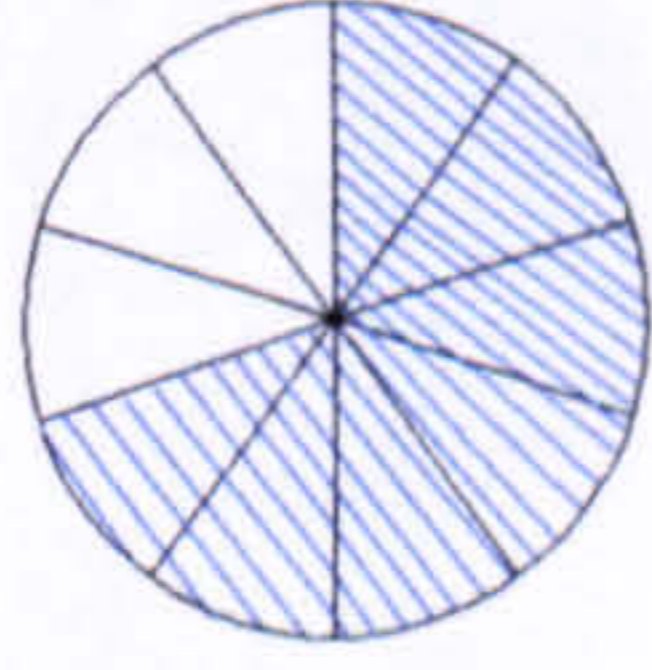
6. A degree graduate planning research studentship work in chemistry may enter university X where, because of rigorous standards, only a fraction of the students manage to receive the PhD, or may enter university Y which has a poorer reputation but where almost every graduate student receives a PhD.



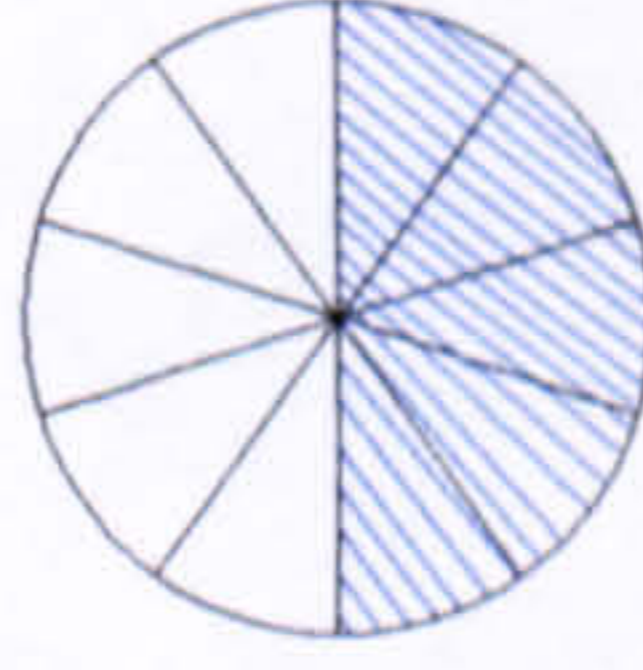
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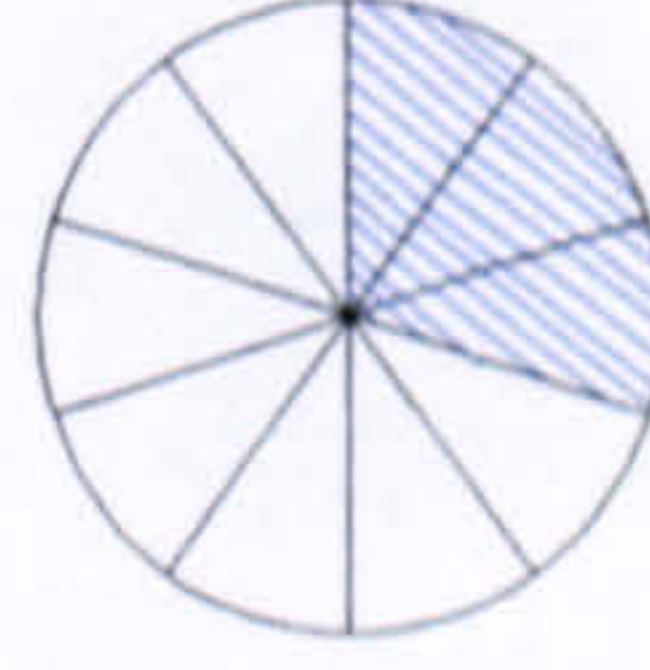
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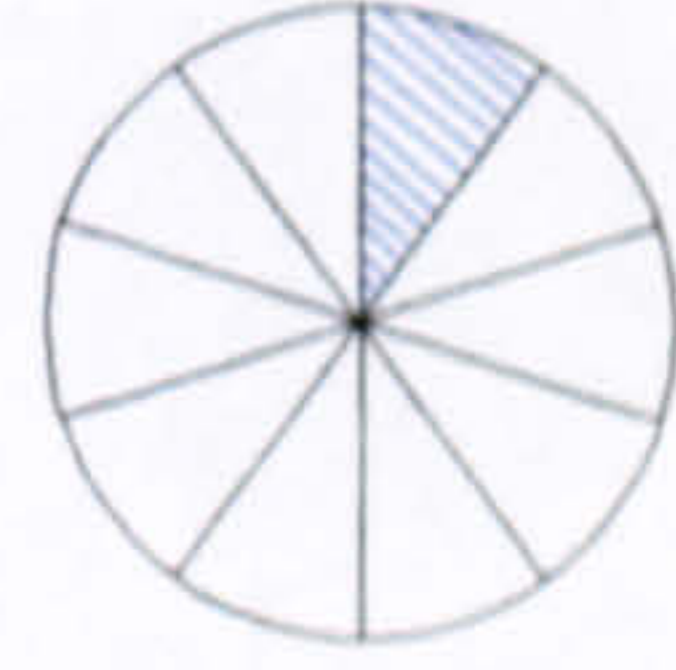
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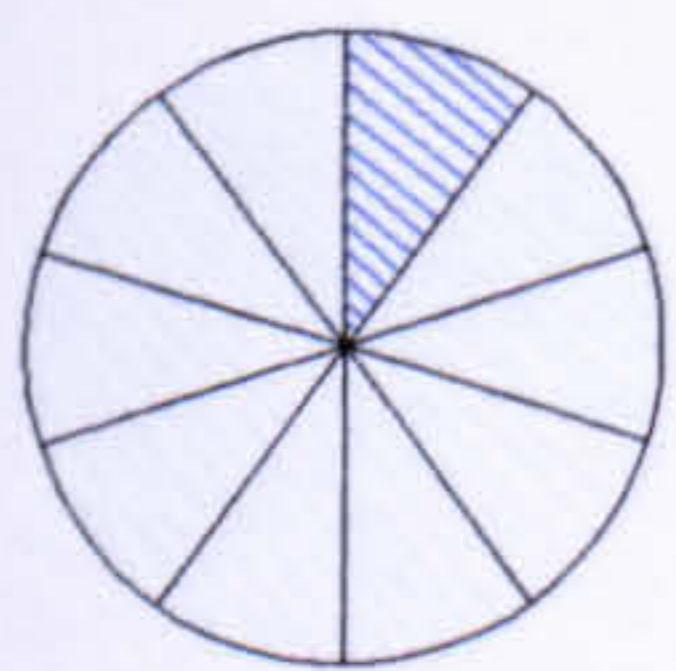


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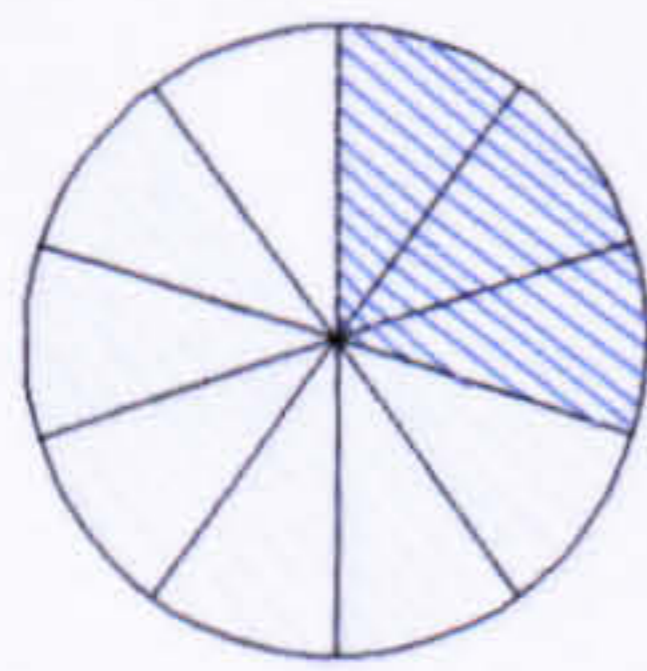


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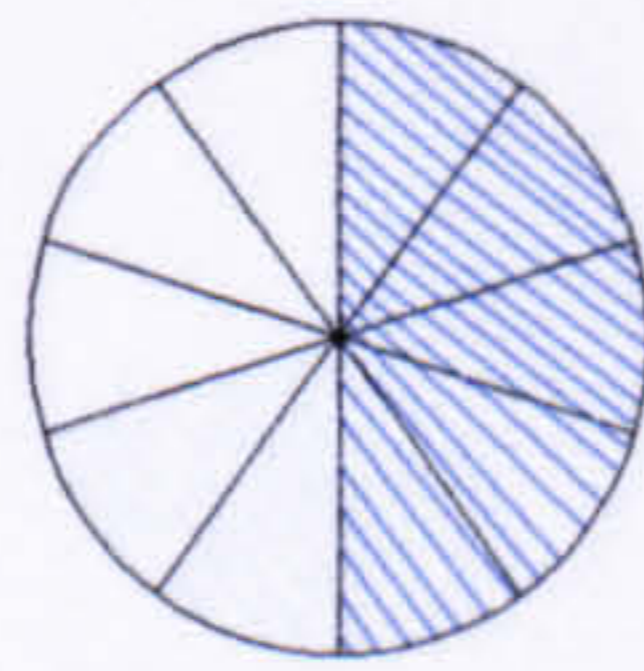
7. A low ranked participant in a national chess tournament, playing an early match with the tournament favourite, has the choice of attempting or not trying a deceptive but risky manoeuvre which may lead to a quick victory if successful or almost certain defeat if it fails.



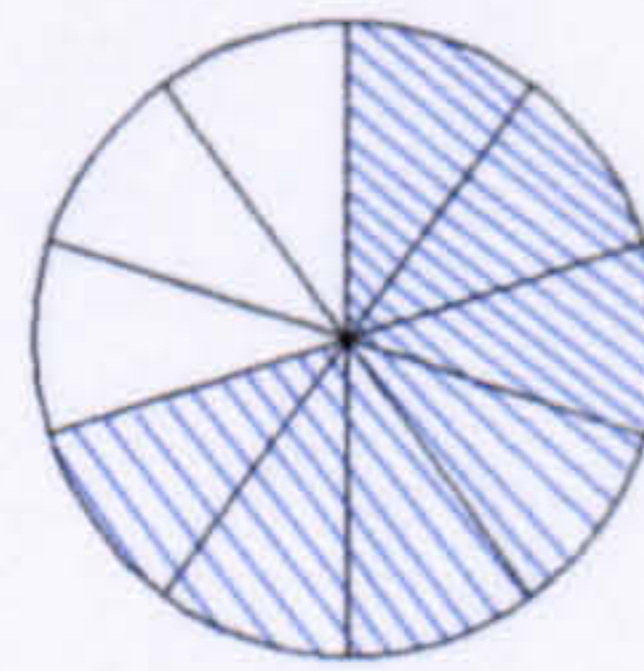
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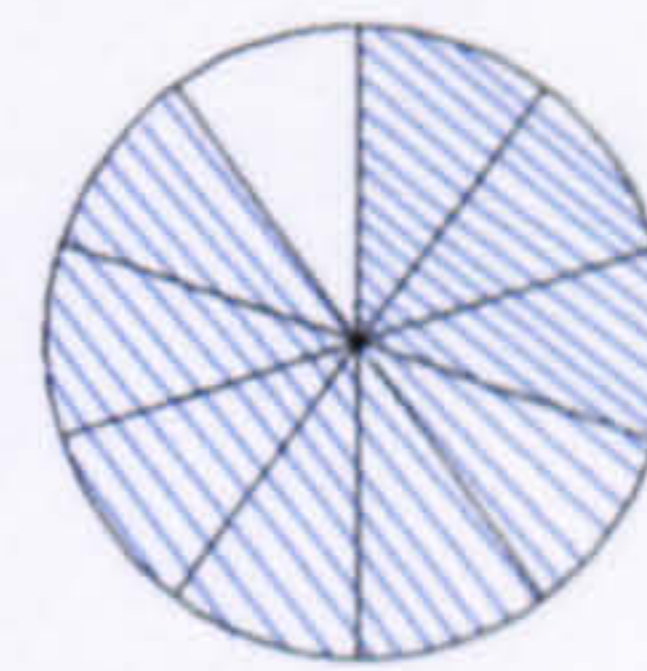
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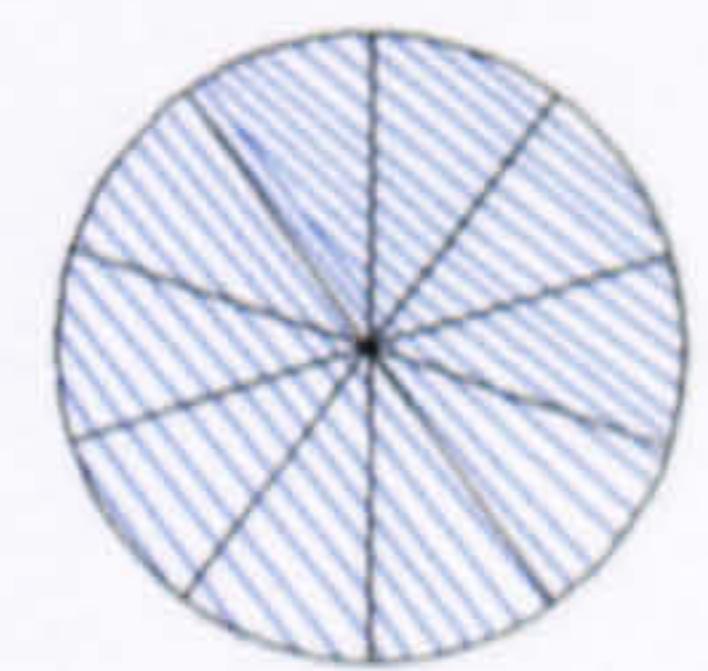
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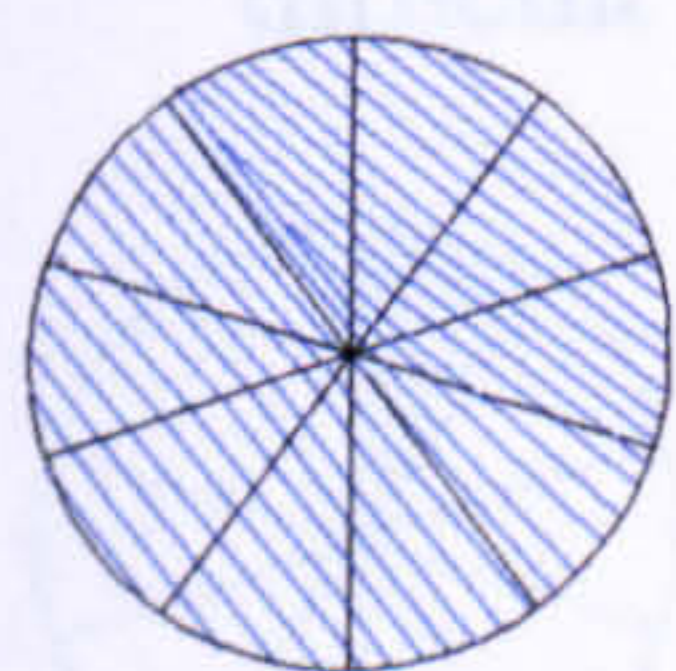


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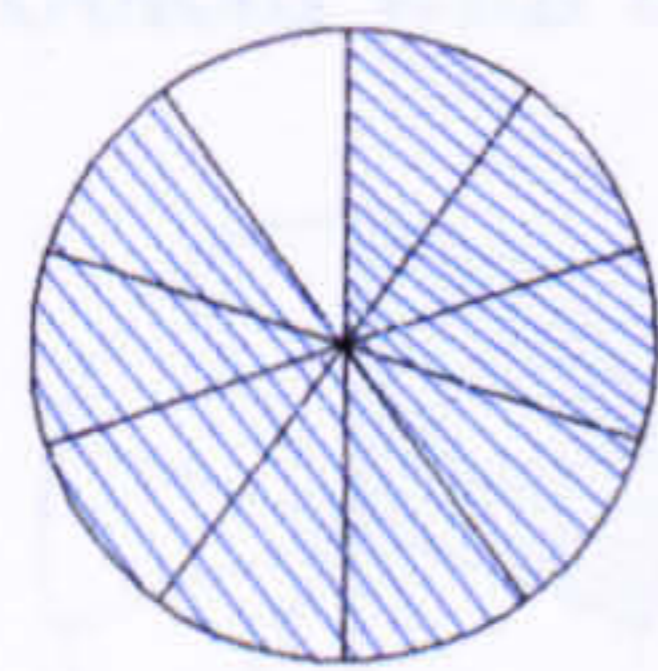


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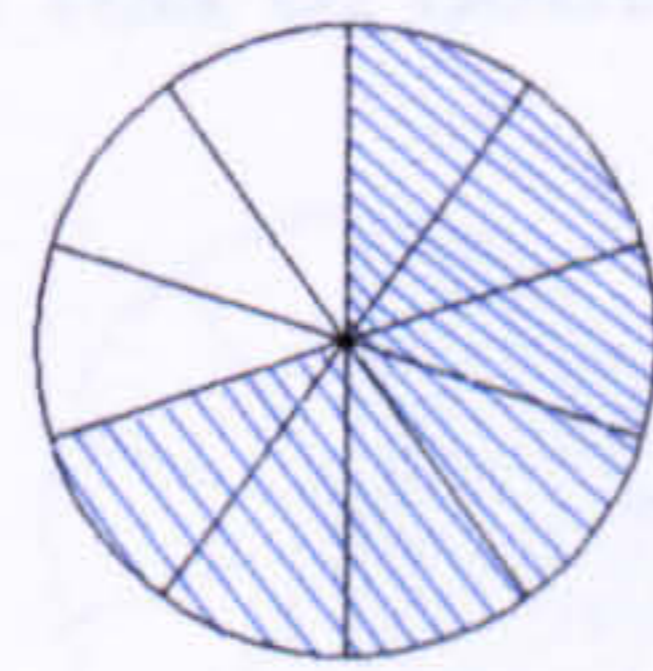
8. A degree graduate with considerable musical talent must choose between the secure course of going on to medical school and becoming a physician, or the risky course of embarking on the career of a concert pianist.



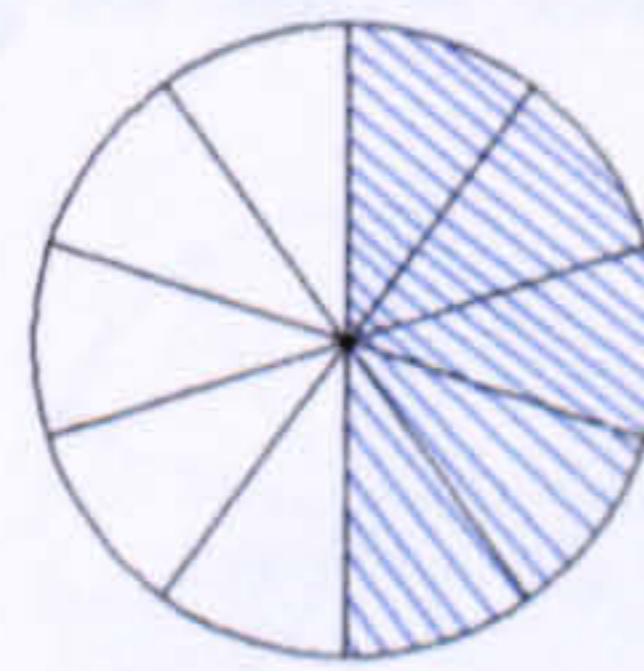
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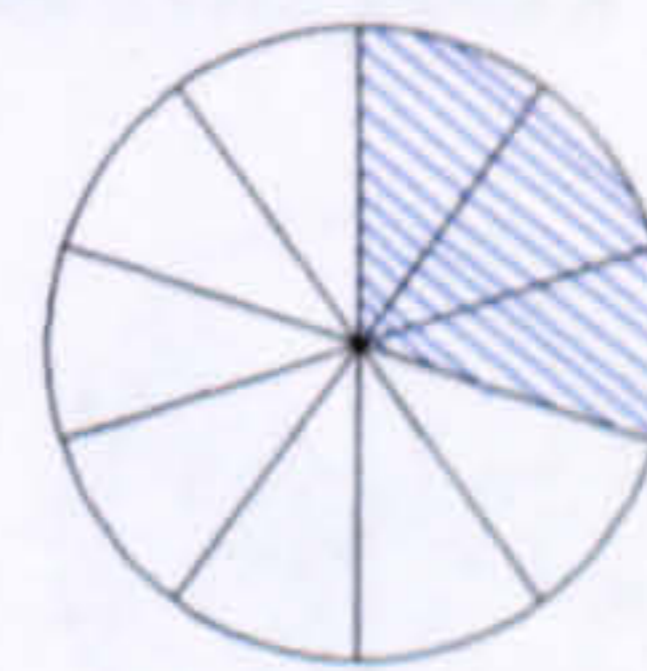
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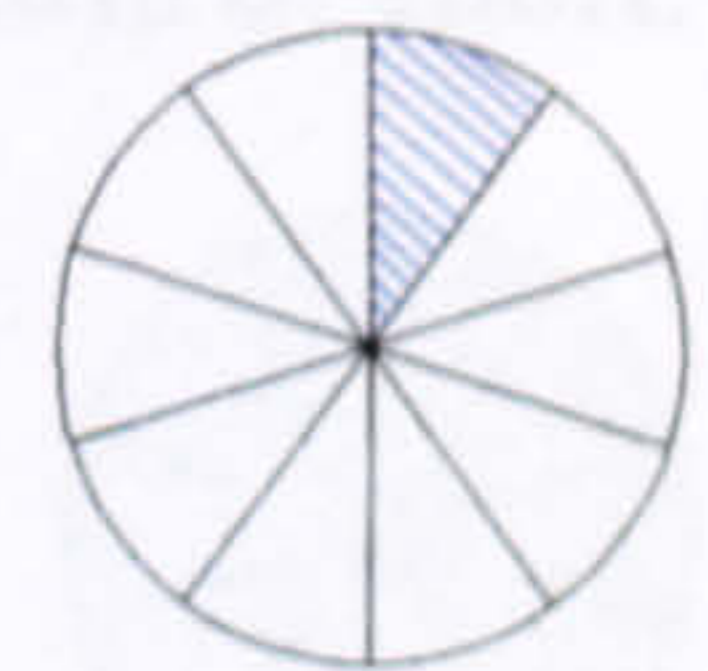
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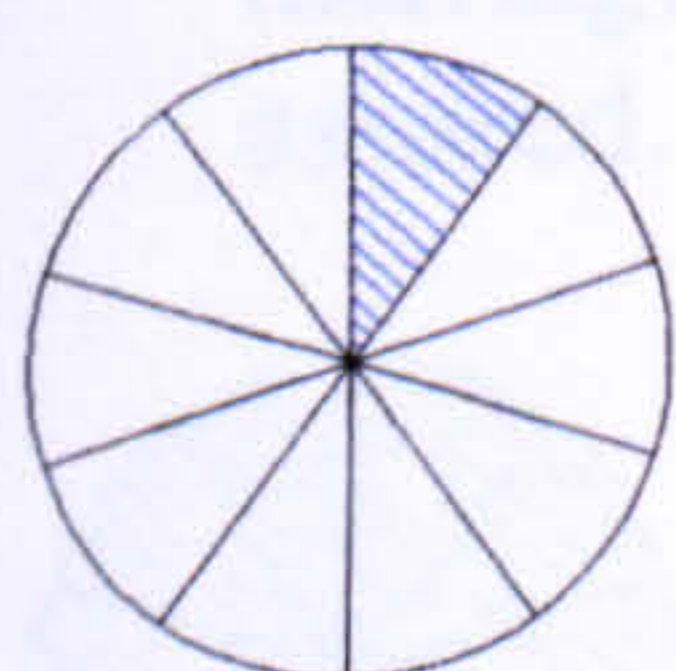


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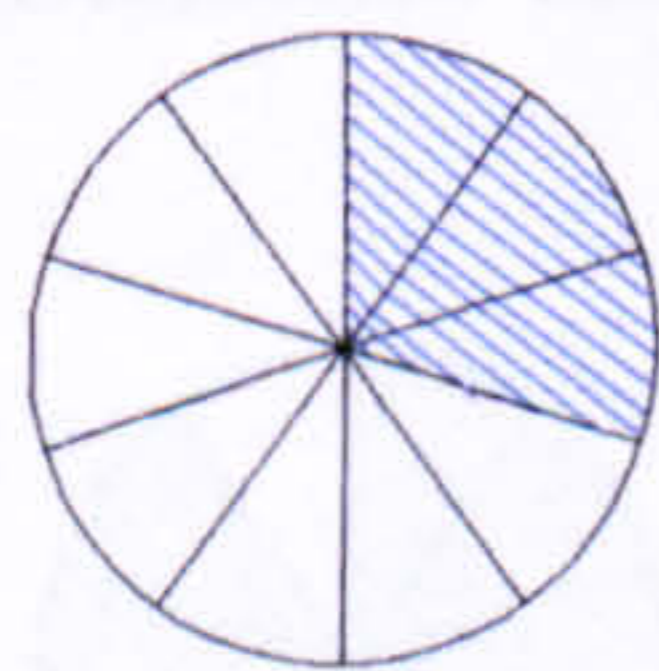


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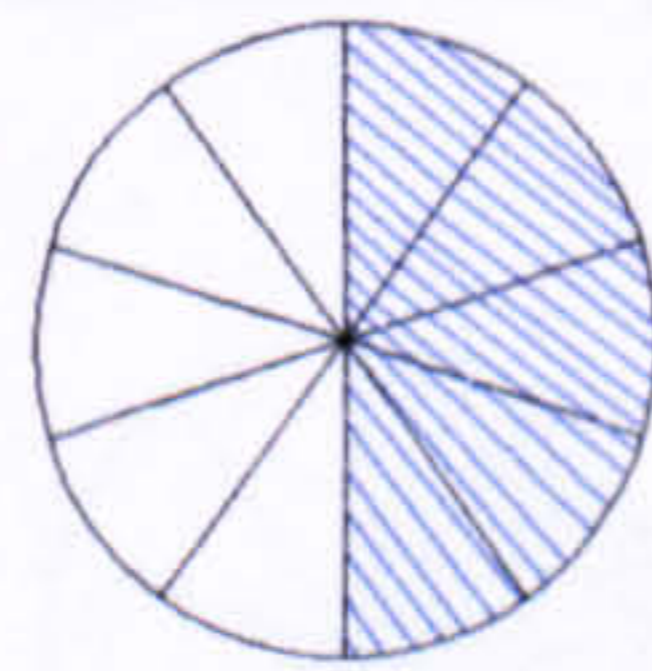
9. An English prisoner of war in World War II must choose between possible escape with the risk of execution if caught or remaining in the camp where privations are severe.



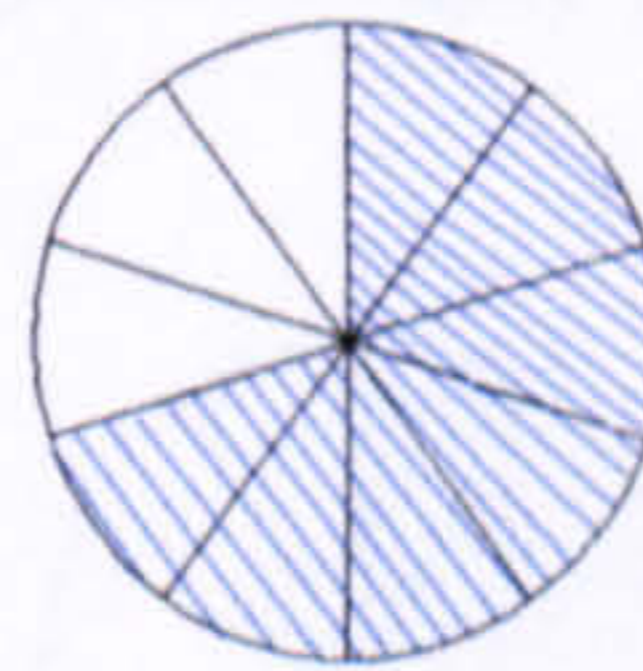
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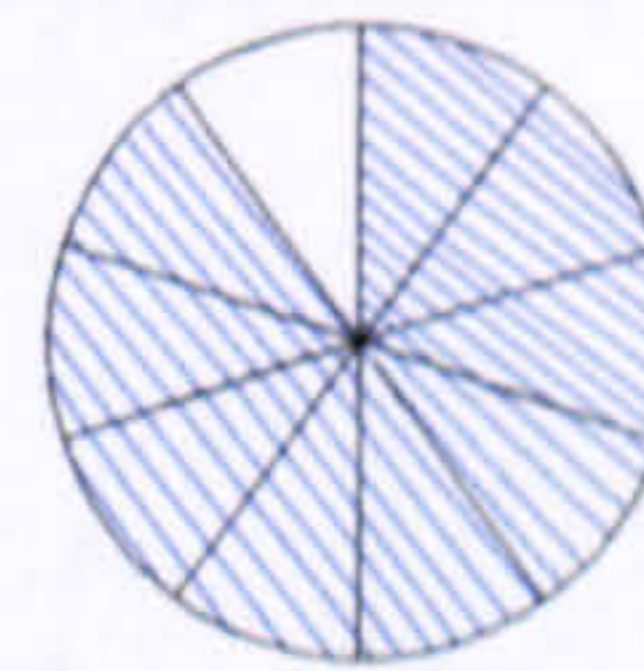
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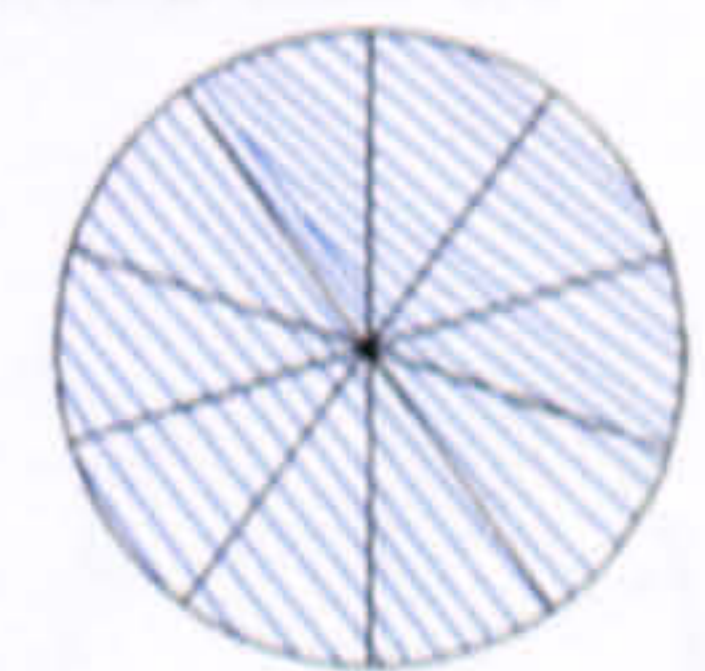
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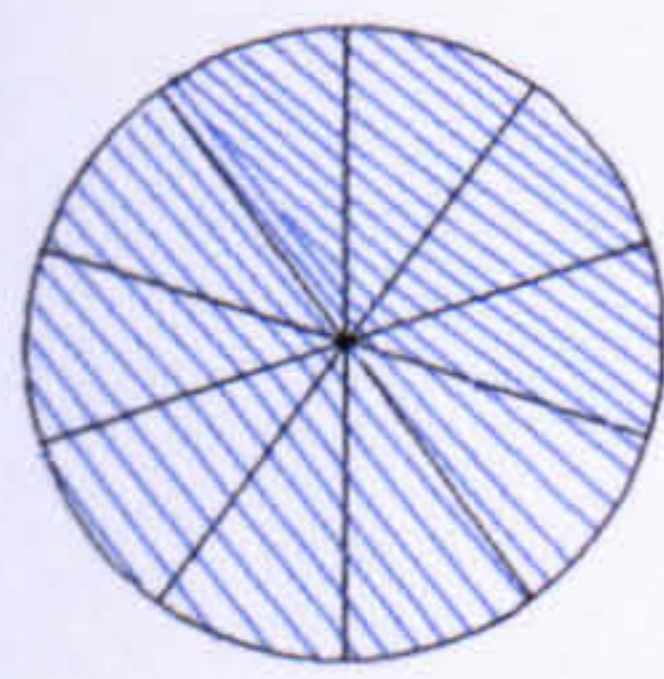
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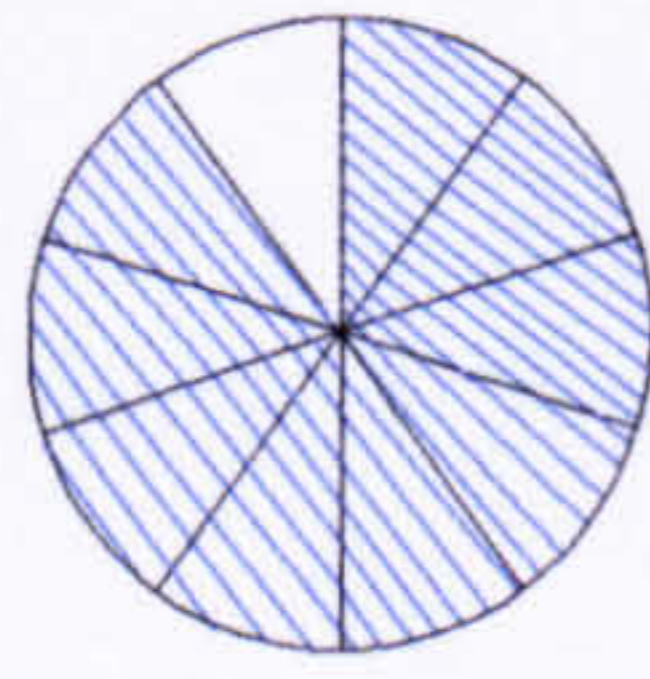
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Chance

APPENDIX B

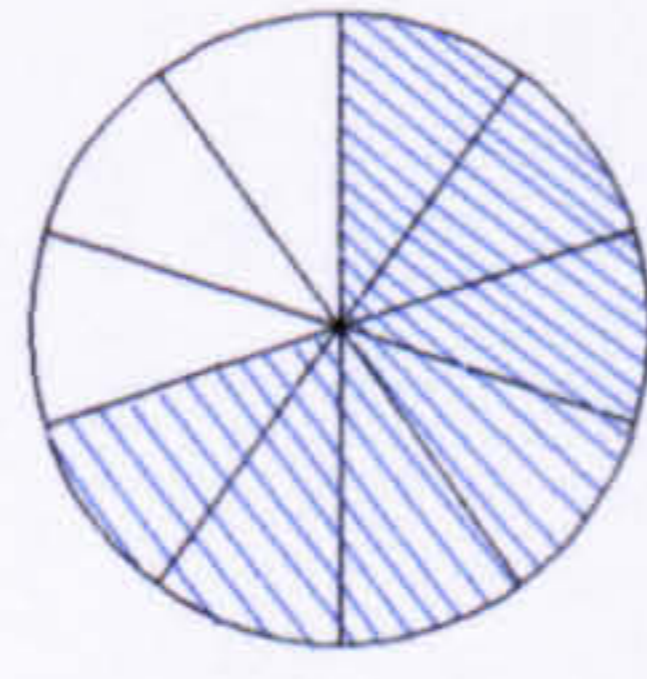
10. A successful businessman with strong feelings of civic responsibility must decide whether or not to run for Parliament on the ticket of a minority party whose campaign funds are limited.



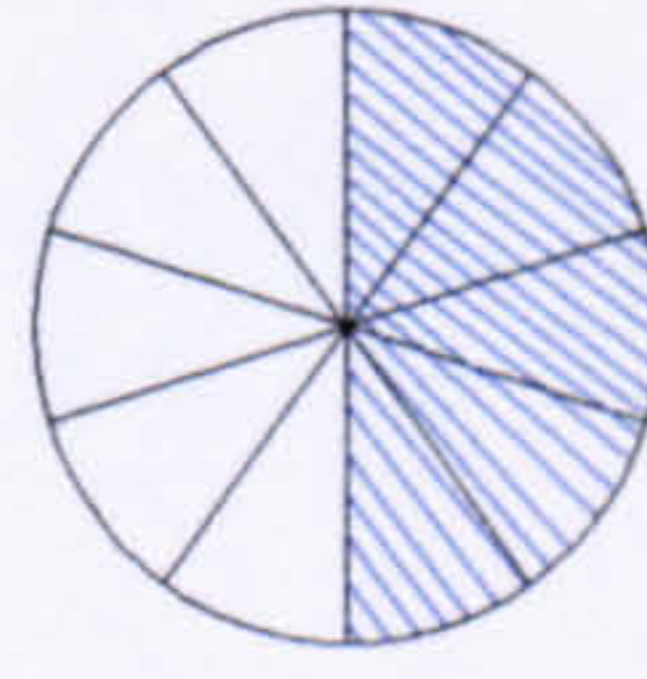
10 in 10
Chance



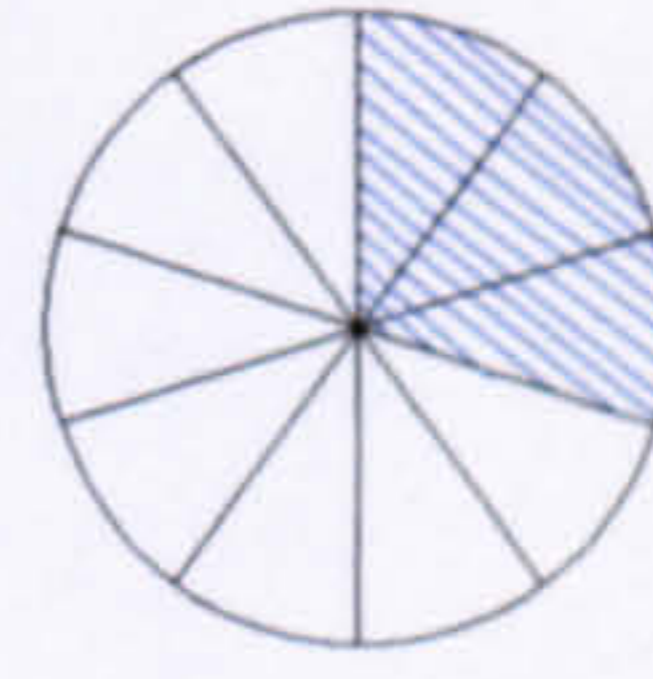
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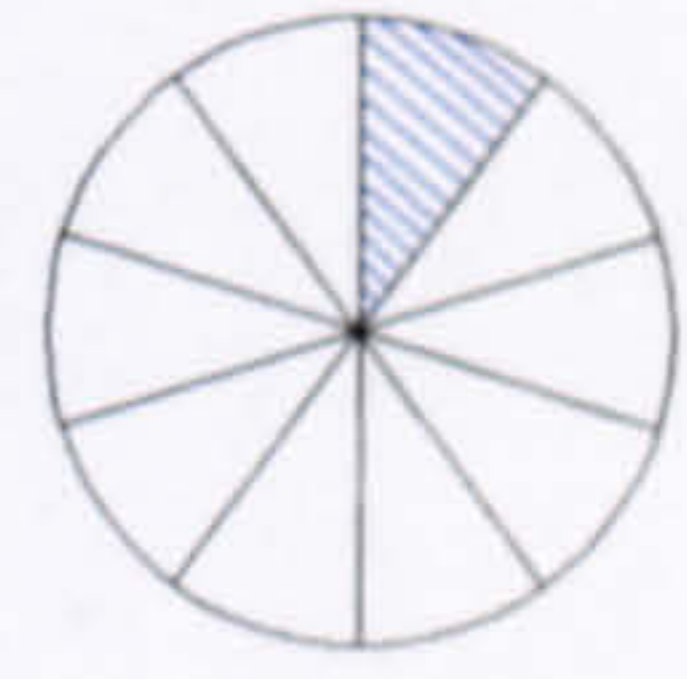
7 in 10
Chance



5 in 10
Chance

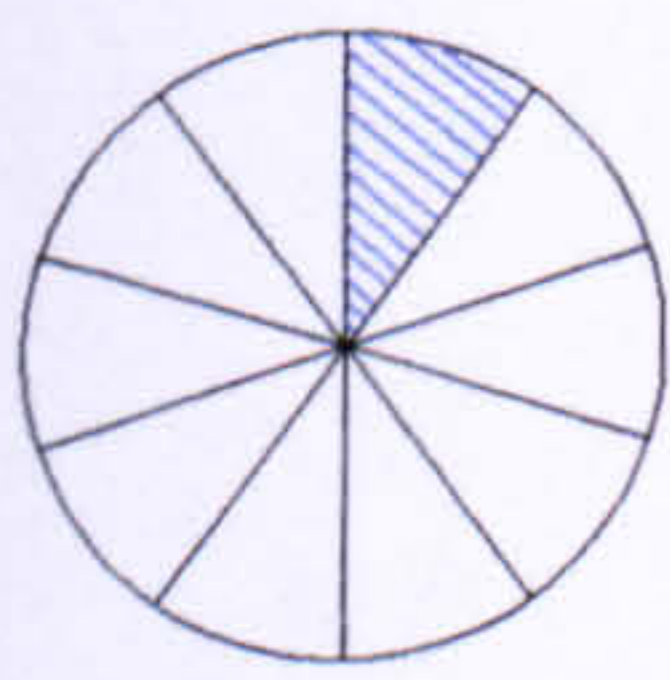


3 in 10
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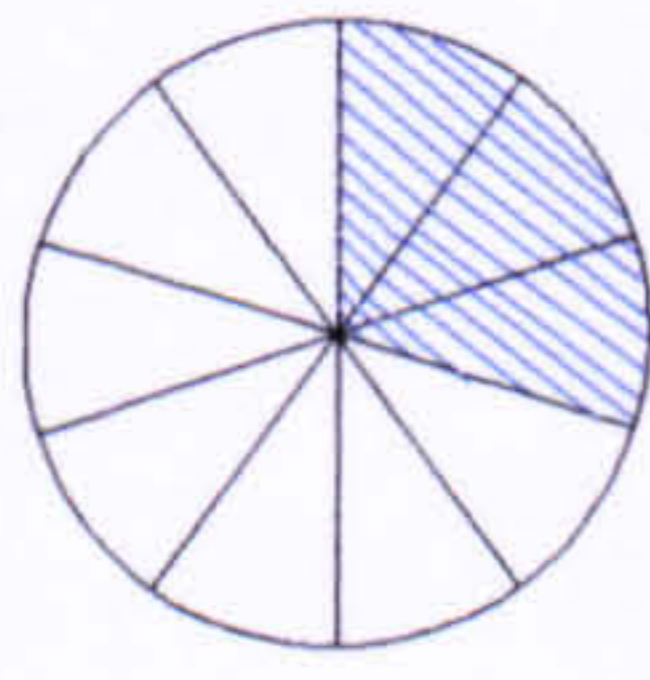


1 in 10
Chance

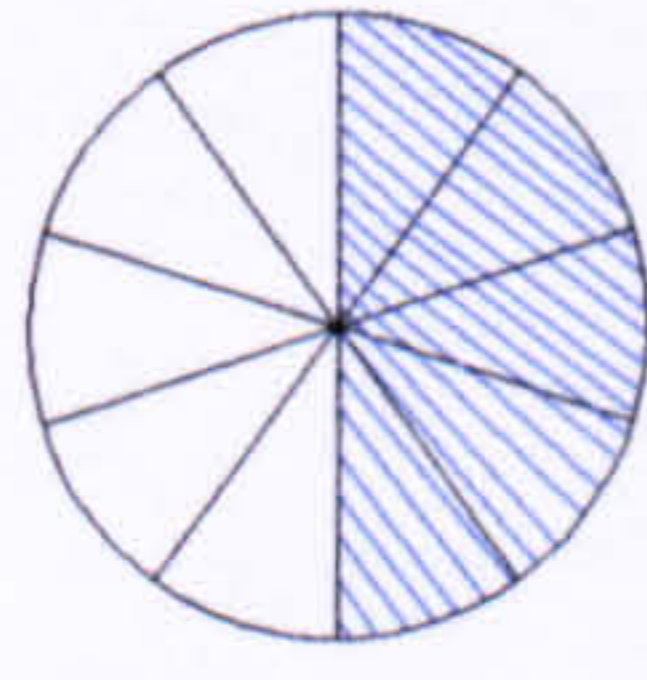
11. A research physicist, just beginning a five year appointment at a university, may spend the time working on a series of short term problems which he would be sure to solve but which would be of lesser importance, or on a very important but very difficult problem with the risk of nothing to show for his five years worth of effort.



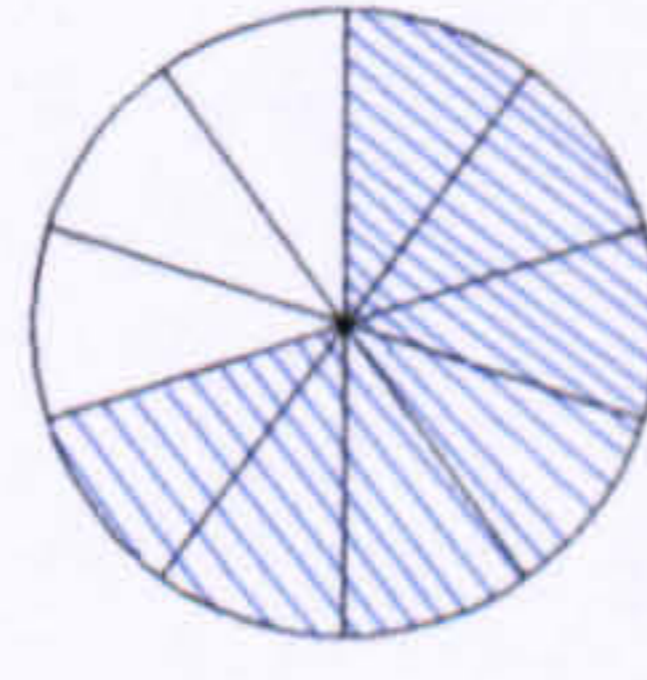
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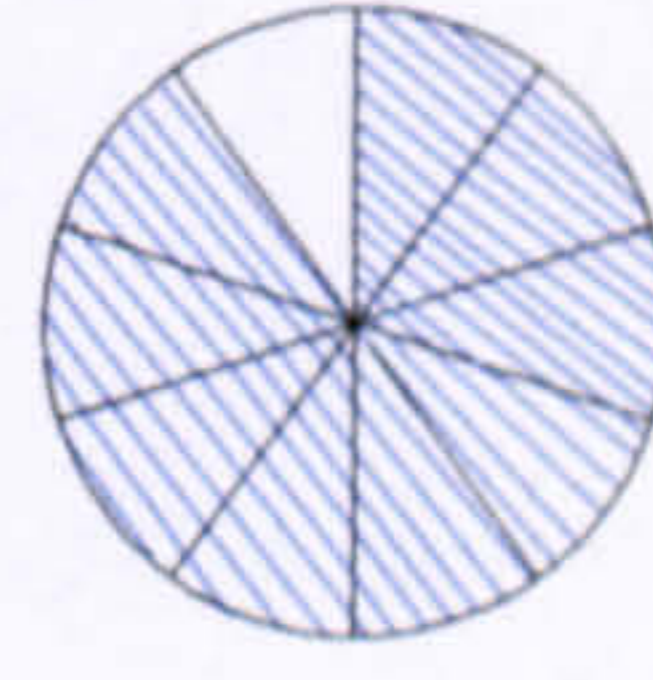
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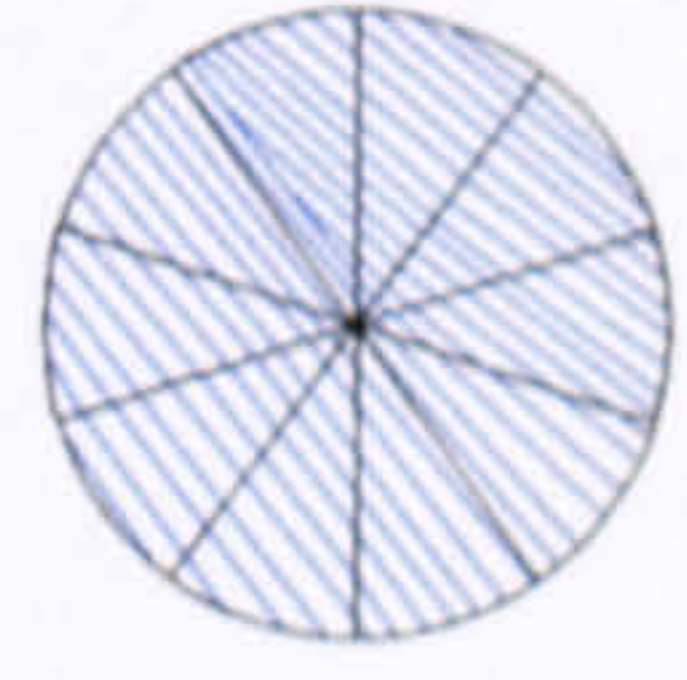
5 in 10
Chance



7 in 10
Chance

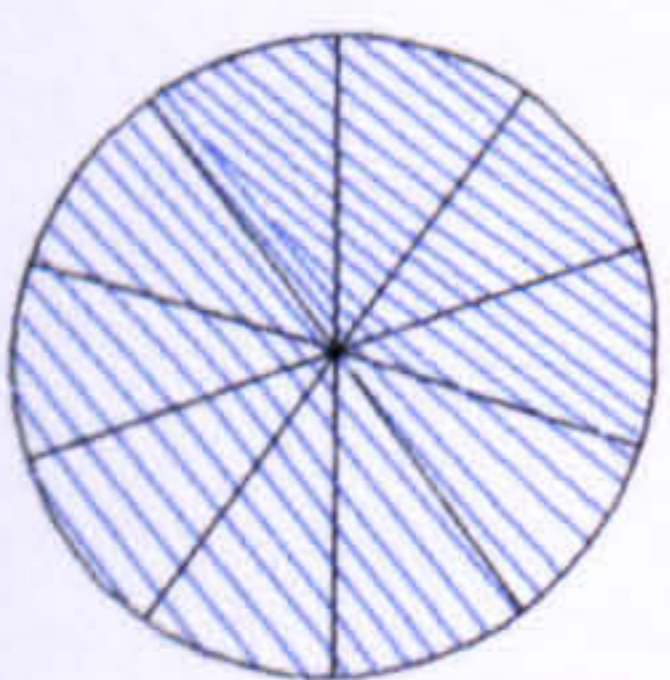


9 in 10
Chance

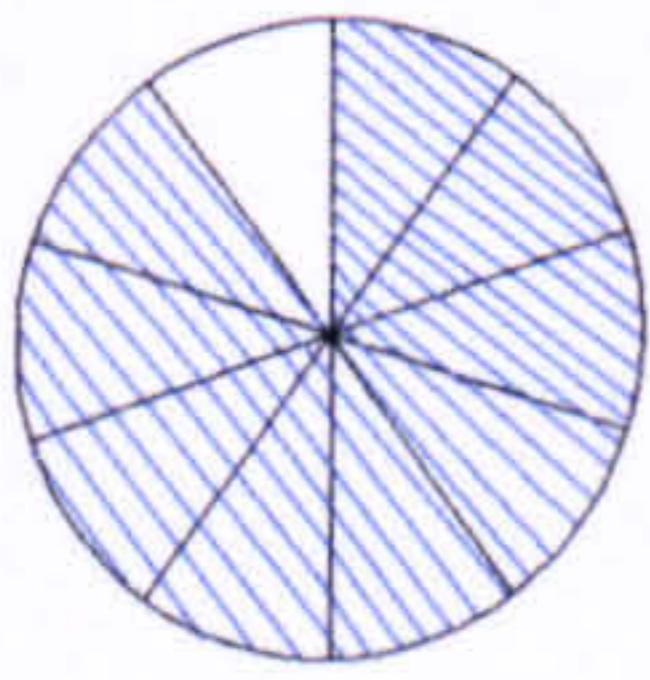


10 in 10
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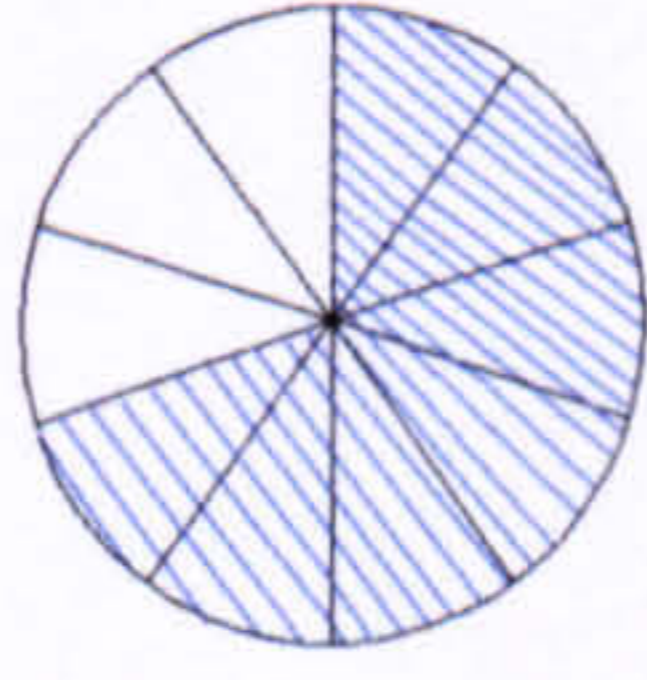
12. An engaged couple must decide, in the face of recent arguments suggesting some sharp differences of opinion, whether or not to get married. Discussions with a marriage counsellor indicate that a happy marriage, while possible, would not be assured.



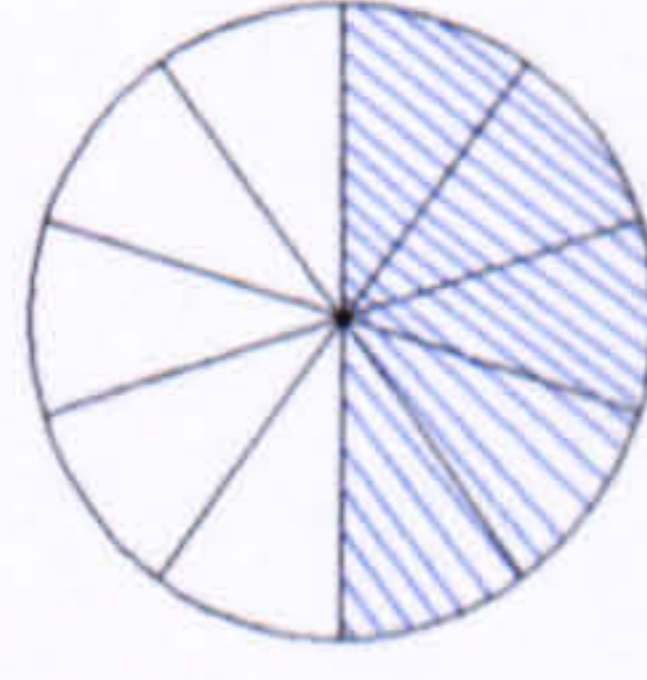
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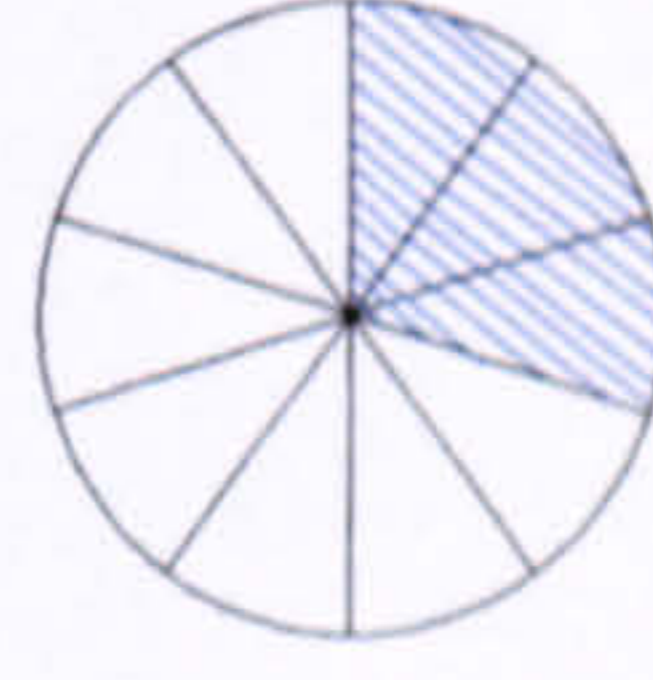
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Chance



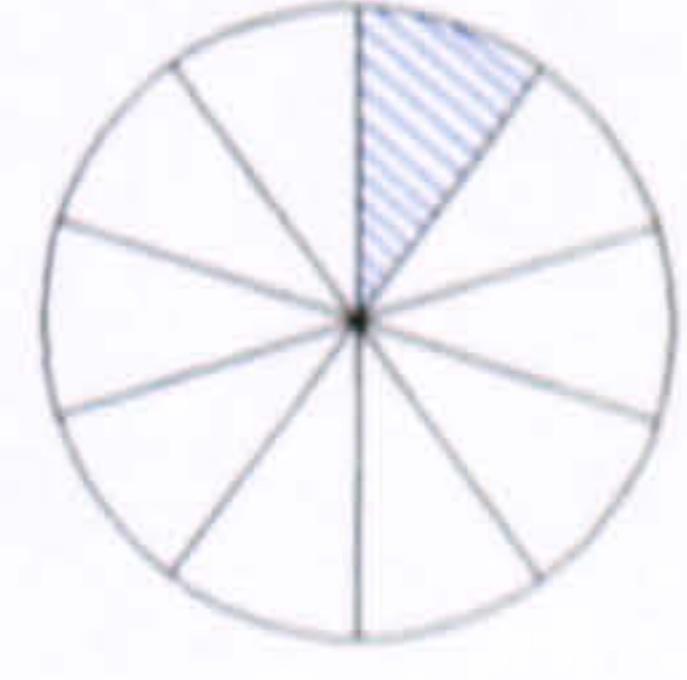
7 in 10
Chance



5 in 10
Chance



3 in 10
Chance



1 in 10
Chance

APPENDIX B

Industrialists Individual Totals (PRE DISCUSSION)

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTAL ID
AJA	9	9	9	5	7	7	7	9	9	9	7	5	92
RJC	7	9	5	7	9	7	5	3	5	5	3	9	74
MTH	5	9	3	7	3	9	1	7	5	3	7	9	68
EJ	9	9	5	9	9	9	3	7	7	9	7	3	86
AEC	7	9	7	5	9	5	3	9	5	3	9	9	80
GL	9	9	3	1	9	7	3	10	5	9	3	3	71
BH	9	5	7	3	7	7	3	7	5	3	5	7	68
DC	7	9	5	3	9	5	3	7	9	3	9	10	79
CE	9	7	10	5	9	10	5	10	5	10	3	10	93
DCF	7	9	7	3	9	7	1	5	9	9	7	7	80
TW	7	5	7	3	9	3	1	5	3	3	1	5	52
JW	7	9	7	5	7	7	5	5	3	3	3	3	64
RM	9	3	5	3	7	9	3	5	5	7	3	1	60
TBH	3	10	9	7	9	7	9	5	10	3	7	3	82
LA	7	10	7	3	7	9	3	5	5	10	3	5	74
SB	7	9	7	5	9	7	3	7	9	5	7	9	84
DH	9	10	5	3	7	7	3	5	3	3	5	10	70
TR	5	3	9	5	3	7	9	3	5	3	7	7	66
PAH	5	3	9	1	9	5	1	5	9	7	7	5	66
WF	7	9	9	3	9	9	3	1	7	9	9	9	84
AD	5	9	7	3	10	10	1	10	3	7	7	1	73
AS	5	1	5	3	9	5	7	5	9	5	9	9	72
TJB	9	7	5	5	9	7	3	7	5	9	7	9	82
CH	9	7	7	7	9	5	5	7	5	5	7	9	82
CM	7	10	9	3	3	7	3	7	9	5	3	9	75
SVC	7	7	9	1	7	10	9	10	10	9	7	7	93
SJL	7	9	7	3	9	7	3	9	9	7	7	9	86
GAD	5	9	5	9	9	7	1	3	10	9	7	9	83
JLF	5	3	7	7	5	9	5	5	3	5	5	5	64
RJL	5	3	7	1	5	3	7	3	1	7	5	3	50
AJ	7	9	5	7	7	3	3	3	3	3	3	7	60
ME	9	7	9	3	10	7	1	3	3	9	1	1	63
PC	5	9	7	7	7	5	5	5	9	7	7	5	78
GHP	3	10	9	10	7	5	9	1	10	1	3	5	73
SN	5	10	7	7	9	5	1	9	9	1	1	9	73

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTALS	MEAN (individual post disc.)
KWH	7	9	7	5	9	7	3	7	5	9	7	10	85	KWH
HV	7	9	9	5	7	3	3	1	3	5	1	9	62	HV
DRB	10	7	7	9	10	10	5	7	5	5	3	10	88	DRB
MF	5	5	7	3	9	9	5	3	5	3	3	9	66	MF
TMG	7	10	9	7	5	10	5	10	7	9	10	5	94	TMG
PAS	7	7	9	10	7	3	1	3	7	1	5	7	67	PAS
IE	10	7	10	7	10	10	3	10	10	10	7	10	104	IE

Q. TOTALS	290	319	298	208	328	290	162	248	263	247	227	286	70.36	MEAN (individual post disc.)
Individual Mean (pre)	6.90	7.60	7.10	4.95	7.81	6.90	3.86	5.90	6.26	5.88	5.40	6.81	6.28	MEAN (of answer means)
Group Mean (post)	6.60	7.40	4.60	2.60	8.20	5.40	2.20	6.60	4.60	4.60	4.20	7.80	5.40	

POST DISCUSSION GROUP TOTALS

Group	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTALS
Group One	9	5	5	1	9	9	1	7	3	3	3	9	64
Group Two	7	9	5	3	7	5	3	5	9	3	3	7	66
Group Three	7	7	5	1	9	3	3	5	3	5	5	7	60
Group Four	7	7	3	3	7	7	3	9	3	9	7	9	74
Group Five	3	9	5	5	9	3	1	7	5	3	3	7	60

Q. TOTALS	33	37	23	13	41	27	11	33	23	23	21	39	64.8	MEAN
Mean	6.60	7.40	4.60	2.60	8.20	5.40	2.20	6.60	4.60	4.60	4.20	7.80	5.40	AVERAGE

COLLATED POST DISCUSSION GROUP SCORES (INDUSTRIALIST ONLY) AND MEAN OF INDIVIDUAL ANSWERS (PRE DISCUSSION) FOR THAT GROUP

Group	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTALS
Group One (pre disc.)	9	5	5	1	9	9	1	7	3	3	3	9	64
MEAN	6.71	8.00	6.57	5.57	7.57	7.71	4.43	6.29	5.43	4.86	5.00	6.29	74.43
Group Two (pre disc.)	7	9	5	3	7	5	3	5	9	3	3	7	66
MEAN	8.14	7.86	6.14	3.86	8.43	6.43	3.00	7.14	6.71	6.43	5.57	5.71	75.42
Group Three (pre disc.)	7	7	5	1	9	3	3	5	3	5	5	7	60
MEAN	6.25	6.75	7.25	3.25	7.88	7.38	3.75	5.13	6.25	6.13	6.75	6.88	73.65
Group Four (pre disc.)	7	7	3	3	7	7	3	9	3	9	7	9	74
MEAN	6.75	6.88	7.00	4.50	7.00	6.88	4.50	6.38	6.50	7.00	6.00	7.50	76.89
Group Five (pre disc.)	3	9	5	5	9	3	1	7	5	3	3	7	60
MEAN	5.80	9.00	7.40	6.80	8.00	5.00	3.80	4.20	6.80	4.20	3.00	5.40	69.4

WORKSHOP ONE PRE DISCUSSION QUESTIONNAIRE RESULTS

ID	GROUP ONE												TOTAL ID
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
RM	9	3	5	3	7	9	3	5	5	7	3	1	60 RM
JW	7	9	7	5	7	7	5	5	3	3	3	3	64 JW
MTH	5	9	3	7	3	9	1	7	5	3	7	9	68 MTH
RJC	7	9	5	7	9	7	5	3	5	3	3	9	74 RJC
AEC	7	9	7	5	9	5	3	9	5	3	9	9	80 AEC
TBH	3	10	9	7	9	7	9	5	10	3	7	3	82 TBH
CE	9	7	10	5	9	10	5	10	5	3	3	10	93 CE
MEAN (pre disc.)	6.71	8.00	6.57	5.57	7.57	7.71	4.43	6.29	5.43	4.86	5.00	6.29	74.43
GROUP ONE (post disc.)	9	5	5	1	9	9	1	7	3	3	3	9	64

ID	TOTAL PRE - POST	% SHIFT POSTAL	POSTAL - POST DISC	% SHIFT POSTAL - PRE	% SHIFT
RM (least conservative pre disc)	60	-6.67	-12	-20.00	-8
JW	64	0.00			
MTH	68	5.88			
RJC	74	13.51			
AEC	80	20.00			
TBH	82	21.95	29	35.37	11
CE (most conservative pre - disc)	93	31.18			13.4146
MEAN	74.43	14.01			
GROUP ONE (post disc.)	64				

POST DISCUSSION INDIVIDUAL ANSWERS

ID	GROUP ONE												TOTAL ID
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
RM	9	5	5	1	9	9	1	7	3	3	3	9	64 RM
JW	9	7	5	1	5	7	1	7	3	3	3	9	60 JW
MTH	3	5	3	1	5	9	1	5	3	3	3	10	51 MTH
RJC	9	5	5	1	9	9	1	9	3	3	3	9	66 RJC
AEC	9	5	3	1	9	9	1	9	3	7	3	9	68 AEC
TBH	9	5	5	1	9	9	1	7	3	3	3	9	64 TBH
CE	9	5	5	1	9	9	1	7	3	3	3	9	64 CE
MEAN (post disc.)	8.14	5.29	4.43	1.00	7.86	8.71	1.00	7.29	3.00	3.00	3.57	9.14	62.43
GROUP ONE (post disc.)	9	5	5	1	9	9	1	7	3	3	3	9	64

WORKSHOP ONE PRE DISCUSSION QUESTIONNAIRE RESULTS

ID	GROUP TWO												TOTAL ID
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
TW	7	5	7	3	9	3	1	5	3	3	1	5	52
BH	9	5	7	3	7	7	3	7	5	3	5	7	68
GL	9	9	3	1	9	7	3	10	5	9	3	3	71
DCF	7	9	7	3	9	7	1	5	9	7	7	7	80
DC	7	9	5	3	9	5	3	7	9	3	9	10	79
EJ	9	9	5	9	9	9	3	7	7	7	7	3	86
AJA	9	9	9	5	7	7	7	9	9	7	7	5	92
MEAN	8.14	7.86	6.14	3.86	8.43	6.43	3.00	7.14	6.71	6.43	5.57	5.71	75.43
GROUP TWO (post disc.)	Z	9	5	3	Z	5	3	5	9	3	3	Z	66

ID	TOTAL PRE - POST			POSTAL - POST DISC			% SHIFT POSTAL - PRE			% SHIFT
	POSTAL	% SHIFT	POSTAL	POSTAL	% SHIFT	POSTAL	% SHIFT	POSTAL		
TW (least conservative pre disc)	71	-26.92	5	7.58	19	36.54				
BH	64	2.94	-2	-3.03	-4	-5.88				
GL	60	7.04	-6	-9.09	-11	-15.49				
DCF	68	17.50	2	3.03	-12	-15.00				
DC	83	16.46	17	25.76	4	5.06				
EJ	80	23.26	14	21.21	-12	-13.04				
AJA (most conservative pre-disc.)	80	28.26	14	21.21	-12	-13.04				
MEAN	75.43	9.43								
GROUP TWO (post disc.)	66									

POST DISCUSSION INDIVIDUAL ANSWERS

ID	GROUP TWO												TOTAL ID
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
TW	7	7	7	3	9	5	1	5	5	3	3	7	60
BH	7	9	7	3	7	5	3	7	7	3	5	7	70
GL	7	9	9	3	7	5	3	7	7	5	3	7	68
DCF	7	9	7	3	7	7	3	5	9	9	3	7	76
DC	7	9	9	3	7	7	3	7	9	3	7	9	76
EJ	7	9	5	5	7	9	3	5	7	7	7	5	76
AJA	7	9	7	3	7	7	3	5	9	3	3	7	70
MEAN (post disc.)	7.00	8.71	5.86	3.29	7.29	6.43	2.71	5.86	7.57	4.71	4.43	7.00	70.86
GROUP TWO (post disc.)	Z	9	5	3	Z	5	3	5	9	3	3	Z	66

Group Composition

<u>Group One</u>	<u>Job Role</u>	<u>Sector</u>	<u>Business Unit</u>
RM	Surveyor	Capital Projects M&E	Watsons Steel
JW	Chief Buyer	Building Services	Capital Projects
MTH	Commercial Director	Capital Projects M&E	Watson Steel
RJC	General Manager	Capital Projects M&E	Fire Engineering
AEC	Contracts Manager	Building Services	Fire Engineering
TBH	Commercial Manager	Services	Facilities
CE	Commercial Manager	Services	Facilities

Group Two

<u>Group One (pre disc.)</u>	<u>Job Role</u>	<u>Sector</u>	<u>Business Unit</u>	<u>ID</u>
TWA	Engineering Manager	Capital Projects	AGRA Birwello	TWA
BH	Area Procurement Manager	Capital Projects	Civil Engineering	BH
GL	Commercial Director	Services	Utilities	GL
DCF	Technical Manager	Capital Projects	AGRA Birwello	DCF
DC	Chief Operations Manager	Capital Projects M&E	Fire Engineering	DC
EJ	Regional Engineer	Capital Projects, Construction Division	Civil Engineering	EJ
AJA				AJA

<u>Group One (pre disc.)</u>	<u>Totals</u>	<u>Group Two (pre disc.)</u>	<u>Totals</u>
	60		52
	64		68
	68		71
	74		79
	80		80
	82		86
	93		92
Sample Mean (pre disc.)	74		75
Group Score (post disc.)	64		66
RE - POST DISC. SCORES	10		9

Sample Mean (pre disc.)
 Group Score (post disc.)
 RE - POST DISC. SCORES

WORKSHOP TWO PRE DISCUSSION QUESTIONNAIRE RESULTS

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTAL ID
LA	7	10	7	3	7	9	3	5	5	10	3	5	<u>74</u> LA
SB	7	9	7	5	9	7	3	7	9	5	7	9	<u>84</u> SB
DH	9	10	5	3	7	7	3	5	3	3	5	10	<u>70</u> DH
TR	5	3	9	5	3	7	9	3	5	3	7	7	<u>66</u> TR
PAH	5	3	9	1	9	5	1	5	9	7	7	5	<u>66</u> PAH
WF	7	9	9	3	9	9	3	1	7	9	9	9	<u>84</u> WF
AD	5	9	7	3	10	10	1	10	3	7	7	1	<u>73</u> AD
AS	5	1	5	3	9	5	7	5	9	5	9	9	<u>72</u> AS
MEAN (pre disc)	6.25	6.75	7.25	3.25	7.88	7.38	3.75	5.13	6.25	6.13	6.75	6.88	<u>73.63</u>
GROUP THREE (post disc.)	Z	Z	<u>5</u>	1	<u>9</u>	<u>3</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>5</u>	<u>5</u>	Z	<u>60.00</u>

GROUP THREE

ID	TOTAL PRE - POST	% SHIFT POSTAL	POSTAL - POST DISC	% SHIFT POSTAL - PRE	% SHIFT
LA	<u>74</u>	18.92			
SB (most conservative pre - disc)	<u>84</u>	28.57			
DH	<u>70</u>	14.29	40.00	66.67	42.86
TR (least conservative pre disc)	<u>66</u>	9.09			
PAH (least conservative pre disc)	<u>66</u>	9.09	-10.00	-16.67	-24.24
WF (most conservative pre - disc)	<u>84</u>	28.57	33.00	55.00	10.71
AD	<u>73</u>	17.81	-1.00	-1.67	-19.18
AS	<u>72</u>	16.67	14.00	23.33	2.78
MEAN	<u>73.63</u>	<u>13.63</u>			
GROUP THREE (post disc.)	<u>60</u>				

GROUP FOUR
POST DISCUSSION INDIVIDUAL ANSWERS

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTAL ID
TJB	7	7	3	3	9	7	3	7	5	9	7	9	76 TJB
CH	7	7	7	5	7	5	3	9	3	9	7	9	78 CH
CM	7	7	3	3	3	9	3	9	9	9	7	9	78 CM
SVC	7	7	3	3	7	7	1	9	3	9	7	7	70 SVC
SJL	7	9	3	3	7	7	3	9	3	7	7	9	74 SJL
GAD	7	7	5	9	7	7	1	9	3	9	7	9	80 GAD
JLF	3	7	3	5	7	7	3	9	3	7	7	7	68 JLF
RJL	3	7	3	3	7	7	1	5	3	9	7	7	62 RJL
MEAN (post disc.)	6	7.25	3.75	4.25	6.75	7	2.25	8.25	4	8.5	7	8.25	73.25
GROUP FOUR (post disc.)	Z	Z	3	3	Z	Z	3	9	3	9	Z	9	74.00

Group Three (pre disc.)	ID	Totals	Group Four (pre disc.)	ID	Totals
	LA	74		TJB	82
	SB	84		CH	82
	DH	70		CM	75
	TR	66		SVC	93
	PAH	66		SJL	86
	WF	84		GAD	83
	AD	73		JLF	64
	AS	72		RJL	50
Sample Mean (pre disc.)		74	Sample Mean (pre disc.)		77
Group Score (post Disc.)		60	Group Score (post Disc.)		74
PRE - POST DISC. SCORES		14	PRE - POST DISC. SCORES		3

GROUP THREE**POST DISCUSSION INDIVIDUAL ANSWERS**

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTAL ID
LA	7	7	7	1	7	3	3	5	3	9	3	5	60 LA
SB	5	7	7	3	9	3	3	5	9	5	5	9	68 SB
DH	7	7	7	1	7	5	1	5	3	5	5	7	58 DH
TR	7	7	7	1	9	3	3	5	3	5	5	7	60 TR
PAH	7	7	3	1	9	3	1	5	3	5	5	7	54 PAH
WF	7	7	9	3	7	9	3	9	3	9	9	7	78 WF
AD	7	7	3	1	9	3	3	5	3	5	5	1	50 AD
AS	5	7	3	1	9	3	5	5	9	5	5	7	62 AS
MEAN (post c	6.5	5.75	5.75	1.5	8.25	4	2.75	5.5	4.5	6	5.25	6.25	61.25
GROUP THR	Z	Z	Z	1	9	3	3	5	3	5	5	Z	60

Workshop Two Composition

Group Three	Job Role	Sector	Business Unit
LA	Commercial Manager	Services	AMEC Offshore/Facilities
SB	Technical Manager	Capital Projects	M&E Industrial
DH	Design Engineer	DBFO (Services)	Utilities
TR	Bid Manager	Services	AMEC Rail
PAH	Manager Production	Services	AMEC Rail
WF	Onshore Support	Services	AMEC Offshore/Facilities
AD	Quantity Surveyor	Services	Offshore
AS	Quantity Surveyor	Services	Offshore
Group Four	Job Role	Sector	Business Unit
TJB	D&B Manager	Capital Projects	Building Services
CH	Estimator	Capital Projects	M&E
CM	Operations Manager	Capital Projects	Building Services
SVC	Surveying Manager	Capital Projects	M&E
SJL	Senior Project Manager	Capital Projects	Building Services
GAD	Project Surveyor	Capital Projects	Watsons Steel
JLF	Mechanical Engineer	Capital Projects	M&E
RJL	Estimator	Capital Projects	M&E

WORKSHOP THREE PRE DISCUSSION QUESTIONNAIRE RESULTS

GROUP FIVE

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTAL ID
AJ	7	9	5	7	7	3	3	3	3	3	3	7	<u>60</u> AJ
ME	9	7	9	3	10	7	1	3	3	9	1	1	<u>63</u> ME
PC	5	9	7	7	7	5	5	5	9	7	7	5	<u>78</u> PC
GHP	3	10	9	10	7	5	9	1	10	1	3	5	<u>73</u> GHP
SN	5	10	7	7	9	5	1	9	9	1	1	9	<u>73</u> SN
MEAN (pre disc.)	5.80	9.00	7.40	6.80	8.00	5.00	3.80	4.20	6.80	4.20	3.00	5.40	<u>69.40</u>
GROUP FIVE (post disc.)	3	9	5	5	9	3	1	Z	5	3	3	Z	<u>60.00</u>

Group Five (pre disc.)

ID	Totals	PRE - POST	% SHIFT POSTAL	POSTAL - POST DISC.	% SHIFT POSTAL - PRE	% SHIFT
PC (most conservative pre - disc)	<u>78</u>	18	23.08	28	46.67	12.82
GHP	<u>73</u>	13	17.81	5	8.33	-10.96
ME	<u>63</u>	3	4.76			
SN	<u>73</u>	13	17.81	6	10.00	-9.59
AJ (least conservative pre disc)	<u>60</u>	0	0.00	2	3.33	3.33
MEAN	<u>69</u>		70.25	10.25	17.08	1.22
GROUP FIVE (post disc.)	60					

POST DISCUSSION INDIVIDUAL ANSWERS

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	TOTAL ID
AJ	3	9	5	5	9	3	1	5	3	3	3	7	56 AJ
ME	7	7	7	3	10	5	1	3	3	7	1	3	57 ME
PC	5	9	5	7	9	5	7	7	5	5	7	7	78 PC
GHP	3	9	7	10	7	3	7	3	9	1	3	5	67 GHP
SN	3	9	7	7	9	5	1	7	7	1	3	7	66 SN
MEAN (pre disc.)	4.2	8.6	6.2	6.4	8.8	4.2	3.4	5	5.4	3.4	3.4	5.8	64.8
GROUP FIVE (post disc.)	3	9	5	5	9	3	1	Z	5	3	3	Z	<u>60.00</u>

Group Composition

Group Five

ID	<u>Job Role</u>	<u>Sector</u>	<u>Business Unit</u>
PC	Project Director	Investments	N/A
GHP	Process Manager	Capital Projects	AGRA Birwelco
ME	Planning manager	Capital Projects	Construction
SN	Commercial manager	Capital Projects	Building Services
AJ	Commissioning Manager	Capital Projects	Building Services

POST-POSTDISCUSSION INDIVIDUAL RESPONSE AND PRE-DISCUSSION INDIVIDUAL RESPONSE COMAPRISON

S² 136.63

t -0.375

POST-POSTDISCUSSION INDIVIDUAL RESPONSE AND POST-DISCUSSION INDIVIDUAL RESPONSE COMPARISON

S² 168.24

t 1.9773

P/P - POST	Ans^2	Ans^2
-12	144	
29	841	
11	121	
-6	36	
-8	64	
-8	64	
7	49	
10	100	
42	1764	
-4	16	
15	225	
9	81	
12	144	
-8	64	
19	361	
2	4	
5	25	
4	16	
-10	100	
6	36	
10	100	
-2	4	
0	0	
MEAN	5.35	
MEAN^2	28.60	4359
	SUM Ans^2	

APPENDIX C

	Interview Quotation	Commentary
	Q. Where did the realisation come from that it should be rolled out throughout the organisation?	
1	"What had been happening was as always, if you get 2 or 3 centres of excellence inside a company they start fighting amongst themselves. No my ways right, no my ways right. They tend to be driven by local business drivers".	Disparate approaches working within the organisation. They had to rationalise by preparing a generic RM approach
2	"Somebody at the top said 'hang on we can't have two schools of thought' they were getting to the point where someone was having to decide which was the best way of doing things".	This turned out to be one person operating within the organisation who was empowered to make this decision.
	Q. What is the purpose of the initiative, what is the message you are trying to communicate now?	
3	"What we have now is a single best practice for all of (the org) in the UK and it is going world wide, Australia and Canada. It is called current best practice; if somebody can find anything better then that will become the current best practice".	Current best practice – the organisation realises that it may learn as it progresses; it is adaptable.
4	"Don't do your own thing. So you will either do it this way or if this is not good enough you have to share with the rest of the company a better way of dealing with things".	Maintaining generality.
5	".. we have standard terminology, approach, a standard seven step process".	The seven-step approach and the visual presentation of these stages have developed into an identity for the entire process. This has become it's branding.
6	"How you work it into your own procedures is up to you".	Overlay the seven-step approach onto their town work practices and procedures.
7	"Originally it's drive was to make (the org) a risk aware organisation, spread the butter quite thinly throughout the organisation, everyone had a common understanding. Education that sort of thing".	Are they able to answer the question "what is risk?" or are they restricted to answering, "what is the organisations view of risk?"
8	"We have trained a large number of the white collared workers so now the new driver is taking us towards being a risk capable organisation; it is one thing to be aware of it but how many individuals can you pull out and stick on a large project to do this? So we can all talk a good risk estimate, and that is a good thing, but how many can do it on a professional basis? So that is the new driver. So we are just beginning to realise that we need to change direction".	The organisation is becoming aware of the nature of risk; either risk per se or the organisations risk; but they are not yet capable of managing that risk. The organisation was previously a risk aware organisation evidenced by their own, albeit disparate, approaches to RM. Therefore the objective was possibly not to make them risk aware, again, but to educate them to the organisations view of risk.
9	".. they will all be speaking the same language..".	Is it a communication tool, a standardised lexicon by which the entire organisation can communicate on the same level?
	Interview Quotation	Commentary

10	<p>“We use the expression, ‘give a man a fish and you feed him for a day, teach him to fish and you feed him for life’; they are going away now and training locally. That is what we are trying to do, “.</p>	<p>The message is communicated once at the workshops and then left for the attendees to take this message back to the workplace and train locally. Could they be diluting the message and the approach? There seems to be an obvious ‘risk’ in allowing the attendees, after only two days of teaching, to then communicate and effectively teach their colleagues.</p>
11	<p>“.. the problem is you take 10 people and put them in a training room and only 1 will be interested in doing it, but then he becomes the fisher man for that village whilst someone else becomes the cobbler and someone else the blacksmith”.</p>	<p>Only a 1 in 10 success rate?</p>
12	<p>“It flies in the face of what this project was all about; making people risk aware with no risk specialists, no gurus sat in the corner. Lets get it out to the masses. I am sure that is the right thing to do otherwise the masses won’t have been risk aware. It will have all been black box and they will not wanted to know anything about it. So now they are risk aware and understand it but now they understand that it is an awful lot of work. So they will help and support those risk specialists do it.”</p>	<p>No experts? Where is the incentive to excel a this particular skill if there is to be no differentiator within the organisation?</p>
13	<p>Q. Do you think (the org), as an organisation was unaware of risk before the initiative? “I think everyone was aware of risk but they have never had a formal process to think it through, it has always been very ad-hoc”.</p>	<p>Everyone was aware of risk but not of the organisations preferred view of risk which was borne as a result of the disparate approaches to risk that existed previously.</p>
14	<p>“We need to formalise risks and use a common language”.</p>	<p>Make it explicit; this is how we want you to manage risk and this is how you are going to do it!</p>
15	<p>“.. making them aware is making them fully aware not just of the risk but aware of the processes..”</p>	<p>Make the employees aware of the process of RM and combine /interweave with standard organisational processes and procedures.</p>
16	<p>“.. hopefully they will build that into their normal processes, we won’t have an additional process.”</p>	<p>They are after synergy; the seven steps will become bedded within the organisations work practices and not be seen as something additional , not an add on. They will hopefully be seen as an integral and necessary feature of the overall construction process.</p>
17	<p>“.. someone on the project who wants to be responsible for it”.</p>	<p>So it will not be completely embedded, it will require a RM manager, but realised that it is useful and can be used if they want to use it.</p>

	Interview Quotation	Commentary
18	<p>Q. What message was communicated to you?</p> <p>“The original message to us, nearly 18 months back, was that risk is probably one of the most important tools that (the org) wants to put in its skill base, something that differentiates us from our competitors; that we are a risk aware organisation. It is what makes us a professional organisation, not only will we come and do the job for you but will make you aware of all the snags and help you through them and that is what makes (the org) a proper service provider and not just a rough arse construction company”.</p>	<p>Using RM as a competitive differentiator.</p>
19	<p>“It is a cultural thing, therefore we must be risk aware. That is the message we got; ‘go out there and make (the org) a risk aware organisation”.</p>	<p>It is designed as a cultural tool. It is to be used as embedded into the culture, and will reflect the organisations cultural view of risk, which is not expressly contained within their communicated RM process.</p>
20	<p>Q. What made the strategic thinkers turn from being a successful company to the state of play with regards to risk you find yourselves in now?</p> <p>“.. as with all organisations we take notice when something goes wrong, and we had had a few surprises, as you would expect”.</p>	<p>‘as you would expect’ from not having the organisations approach to RM, so it is designed to minimise surprises of this sort.</p>
21	<p>“.. how can we improve ourselves, how can we stop these surprises on these projects? And somebody pointed out that we are taking risks and some of them are coming back to bite us”.</p>	<p>Rather a negative connotation. Somewhere along the line they have decided that RM is also useful to exploit opportunities. Therefore they are moving away from a traditional view of RM towards a more progressive view that RM is the management of information and a decision making aid(?)</p>
22	<p>“.. we can now see the risk”.</p>	<p>Is the organisations RM approach a visualisation tool? Risk is objective; ‘now we can see the risk’!</p>
23	<p>“Personal view; if you want to change the way the approach is being made, you had a customer and you had an engineering organisation and basically that engineering company was there to protect that client, ‘yeah that is a good way to make it, yeah that meets our criteria.’ If you come along and say I am not a rough arse construction company I am a service provider and we can do all of this for you, suddenly what you have to take on board is some of the things that engineering company was doing if you are going to work with them. If you are going to do that you are going to be taking on new roles and you are going to have to start managing risk, risk you have never even thought of in the past”.</p>	<p>The changing nature of the organisation was a driver for the new RM approach. Does the organisation realise that the RM approach is only a framework and will only be as effective as the knowledge held by the people who operate it?</p>

	Interview Quotation	Commentary
	Q. Part of the message you are communicating is that there is upside and downside risk. Is the purpose of the initiative to maximise upside or to minimise downside or both?	The message is that the organisation is not afraid to take risks, but if they do they want the reward that accompanies that. Risk equals reward. This may encourage the risk takers to take even more whilst the risk averse may be inclined to take a disproportional smaller increase in risk compared to the risk takers. 'walk off the cliff with their eyes open' is almost a challenge. If you think you know what you are doing then walk the organisation and yourself off the cliff. The only qualifying criterion is that we must be rewarded for doing so.
24	"It is both. What we are trying to do is to get people to walk off the cliff with their eyes open. We are not frightened of taking risk. But if we are being asked to take risk we want reward for it and if the reward is not there then that is not fair. So we are trying to make our people capable of identifying risk, we have given them the tools and techniques to do that, and then take a balanced view of it".	Q. The sceptic in me thinks that corporate governance was the prime motivator behind the implementation of the initiative.
25	"... one of the key messages we got was that, if corporate governance disappeared tomorrow and if the clients turned around to us and said 'we are not interested anymore' we would still want to do it".	The organisation realises the benefits of RM beyond those of customer and stock market satisfaction
	Q. So it has filtered down, but how is it working the other way; back up to the strategic decision-makers? How are the people who initially identified the need for risk management utilising risk management themselves?	
26	There are a few things happening. The first thing is that most of the tender review revolves around risk. This is a risk, what are you doing about it and they get the third degree. It is actually working against them now because people are afraid to put the top ones forward (risks?) because people are jumping on them.	A cultural change may be required at the higher levels of strategic management if the RM practitioners are to 'feel' able to complete a comprehensive RM process.
27	"No blame culture; we have to say very good for identifying those now tell me what you are going to do about it".	What will happen when the risk averse identify the hazards and are unwilling or unable to design management strategies accordingly?
28	"So people are now coming on the courses because they know they cannot get away without doing it, (Risk management?)".	Get on board or be left behind. Is this real acceptance or just going through the process of showing interest?
	Q. From my understanding of (the org) above the group level you have (the org) group Ltd. The decisions that they make and the problems they will face are not the kind of tangible problems you may face on a construction project. How are they using risk management?	
29	"Lets get specific.. the managing director of (the org) group Ltd is our boss. We report directly to him. That is how important they see this".	The need and desire to implement the RM process is coming from the very highest levels; therefore be a part of the new organisation or you will be unable to operate effectively within the organisation.

	Interview Quotation	Commentary
30	<p>“(the org) group deals with the really large customers because they are the ones who do not want five different tenders. They deal with Aldermaston and the nuclear industry so to deal with those types of customers you must have some risk capability.. if you go to those people and say I don’t do risk management it is like saying we don’t do plans. They are going to say I am sorry but we do not want to deal with you. Risk is a discipline to them, they expect it to be managed and they expect people to be up to speed on it”.</p> <p>Q. How risk aware is (the org managing director)?</p>	<p>Is the issue of customer acceptance and customer requirements a driver behind the new RM process? Stated earlier to the effect that if our customers did not want it we would still do it’ however that is not strictly the message that is coming across. Is the new RM an imposition or an invited guest?</p>
31	<p>“Very risk aware, the entrepreneurs see opportunity first and risk second. They see and they love opportunities”.</p>	<p>If the managing director is risk seeking the primary driver could be exploitation of opportunities.</p>
32	<p>“I have seen certain senior people who are risk averse and would like to go back to the good old days of 20 years ago where we dig the ditch across the drive and the risk is actually an opportunity, we make money out of it. That is one of the problems we are hitting. They understand the process. There are some key individuals who have grown up through the last 20 – 30 years through that sort of environment, true contractors who have made money when the client has made a mistake. The contractor makes his money in the ground was an old expression and they come from that sort of mentality”.</p>	<p>A conflict of needs. One group exhibiting risk seeking tendencies and a new pro-active RM process and the other group exhibiting risk averse, old fashioned tendencies.</p>
33	<p>“Here we are saying we are not going to do that anymore, we are finding new ways of working with our partners, contractor partnering, and they are risk aware and they even understand the process but their makeup is risk averse. We have identified the opportunities and they say right we want them by hook or by crook but write into the contract that we cannot accept the background (?) conditions. Now you are being just as unfair as the client was back then (unfair transferral of risk)”.</p>	<p>This new RM process is conducive to a partnering arrangement, a closer working arrangement between parties to the contract. But we will not resort to unfair means by which to exploit the risks we have identified in our relationships.</p>

	Interview Quotation	Commentary
34	<p>“Another problem of all this lovely theory stuff is human nature.. At the end of the day it comes down to price. (Using a workshop example) we start off with a £20,000 extension and then tell them that you can convert the garage for £10,000. You tell a client his and they say ‘ oh! Well lets stop the tender process, lets go out to the market and see how cheap I can get a garage conversion now. I wish I had kept my gob shut. I have seen it happen more times than not when you bring the big opportunities out. So making people play the game back again is a challenge for the future. But if the clients want to encourage the industry to work with them, to partner with them and tease these opportunities out so everyone wins occasionally you have to let them win a battle if you want to win the war”.</p>	<p>Be aware when using RM that you may actually ‘plan’ your way out of work! This indicates that the organisation is aware that clients require education as to the nature of the service they are offering; i.e. we can only do this if you trust us and allow us to make the most of the opportunities we are identifying for you.</p>
35	<p>Q. How many people who turn up to the risk courses now are aware of the initiative and how aware of the new culture of risk awareness are they?</p> <p>“When they walk through the door I don’t think half of them know what they are letting themselves in for. When we started with these businesses we are hitting at the moment I would say 75% didn’t have a clue. They couldn’t define what risk management is and they couldn’t define what risk is. Now we are finding that they are walking through the door and they are defining it, they have heard it at a meeting or someone who has been on the course has told them about it or they have had a career interview with their boss who has said you had better get into it because of this, this and this. So I would now say that three quarters have a brief understanding of risk but they don’t have the depth. But we are finding that opportunity and threat are being chucked out to us in the brain storms and that would never have happened in the past, and they understand it so they are getting it from somewhere”.</p>	<p>They still do not know what they are letting themselves in for? They were doing RM, albeit in an ad hoc) between departments) fashion but they still did not know what RM or risk was?</p> <p>However because of the organisations approach to RM training (for the new approach) they are finding that individuals are associating risk with opportunity and threat?</p>
36	<p>“If I had asked people back in June last year to tell me how they were using this they would have done it using different terminology”.</p>	<p>The terminology has become part of the organisations everyday lexicon of language. It has become culturally embedded within their approach to project execution?</p>
37	<p>“Now they are coming on the course, they know they have to be there, they know they should be there and there is something to learn”.</p>	<p>Usage of the RM process and consequently attendance on the workshops is prescribed and compulsory, they have to and they should be there. This is very much the correct way to do RM as far as the organisation are concerned.</p>

	Interview Quotation	Commentary
38	<p>“They are not experts in it (risk management), but they want to get on the course because they are being left behind. Probably over the last six months we have found that”.</p>	<p>The employees know that attendance is for their own good? Being left behind will make them dinosaurs within the organisation?</p>
	<p>Q. How was the initiative launched and how are you maintaining its profile?</p>	
39	<p>“we have trained over 1000 people who are cascading it out with toolbox talks etc. They then very quickly came to the conclusion that this is just the start. We have now gone round and made sure that everyone knows that the internet is a good thing, and you can use it for this, and this is how you use it, now we need to make sure that all the infrastructure is in place the tools are there and that everyone has access to it, it is no good if they cannot get to the tools to do the job”.</p>	<p>There is an IT infrastructure available to support the employees.</p>
40	<p>“We need to embed it into some of the major projects we need to give those some emphasis and some backing, send someone around holding hands, helping them to set something up, don't let it fall by the wayside. We need key individuals in all the businesses, we need risk managers”.</p>	<p>The interviewee is talking as though this hasn't happened yet! @we need', 'don't let it fall by the wayside'.</p>
41	<p>“It is a discipline, we need risk professionals throughout our organisation, but those risk professionals are not doing it for everyone else, they are doing it to support everyone else or to be a focus for everyone else, not doing it instead of. We don't want to have a risk unaware organisation where 10 key individuals do it and everyone else says well I don't need to be aware of it because he does it. The whole point of the initiative was to start with the awareness first and make that drive up rather than it is just a black box that someone does. I don't know what you do but you get an awful lot of money, it has something to do with risk, you sit over there and we don't have to worry about it over here”.</p>	<p>There is a personal accountability for the individual employees to take up and instigate RM. Everyone should be able not just a choice few. They are trying to make it a core skill for all their employees.</p>
42	<p>“I was offered silly money to leave the company. I have been offered five quality jobs this year in risk. We have lost a guy recently. Another guy I know is a key individual within the higher level you were talking about and he has been offered a lot of money, we are talking triple salaries. HR is aware of it they are dealing with it and they are prepared to put their money where their mouth is. We have to manage it very carefully otherwise everyone is up for promotion, everyone puts it on their CV and they are off and we don't want that either. From that point of view it is being taken very seriously”.</p>	<p>The organisation may be losing the capable professionals because they are not able to match the salaries of other potential employers.</p> <p>I have to ask why the interviewee has told me this; is it to show that the RM process the yare adopting is the envy of other employers, or is it simply to let me think that?</p>
	<p>Interview Quotation</p>	<p>Commentary</p>
	<p>Q. Is there an infrastructure there to support these people once they have become risk aware?</p>	

43	<p>“Yes there is. I mean (the orgs. approach) doesn’t stop come Christmas. It comes of age I think”.</p>	<p>If the purpose was to achieve an understanding for he need for RM this is true.</p>
44	<p>“We have some major projects and they are screaming for risk professionals to get on those projects so whether we go out and recruit somebody which is probably not a good thing or we take, I have some individuals out there who are screaming out to take risk forward”.</p>	<p>Are they getting projects based upon their ability to manage risk according to their RM approach and then finding that they are unable because they do not have the ability or manpower to do so?</p>
45	<p>“They have been on all the training courses, pretty good, but if called them up and asked them help me with this project they would say ‘well my local director is wanting me to do my day job!’ Someone has to take that big picture view, unplug them and say ‘sorry but I am going to cause a headache locally but for the greater (the org) this individual is better placed doing the bigger role.’ They are the sort of issues they are dealing with now”.</p>	<p>Everyone is risk aware but not everyone is risk capable. Their has to be some flexibility within the structuring of the organisation to allow employees who are independent of the project to facilitate the RM process.</p>
46	<p>“We have used the magic words that this is the beginning of the initiative, not the end. We have a broad understanding so that when someone sits on a tender review he knows what they have done and where they are coming from, he has been through the mill and he has had a little practice”.</p>	<p>It has to become part of the organisations lexicon, a standardised approach and language so that business sectors can communicate effectively with each other.</p>
47	<p>Q. How many of those people who have been through the courses have actually left with the level of understanding or the awareness you have tried to impart? “We have the feedback sheets. I would say 99% of people who have been on the course say ‘I am now risk aware’, ‘I am far more aware than I was’ ‘it was more benefit than I thought it was going to be’, ‘I feel I am on the right road to go back and start applying this’”.</p>	<p>99% are aware. They know they should be there and they know they have to be there because there is something to learn; yet only 10% (from previous statement) actually pay attention?</p>
48	<p>“Where it doesn’t work, or where we start to loose heart is when they go back to the ranch they don’t get the chance to apply it, time moves on, if you don’t start to use it you loose it and I think there is a lot of that going on. Because life gets in the way the key people aren’t using them. They are letting the personnel department nominate people. Everyone tells me that I now need to practice it before I forget it”.</p>	<p>This is validated by my own experiences.</p>

Summary of Interview

Analysis of the interview suggests that the 'drivers' behind the instigation of the organisations RM approach are three fold:

1. Firstly it is intended to replace the disparate approaches that existed previously with a generic approach that may be used globally throughout the organisation (1, 2, 4, 13).
2. Secondly the approach is intended to represent the company's diversification from the mainstream of its competitors by exhibiting a progressive and matured approach to risk management to its customers (18, 23, 25).
3. The changing nature of the organisations customer interface necessitated a prescribed RM approach (23)

The approach as it currently stands is identifiable by its seven step 'branded' structure that represents a formalised, current best practice within the organisation (4, 5, 14, 3). This approach combines standardised terminology, lexicon and generality by which the entire organisation can communicate on the same level; can "speak(ing) the same language" (5, 9, 14, 46). Whilst it was communicated to the risk management trainers that the organisation would want to use RM even if their customers did not require it (30). However whilst some of the higher management would prefer to exploit opportunities at the cost of customer relations (32) the RM process is intended to facilitate to a partnering style arrangement that offers a closer working arrangement between parties to the contract (33).

One of the organisations objectives was to design an RM approach that would be generic (3) and one that could be incorporated into the various departments own working practices and processes that will hopefully be seen as an integral and necessary feature of the overall construction process (6, 16). This involves educating the employees in the philosophy and the processes of the organisations preferred approach to RM (15). The initiative stresses individual accountability (41) that is supported by an objective view of risk afforded by the RM strategy (21, 22).

One of the principle aims of the initiative was to make the organisation risk aware, able to answer the question "what is risk?" (7, 8). However the intention may be a little more oriented towards educating employees to answer the question "what is the organisations view of risk?" (7). This assumption is evidenced by the acknowledgement that there existed previously disparate approaches towards RM within the organisation; the interviewee acknowledges that "everyone was aware of risk" but they had not been 'educated' in a preferred approach to its management (13, 15).

The intention is to educate first hand a selected number of employees who may then take the 'message' back to their departments and begin the dissemination process again via toolbox talks etc (10, 12). It is hoped that the approach will become one of the core skills within the organisation and be embedded into the organisational work culture (19, 41). The message is that the organisation is not afraid to take risks, but if they do they want the reward that accompanies that. Risk equals reward. This may encourage the risk takers to take even more whilst the risk averse may be inclined to take a disproportional smaller increase in risk compared to the risk takers. 'walk off the cliff with their eyes open' is almost a challenge. If you think you know what you are doing then walk the organisation and yourself off the cliff. The only qualifying

criteria is that we must be rewarded for doing so (24). However the nature of RM is that potential hazards will be identified and for these to be managed rationally strategic managers within the organisation need to be able to promote 'free speech' (26, 27).

The initiative has been running for approximately four years and the delivery team are finding that approximately three quarters of the attendees arrive with an understanding of the premise and the language used within the new RM framework (35, 36).

Approximately ninety nine percent of the attendees leave with an 'understanding' of RM and the organisation preferred approach (47) however only ten percent show any interest in continuing their RM training (11). This is leaving the organisation with a problem; they do not have the risk managers capable of managing the process (39, 40, 44, 45) and so the training initiative is changing to make the organisation risk capable (8, 24). However once employees have attended the workshop they are not always getting a chance to put what they have been taught into practice and thereby they are losing the skill before they have acquired it (48). This is further evidenced by the fact that there are projects that are asking for risk managers (44) but are unable to instigate the process either partially, if at all, because there is insufficient trained and available manpower to do so (17, 45). However those that are trained are being offered higher paid employment outside of the organisation (42).

The need to adopt the new organisational approach is being communicated from the highest levels of the organisations management (29), which is leading towards a view of the inevitable; i.e. we had better attend this course or we will be left behind, a dinosaur within our own organisation (28, 38). However there is an air of the dictatorial about the learning process, attendance at the training workshops; "they know they have to be there, they know they should be there" (37).

Conclusions

The organisation has designed and is in the process of introducing an RM strategy that it views as objective enabling risks to be 'seen' (22). The cultural change accompanying this view communicates that the organisation is not afraid to accept risk and that in some cases risk may equal reward (24). This initiative was partly designed to provide a framework within which risks to the organisation arising from their diversification of interests may be effectively and objectively managed (23). However as they are not inclined to recruit risk managers from outside of their organisation (44) there is uncertainty as to whether they realise that the initiative only provides a framework and does not educate the risk managers to identify risks they do not have the knowledge to recognise.

The workshop attendees are encouraged to educate their colleagues back in the workplace in the organisations approach to RM; a process that may ultimately dilute the message the organisation is trying to communicate.

The organisation is also facing problems on two other fronts. One is their struggle to educate sufficient numbers of risk managers and then to keep them within the company. The second is the clients perspective of the RM service offered by the organisation, i.e. we can only do this if you trust us and allow us to make the most of the opportunities we are identifying for you (34).

APPENDIX D

Green Team Verbal Transcription

- G709ea. what do we write in here (1.6)
G710ha. what we believe the values should be (.) what's the minor value (.)
G711ga. what ((coughs)) (.) what I understand is we write in here and transfer it to there (0.6)
G712ha. yep (0.3)
G713ea. first of all opportunities (7.4) right are we saying it is a scale of: six months (.) =
G714ga. [yes]
G715ha. [yes]
G716ea. = for the whole job right (1.0) so a minor opportunity (1.8)
G717ha. save an hour or two here or there (.)
G718ea. would you say is a day (1.2)
G719ha. is that minor (3.0)
G720ga. a minor opportunity what gaining a day (0.4)
G721ea. a week
G722ga. see if you gain a day here you can lose it somewhere else it's: it's:
G723ha. [hm:]
G724ea. [yeah well
G725fa. [well i hope=
G726fa. = you were all paying attention because i started to loose the plot in that last bit =
G727fa. = i must admit
G728ha. i- in a six months: programme (.) right (.) let's start in the middle then (.) what =
G729ha. = do y- what do you believe would be a substantial opportunity (1.6) on a six =
G730ha. = month contract period (2.1)
G731ga. a saving right so how much:
G732ea. [it would be a ten grand saving< (2.4) on your =
G733ha. [yeah]
G734ea. = budget (.) no five thousand
G735ha = [>ha ha<] ((laughing))
G736ha. yeah
G737ga. a twenty thousand pound budget is a really small budget ((mumbles away))=
G738ga. = hardly °enough to pay one mans wages is it°
G739ea. what five k (1.5) five k i would say is a substantial (.) opportunity (0.4)
G740ha. to save
G741ea. hm:
G742ha. hm:: (2.9) i mean pencil in five grand
G743ea. yeah we can always change it (1.1)
G744ha. yeah (1.2)
G745ea. exceptional's ten (2.7) you know coming in at half the budget (8.1)
G746ha [yeah] [yeah (.) very =
G747ha. = substantial is °what about six-°
G748ea. [can i just ask you something here (0.6) how can something highly =
G749ea. = probable (2.3) oh it wouldn't be highly probable would it
G750ha. no it is nothing to do with that is it
G751ea. no
G752ha. they are just separate columns
G753ea. sorry (.) sorry (2.5)
G754ha. [yeah]
G755ea. seven k for very substantial ((laughing))
G756ha. yeah (1.1) significant what (0.8) two (.)
G757fa. °yeah°
G758ha. or shall we say one thousand (3.9)
G759fa. on on on that scale i would have said one (.) was significant °on a budget =
G760ha. [°yeah°]
G761fa. = of twenty thousand°
G762ga. may- maybe substantial should go to three

G763ha. *[minor is what one hundred pound (2.1)*
 G764ga. three thousand pounds is still (.) °quite a lot of money yeah maybe one =
 G765ga. = hundred pounds is:°=
 G766ha. minor (0.3)
 G767ga. = [quite a lot of money to loose (1.1)
 G768ea. yeah one hundred pounds (0.9) one thousand for significant (.) substantial what three =
 G769fa. [yeah] [yeah] [yes]
 G770ha. [yeah]
 G771ea. =and a half (1.3) very substantial would be (1.6)
 G772ha. six
 G773ea. six
 G774ha six ish
 G775fa. hm:
 G776ea. yeah
 G777ga. hmm
 G778ea. and exceptional would be eight (1.5)
 G779fa. yeah yeah because you are talking major percentage of your budget there
 G780ha. [hm]
 G781ea. >yeah< (.) i don't think we are out (0.3) a grand here of there are we
 G782ha. [yeah] [no]
 G783fa. [hm:]
 G784ga. and how and how (.) ok just ask the question hm: (0.6) devil devils advocate =
 G785ga. = style (.) erm:: ° how have you come to those figures°
 G786ea. we've guessed (.)
 G787ha. [hm:]
 G788fa. yes (3.2)
 G789ea. phew ((ea. blows a breath out)) if you if you've got a project and it's: it's =
 G790ea. = worth twenty grand (.) yeah (.) an exc:e:ptional opportunity (1.2) °yeah° =
 G791ha. [hm:]
 G792ea. = would be if it came in at you know sixty percent of your of of your budgeted =
 G793ea. = cost wouldn't it
 G794fa. [hm:]
 G795ha. of course (.)
 G796ea. yeah (0.3) and it is achievable if you've if you've but if a builder were to =
 G797ea. = come in and say i'll do your extension for twenty k (0.9) you could do =
 G798ea. = it for twelve (.)
 G799ha. hm
 G800ea. you could do it for twelve if you shopped round (.) dug the footings yourself
 G801fa. [yes yes yeah] [hm:]
 G802ha. [hm:]
 G803fa. there are ways-
 G804ea. [there are ways and means of doing it yeah
 G805ha. get rid of all the unskilled
 G806ea. [there might be some value engineering that goes on (.) ((laughing)) yeah =
 G807fa. [yes]
 G808ea. = but you know you could still get your u values and so on
 G809fa. [ha] ((laughing))
 G810ha. [hm: hm:] ((laughing))
 G811ea. you wouldn't have any windows in the place like but er::m ((laughing))
 G812fa. [ha ha] ((laughing))
 G813ea. but realistically you could get that to twelve k couldn't ya..
 G814fa. you probably could yes..
 G815ea. yeah (.) ((ea. sniffs in loudly)) erm: (1.47) time days (1.0) minor (0.5) one day (4.4)
 G816fa. weighing against the whole project
 G817ea. [you s;ee yeah ::: (1.4) ((training provider walks in))
 G818fa. i would have thought yeah erm: slightly erm: (1.7) higher than that (.)
 G819ha. [°yeah°]
 G820ea. a w;eek-
 G821fa. a week (.) yea:h a week (0.8)
 G822ea. you think about it it's only twenty grand over what are we saying six months..

G823fa. yeah hm::
G824ea. you know a week you know a week it's not like it's a retail outlet (0.4)
G825fa. no (4.3)
G826ea. six months is quite °a long time though isn't it°
G827fa. ye:s it is ((george haughton discussion 6.20))

((Training provider enters room and presents a monologue upon figures quoted for threats and opportunities... "they are specific to your project but they are the steepest i have seen recently.. "... " one trick you can use is to say greater than a figure..." "just think about it you want to be able to scale them to prioritise no have all your risks in the bottom left hand corner.."))

G828ea. i would still say a grand for that
G829fa. yes i think we °are somewhere along the right lines for that°
G830ea. [i would say (2.6) we can =
G831ea. = do a band i'll do the band in a minute
G832fa. yeah
G833ea. so from the bottom i have gone five three two one
G834ha. and virtually zero
G835fa. yeah
G836ea.[yeah now i would say an exceptional opportunity (1.3) in time (4.74)
G837ha. [hmm]
G838ea. is:: (1.1)
G839fa. what do we work on the same side as
G840ha. or do we work on the other side, i would say
G841ge. i would start on the threat if i were you (.) you might find it easier with a threat=
G842ea. >RIGHT<
G843fa. ok
G844ge = and mirror for the opportunity
G845ea. what for the cost and the time
G846ge. you have the cost (.) but you may find it easier
G847ea. [RIGHT OK] [well i think cost is more a =
G848ea. = priority on this job than time (.)because it's not a retail or a hospital or anything (2.3)
G849ha. [yeah]
G850ea. i'm just throwing things in here: (.)
G851fa. yeah (6.9)
G852ea. what i've said is and i am not saying it's right-
G853ha. [yeah]
G854fa. no
G855ea. on the on the threats (.) i've said insignificant seven days (1.8) because it's not =
G856ea. = really not for a domestic (.) job is it
G857ha. no not really (.) seven days stop but
G858ea. [twenty one for marginal (0.8) i've tripled that (.)
G859fa. could we do it on the same seven you know band because there is a little more flexibility
G860ea. [fourteen] [yeah =
G861ea. = between twenty one and thirty is serious because it's a month then (.) getting on to =
G862fa. [yeah]
G863ea. = a month isn't it
G864ga. [are we talking about excuse me are we talking about erm: a delay erm: of all =
G865ga. = works are you saying it would occur and cease all work or is it just a delay in =
G866ea. [er:: i would say it is the]
G867fa. [yeah]
G868ga. = the programme (0.5)
G869ea. whole job really completion of the whole job really (0.6) completion of the whole job
G870fa, [yes:] [yeah =
G871fa. = that is how i see it (0.9)
G872ea. yeah i know what you mean (.) you could overcomplicate it (.) i know what you are saying
G873fa. if that project overrun by those amounts time well
G874ea. [>critical would be between one month and a month and a half <(0.4)

G875fa. yeah:
 G876ga. so i am taking it as()
 G877ea. [catastrophic would be forty two days (.) >that is what i have said <(.) i might =
 G878ea. = not be right and we can alter these
 G879fa. [it's open to discussion
 G880ea. forty two to sixty days (2.0)
 G881ga. that's three months
 G882ea. two months
 G883fa. two months (.) yea:h (4.9)
 G884ea. two months (.) and considering that it's (.) probably you know (0.8) it's a long time on a =
 G885ea. = normal type job but this isn't a normal type job (.)
 G886fa. no (1.6)
 G887ea. lets be honest percentage wise yeah (1.9) five you know (.) twenty five percent =
 G888ea. = over (.)on your costs (.) yeah and you would be going fucking ballistic =
 G889fa. [yes]
 G890ea. = wouldn't you
 G891fa. [yeah (.) on a personal level yes of course(.)
 G892ea. e- >EVEN ON A MAJOR JOB EVEN on a normal job < (.) twenty five percent =
 G893fa. ()- [yeah =
 G894ea. = over and you would be (0.5) phew
 G895fa. = twenty five percent over] [you'd be (.) phew
 G896ea. it would be exceptional really
 G897fa. [it would be a firing squad job ha
 G898ea. yeah and it probably wouldn't get to twenty five percent before it would be exceptional =
 G899fa. [no]
 G900ea. = to be honest
 G901ga. maximum what would you say would (.) °be the maximum°
 G902ea. on a job
 G903ga. [on this job (.) a twenty thousand pound budget percentage wise
 G904ea. five k (0.4) five k over yeah which is what we have said here (.) would be catastrophic (.)=
 G905fa. [yeah] [yeah]
 G906ea. = yeah (.) in relative terms (0.7) if if you know if (.)
 G907fa. yeah if that's right (.) °significantly amount of money ° (.) if you were looking to =
 G908fa. = borrow again you would be looking at a hun::dred and fifty quid a month for five =
 G909fa. = years and paying it back that would be-
 G910ea. [hm:]
 G911ga. that would be two hundred ()
 G912fa. yeah well whatever it is you know -
 G913ea. [do you (.) do you think the time is right (.) an insignificant threat (.) up to seven =
 G914ea. = days you wouldn't be bothered would you (1.1)
 G915fa. no i-
 G916ea. [seven to three weeks you would be starting to worry but it would not be serious yet..=
 G917ea. = three weeks (.) well just hurry up yeah i want it no more serious yet (0.7) =
 G918fa. [hm:] [hm] [yeah
 G919ea. = now come you're a month late now yeah all right i'm in my main office=
 G920fa. [yeah]
 G921ea. =my (1.2) main office but i want to stop that now (.) yeah (.) you should have had this finished
 G922fa. [hm]
 G923ea. = come on (0.9) critical (1.0) yeah (.) he's taking the piss now isn't he (.) he's over the =
 G924fa. [hm]
 G925ea. = month and he is going to a month and a half (.3) he is taking the piss in't he (.) and =
 G926ea. = anything other is catastrophic isn't it (0.8)
 G927fa. hm: yeah
 G928ea. = >now< (.) what do you think
 G929ha. hm: yeah- (2.8)
 G930ea. is it a (.) good: ba::nd >are the bands< (0.5) reasonable enough (1.5
 G931ha. seven twenty one (2.1) what thirty
 G932ea. >twenty one to thirty for three< (2.5)
 G933ha. hmm
 G934ea. four: is thirty to forty two..(2.0)

G823fa. yeah hm::
G824ea. you know a week you know a week it's not like it's a retail outlet (0.4)
G825fa. no (4.3)
G826ea. six months is quite °a long time though isn't it°
G827fa. ye:s it is ((george haughton discussion 6.20))

((Training provider enters room and presents a monologue upon figures quoted for threats and opportunities... "they are specific to your project but they are the steepest i have seen recently.. "... "one trick you can use is to say greater than a figure..." "just think about it you want to be able to scale them to prioritise no have all your risks in the bottom left hand corner.."))

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G832fa. yeah
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G834ha. and virtually zero
G835fa. yeah
G836ea.[yeah now i would say an exceptional opportunity (1.3) in time (4.74)
G837ha. [hmm]
G838ea. is:: (1.1)
G839fa. what do we work on the same side as
G840ha. or do we work on the other side, i would say
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G842ea. >RIGHT<
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G846ge. you have the cost (.) but you may find it easier
G847ea. [RIGHT OK] [well i think cost is more a =
G848ea. = priority on this job than time (.)because it's not a retail or a hospital or anything (2.3)
G849ha. [yeah]
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G851fa. yeah (6.9)
G852ea. what i've said is and i am not saying it's right-
G853ha. [yeah]
G854fa. no
G855ea. on the on the threats (.) i've said insignificant seven days (1.8) because it's not =
G856ea. = really not for a domestic (.) job is it
G857ha. no not really (.) seven days stop but
G858ea. [twenty one for marginal (0.8) i've tripled that (.)
G859fa. could we do it on the same seven you know band because there is a little more flexibility
G860ea. [fourteen] [yeah =
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G869ea. whole job really completion of the whole job really (0.6) completion of the whole job
G870fa, [yes:] [yeah =
G871fa. = that is how i see it (0.9)
G872ea. yeah i know what you mean (.) you could overcomplicate it (.) i know what you are saying
G873fa. if that project overrun by those amounts time well
G874ea. [>critical would be between one month and a month and a half <(0.4)

G935ha. hmm (0.3)
 G936ea. catastrophic (.) five is forty two to sixty (.) ok and that goes then for the opportunities =
 G937ea. = as well doesn't it (.)
 G938ha. >what oh yeah<
 G939ea. you just take them and put them there don't ya-
 G940ha. [oh hm:::] [yeah ((mumbles)) (13.6)]
 G941fa. just working that back (0.4) is there any correlation (.) if that is 25% of the cost of the =
 G942fa. = project (.) do we need to think in terms of twenty five percent for time
 G943ea. [no!] [no (.) he said that (.) =
 G944fa. [oh all right]
 G945ea. = you're costs might be more=
 G946fa. [that's probably=
 G947ea. = you may be more cost driven than you are time driven (.)
 G948fa. = where i nodded off] [yes] [yes he did say that
 G949ha. [yeah] [yeah]
 G950ea. hm: i'm doing a job at the moment (.) where (1.9) time is more an issue than cost (.) =
 G951fa. [yeah]
 G952ea. = it's a gap manufacturing warehouse (1.0) they want to get the sweatshirts in =
 G953fa. [hmm]
 G954ea. = and start rolling (0.9) and the cost the fuc- .. you know i think they've got =
 G955fa. [hm:::]
 G956ea. = wads of it (.) wads of cash (1.1) right: ok (.)
 G957fa. are we relatively comfortable with that then
 G958ha. now we've got to rate
 G959ea. [i think s-] [yeah we've got to rate everything and plot it on a pi grid haven't we
 G960ha. yeah (.) so yes (0.3) rate
 G961ea. [right]
 G962ha. rate has got to fit the time (.) hasn't it (.) because you will be going backwards =
 G963ea. [right ok]
 G964ha. = and forwards ha ha ((laughing))
 G965ea. rate everything and plot it on a pi grid haven't we (0.5) i don't want to start rating it and =
 G966fa. [yeah] [no]
 G967ea. = find we are not doing it properly (.) shall we find out that we are doing it right first
 G968fa. [no]
 G969ha. we are just looking at these (.) two probability and impact
 G970ea. oh right i would say a normal job like that the probability (.) er::m-
 G971fa. are we going to do this in pencil then we can er: (.) you know change it as we (.) go
 G972ha. [y:eah]
 G973ea. shall we find out if we are doing it right first before we:-
 G974fa. °yeah that wouldn't be a bad idea would it°
 ((break in work whilst ea. checks with training provider)) (153.0)
 G975ea. so building work (0.6) erm: (1.4) the probability (3.2) is: (.) it's improbable that you =
 G976ea. = are going to have a lack of (.) er:: (1.4)
 G977ha. it's going to be low isn't it
 G978fa. yeah
 G979ea. and the threat is insignificant so it's a one (2.3)
 G980ha. °ok°
 G981ea. are we happy (1.7)
 G982ha. i- is the threat (3.9) is the threat insignificant..
 G983fa. [they don't have to be identical any way do they anyway =
 G984ea. [no no .. not at all no]
 G985fa. = so it's just a case of erm: (1.7)
 G986ha. [no]
 G987fa. i would say the impact is higher than the probability
 G988ea. ok (.) so
 G989fa. [that would be my view (2.2) it may not be high but i=
 G990ea. ((breathes out audibly))[all right (.) i didn't mean to go across
 G991fa. = think it will be higher than a one
 G992ea. what it means is if you couldn't get the materials that you specified what would happen=
 G993fa. [yeah]

G994ea. = what would be the cost impact needed what would be the impact (.) right we can't get =
 G995fa. [i-]
 G996ea. = portlands (.) bricks right we'll have to go to:: (0.4)
 G997fa. whoever
 G998ea. whoever
 G999ha. would it cost us more (1.4) is there a cost impact
 G1000ea. [i think it is actually going to be: erm: =
 G1001ha. [time
 G1002ea. = it's going to be a serious threat possibly
 G1003fa. [hm: (2.7)
 G1004ea. °a different type of brick ° ((thoughtfully)) (1.7) have we got the bands right one =
 G1005ea. = to two k (1.0) >WE HAVE YEAH< i i think it is a marginal (.) it's a marginal threat =
 G1006fa. [hmm]
 G1007ea. =isn't it
 G1008fa. hm::
 G1009ha. cost wise
 G1010fa. yeah
 G1011ea. >yeah so< (1.42) it's a two
 G1012fa. [i i would say-
 G1013ha. [what about time (3.3) because there is a cost element =
 G1014ha. = and there is a time element (1.3)
 G1015ga. availability of resources
 G1016ha. [>as I see it-<]
 G1017ea. oh right (1.2)
 G1018fa. well we can get rid of the () for that anyway can't we
 G1019ha. yeah
 G020ea. [oh sorry]
 G1021ea. time (.) i don't think it is going to put more than seven days on it to be honest
 G1022ha. right (.) ok (.) yeah
 G1023ea. what do you think (.)
 G1024ha. h:m yes (1.6) w- we ca-
 G1025ea. [most bricks are stock item aren't they
 G1026ha. there shouldn't be anything fancy we are going for nothing special (.)
 G1027fa. [no]
 G1028ea. ye:ah the only problem s if you get the... th- th- the end of a batch you get=
 G1029ha. [we are not in a conservation area where we need a special brick or =
 G1030ea. = a slightly different colouring but you know (.) they are doing them every =
 G1031ha. = tile or something]
 G1032ea. = day aren't they (3.4)
 G1033ha. [yeah]
 G1034fa. yeah (.) ok (.) yeah (.) labour availability (0.8) er:m (3.7) it could happen
 G1035ha. [yeah]
 G1036ea. it could happen
 G1037fa. [yes it does
 G1038ea. it's a two
 G1039ha. two
 G1040ea. >i am not trying to speed it up<
 G1041fa. well no but we can change it as we go(.) we we yeah (.) we have to get a =
 G1042ea. [i'm just thinking that we have quite a lot to do really]
 G1043ha. [no]
 G1044fa. = base line down so (3.2)
 G1045ea. the threat (1.6) how much (2.0)
 G1046fa. well i i think it's it's one of the: (0.5) higher ones not (.) off the scale (.) but (0.6)
 G1047ea. i think it could cost you anyth-
 G1048fa. [yeah (2.6)
 G1049ea. ((breathes out audibly))
 G1050fa. i see that as quite high
 G1051ea. i think it is a serious really
 G1052fa. hm::
 G1053ea. if you've got a labour problem you are going to have to induce someone to come =

G1054fa. [yes:]

G1055ea. = and do it for you (0.9) now

G1056fa. [yes] [and they may not be available (.) and the chances are if that particular =

G1057fa. = person can't come then everyone else is going to be in the sam-

G1058ea. [>i think we give it a 3<

G1059fa. yeah i would say that's- (1.5) yeah

G1060ea. er::

G1061fa. and then the impact on time (.)

G1062ea. well ((breathes the word out)) (2.5) i think it's a three as well because:

G1063fa. yeah

G1064ha. [yeah]

G1065ea. i can't come i've got a job (.) yeah

G1066ha. yeah

G1067ea. it's going to be another two weeks before i finish that job (.) >because six months is =

G1068ha. [yeah] [yeah]

G1069ea. = ridiculous< (.) once you think about it really (1.2) yeah (.) normally builders i can't =

G1070ha. [yeah]

G1071ea. = come this week it's going to be another three weeks the the three covers it i think

G1072fa. [yeah yeah] [yeah (1.5)]

G1073ea. erm: adverse weather (1.2)

G1074ga. i'd say a three (0.6)

G1075ea. it is yeah (.) it's as likely as not isn't it (2.8) now (1.4) the impact (1.7) i- i basically think =

G1076fa. [yeah] [yeah]

G1077ea. = we are used to working in

G1078fa. [yeah]

G1079ha. it should be marginal

G1080ea. we very rarely do we get weather where we have to down the (.) down tools and =

G1081ha. [completely]

G1082ea. =stop bricky'ing

G1083ha. yeah

G1084fa. [yeah]

G1085ea. yeah (.) so (.) do you think the impact is:: phew ((ea. breathes out audibly)) (2.7)

G1086fa. well i don't know whether this is (0.6)

G1087ea. is:: is:: a two (.) minus (0,4)

G1088fa. two i would have-

G1089ea. [sorry a two (.) yeah: (.)

G1090ha. marginal

G1091ea. and time (.) i think it's: (.) it's insignificant (.) seven days(.

G1092ha. °seven° yeah (.)

G1093ea. yeah

G1094fa. yeah

G1095ea. you know = (1.5)

G1096fa. yeah

G1097ea. = it would be interesting to se what it is statistically on our sites you know i think =

G1098fa. [yes]

G1099ha [yeah]

G1100ea. = this is the only year we have had to (.) down any concrete work isn't it

G1101ha. yeah

G1102ea. erm:: (.) work acceleration-

G1103fa. yeah this was a: (.) an opportunity this was an opportunity yes

G1104ea. [this was an opportunity wasn't it] [now]

G1105fa. yes

G1106ea. erm:: (1.4) i think it is as likely as not really (.)

G1107ha. yeah a six month programme for this one ((laughingly)) small extension

G1108fa. yeah (.) you'll find that people who would be pricing against this would would =

G1109ea. [well this is why it has it's opportunities and it's risks really]

G1110fa. = price: conservatively wouldn't they to allow for and if the weather improves

G1111ea. [hm:] [yes]

G1112ea. i i don't actually think it's a big co:st opportunity (.)

G1113ha. not a cost opportunity no (.)

G1114ea. yeah i think it's a minor it's a minus one (.) to be honest
G1115fa. [hm::]
G1116ea. unless you disagree (1.2)
G1117fa. [yeah
G1118ea. because you'll say listen (.) typically you'll say will it will accelerate the works =
G1119ea. = but it will cost you no less
G1120ha. hm:
G1121ea. yeah
G1122ha. because you sti-
G1123ea. [because i because i am still going to have get another guy in
G1124fa. yes
G1125ha. [yeah]
G1126ea. erm:: (0.9) but your time(1.2)
G1127ha. that's what your saying isn't it
G1128ea. [i think it it's substantial (1.9)
G1129fa. hm:
G1130ea. [i think it could save you a month (1.3)
G1131fa. yeah: potentially ok
G1132ea. minus three (2.5)
G1133ha yeah
G1134fa. hm:
G1135ea. alright
G1136fa. yeah (3.5) what about the access one
G1137ea. oh (.) oh sorry
G1138ha. the acs-
G1139ea. access er::m (2.9) could happen (1.0)
G1140fa. hm: (3.2)
G1141ea. [erm:]
G1142ga. well if you couldn't and you you had to take down a fence or you had to get permission =
G1143ga. = from a neighbour
G1144fa. yeah.
G1145ea. yeah (.) i think your threat is: (.) marginal (.) money wise
G1146fa. hm:
G1147ha. hm: (0.8)
G1148ea. what you're gonna have it's gonna be a fence
G1149fa. yeah
G1150ha yeah it's gonna be-
G1151ea. it's an arse but you can lift it up
G1152fa. yes
G1153ea. soon put the concrete at the tops you know
G1154fa. [yeah there's a way round it
G1155ea. [there's a way round it =
G1156ea. = and it's not very expensive is it-
G1157fa. no (.) °not in the scheme of things no°
G1158ea. and your time element (.) it is going to be seven days it's going to be insignificant
G1159fa. insignificant yes: (.)
G1160ea. it's going to be a one isn't it
G1161fa. yeah i think that's a fair assessment
G1162ha. yes: (.)
G1163ea. erm:: (3.3) right ok (1.2) decorating (.) wife changes mind (.) highly probable
G1164ha. hm:
G1165ea. it's a f: it's a five
G1166ha. hm ((chuckles))
G1167ea. what it is is i think somebody else has picked this as well
G1168fa, it's obviously happened before (.)
G1169ea. er::m (.) tch ((makes sound through teeth)) (2.3) yeah: (1.5)
G1170ha. cost wise (2.0) your talking about decorating (.)
G1171ga. five exceptional
G1172ha. you're not going to spend a five grand on a room decorating it are you =
G1173ga. [you would you would]

G1174ha. =even if you had to re-decorate it
G1175fa. that's right there's no big cost (0.5)
G1176ea. right we'll treat it is a threat yeah because we've got enough enough items
G1177ha. [yeah]
G1178fa. [yes]
G1179ea. er::m (0.3) it's not going to cost you any more it's going to be colour schemes and =
GL1180fa. [no]
G1181ea. = colour schemes don't cost you a great deal-
G1182fa. no [i mean you you
G1183ea. [wall paper doesn't cost =
G1184ea. = you that much (.) for a for a single office does it (.)
G1185fa. no
G1186ha. it could be insignificant (0.5)
G1187ea. so shall we put erm: a one (0.8)
G1188ha. yeah
G1189fa. yes
G1190ea. >time<..
G1191ha. again just a- =
G1192ea. [] ((audible intake of breath))
G1193ha. = just to redecorate a room
G1194ea. °it's going to be up to seven days° ((almost whispering)) (.) you'd have it done =
G1195ea. = in a couple of days wouldn't ya
G1196fa. yeah
G1197ea. [so it's a one again
G1198fa. yeah
G1199ea. [erm:: (.) interface of building and decorating work (1.1)
G1200fa. hm:: ((thoughtfully ?))
G1201ea. erm: phew ((audibly breathes out)) over six months i don't think it's=
G1202ea. = a (2.5)>i think it's a two-<
G1203fa. it's a small project isn't it (.) so you should be able to manage that (.)
G1204ga. can we just go back er:m yeah probability on a five er:m (.) are we going to go for =
G1205ga. = a five or: (0.4)
G1206fa. i would have said that was a three actually
G1207ha. ha ha ((laughs))
G1208fa. not as high as that (0.9) the chances are that-
G1209ea. [i'd say it was a probable i really would =
G1210ea. we::ll ok
G1211ga. it's just a case of putting some more paint on the wall ((rather incredulously))
G1212fa. yeah (.) yes
G1213ea. >no yeah we are saying what's the probability<-
G1214fa. [what's the probability of that actually happening
G1215ha. yeah (.) what's the probability (.) yeah (.) thing is is it likely that your wife is going =
G1216ha. = to change her mind
G1217fa. yeah (0.4)
G1218ga. yeah ok sorry i was-
G1219ha. [it's ok
G1220fa. yeah give it a three
G1221ea. ok
G1222fa. you would hope you had discussed it (.) before hand
G1223ha. [even if she had gone out an bought the paint =
G1224ha. = herself she could still change her mind once it was up
G1225fa. yeah it's about a three (.) as likely as not i think is a fair (.) °thing to say °-
G1226ea. [eh] ((short curtailed vocalisation)) [i think it is improbable that you =
G1227ha. [yeah]
G1228ea. = would on a six months job (.) you're going to have a problem with your building and =
G1229ea. = decorating works to be honest (0.3)
G1230fa. yeah:: not a major one anyway
G1231ha. no
G1232ea. [>what do you think it's a two<
G1233fa. yeah you'll be alright with that i think

G1234ea. erm: (.) you're cost (1.8)
G1235fa. you're cost (.) would I think be fairly minor i would have thought yeah
G1236ea. [minor] [i think =
G1237ea. = it's a one that-
G1238fa. hm:
G1239ea. and time (1.3) >a two< (0.8) it's gonna be seven to twenty one days (1.1)
G1240fa. hm:: (1.2)
G1241ha. yes that would bring it back again
G1242ea. can't do anything yet (.) cant even put magnolia on it mate until it's dry =
G1243ea. = it's not going to be dry for- (.) maybe ten days
G1244ha. hm:
G1245ea. it's damp (.) it's gonna be ten days isn't it (.) if it's sunny it will be less (.) i =
G1246fa. [hm]
G1247ea. = mean (2.0) ((audibly breathes out)) do you thi- why do you (.) are you =
G1248ea. = bordering on the three
G1249fa. i'm i'm thinking of the of the actual middle the middle rating more than: the=
G1250fa. = last one(.) just (2.8)
G1251ea. >what this one<
G1252fa. yeah (0.6)
G1253ea. you think the cost will be higher (.)
G1254fa. hm:: (2.2)
G1255ea. what it will be hundred to (.) a thousand (.) ok
G1256fa. [yeah] [yeah::
G1257ea. yeah
G1258fa. yeah i think that's more-
G1259ea. [i seem to forget that we have them in bands there
G1260fa. yeah
G1261ea. yeah er::m and (.) time (1.5)
G1262ha. give that a two (.)
G1263ea. two (1.0) ok
G1264fa. yeah
G1265ea. do it yourself
G1266fa. this was an opportunity wasn't it.
G1267ea. [>it's as likely as not isn't it<
G1268fa. yeah
G1269ha. [oh yeah
G1270fa. yeah
G1271ha. is it probable or: (.)
G1272ea. is it er:: >it's an opportunity this<
G1273fa. yeah
G1274ha. [yeah]
G1275ea. i think: it is a very substantial cost saving > to be honest i think it is exceptional< (.)=
G1276ea. = shall we go for the minus five
G1277fa. it wouldn't do any harm would it (.) it's going to be the biggest opportunity that =
G1278fa. = you will have
G1279ea. >PUT IT this way you couldn't be proven the other way could ya<
G1280fa. no
G1281ea. >you couldn't be proven < (.) that it's a minus four (.)
G1282ha. we are talking about decorating (3.4)
G1283ea. oh i tho- yeah yeah
G1284ha. we are not going to save five grand on decorating are we ha ha ((laughs))
G1285fa. [yes (.) we've go t- to be]
G1286ha. on decorating
G1287fa. no we need to (.) but that is also something else we could (.) expand on
G1288ea. [right (.) so as likely as not your opportunity (0.4) is going to be =
G1289fa. [of course it is we=
G1290ea. = a two a minus two
G1291fa. = we're getting carried away
G1292ea. er::m (2.0) er::m (0.3) time (3.6) i think that's a threat.
G1293fa. yeah

G1294ea. this is interesting this really when you are saying about diy (.) you know you toy with =
 G1295ea. = the idea at home do it myself and i have done it myself (.) and we've got people in =
 G1296fa. [yes]
 G1297ea. =and i am glad we did i went out to work came back and it was done (.) the lack =
 G1298fa. [and it was=
 G1299ha. [done oh yes]
 G1300ea. = of hassle getting someone else to do it far out weighs
 G1301ha. = done oh yeah]
 G1302fa. yeah
 G1303ea. yeah
 G1304ha. well you pay for it one way or another don't you
 G1305ea. the lack of hassle (.) far outweighs the the fifty quid or whatever it costs you
 G1306ha. °yeah°
 G1307fa. [yeah i would have put that in a band two on that i wouldn't have said it =
 G1308fa. = it was huge (4.0) ((background noise - knocking of pen on table))
 G1309ha. that's two that one (1.0) °a positive two°
 G1310ea. [ok (.) i actually don't think that it would do you a lot
 G1311fa. what would you have said
 G1312ea. well::: i don't know (.) you're not wrong you're not going to be far out
 G1313fa. no
 G1314ea. it actually tells a story that but erm:: (.)
 G1315fa. yes
 G1316ha. [hm]
 G1317fa. well it means we have considered it and that's what we want
 G1318ea. [THE COST SAVING YEAH (.) balances it's self out to the er:m time =
 G1319ea. = saving the time addition should i say=
 G1320fa. [yes]
 G1321ea. =moving in (.) utility provisions (1.1) now i think this is as likely as not really the =
 G1322ea. = probability of that happening (.) you know what they are like these new utility (.) =
 G1323fa. [oh yes]
 GL1324ea. = it's not like the old bt where it was spot on=
 G1325fa. yeah
 G1326ha. [yeah]
 G1327ea. = and the old gas board (.) these other companies offer you hundred quid less a =
 G1328fa. [yeah]
 G1329ea. = year but you get less of a service
 G1330fa. course you do yeah
 G1331ea. so i think
 G1332fa. i think it er: (.) is quite likely(.)
 G1333ha. as likely as not yeah
 G1334ea. i think (2.7) er::m
 G1335ha. cost; (2.0)
 G1336ea. it's going to be minor-
 G1337ha. very minor (.) yeah
 G1338ea. it's going to be a one-
 G1339ha. [it's time delay really isn't it
 G1340ea. it's time time i think it's going to be up to seven days isn't it
 G1341fa. yeah
 G1342ha. i'd have thought so at least
 G1343ea. or do you think it's a
 G1344fa. [well we've got a band of (.) seven to twenty one days
 G1345ha. yes that is probably (.) ° going to be it°
 G1346ea. [ok!] (1.2) fu::rniture delivery (.) right (0.8) i think that is the =
 G1347ha. [hm hm hm] ((laughing))
 G1348ea. = same(.) as likely as not
 G1349fa. yeah (1.8)
 G1350ha. [hm]
 G1351ea. cost (.) ha:: ((audibly breathes out- almost exacerbated)) it er:
 G1352ha. there won't be a cost(.)
 G1353ea. no cost as such

G1354fa. no
 G1355ea. er:m i think it's a one
 G1356fa. yeah (.)
 G1357ea. but the time i think you are getting into a two again
 G1358fa. [yeah] [yes i would agree with that (0.8)]
 G1359ea. will it fit
 G1360fa. yeah will it fit (1.5) well
 G1361ga. [well that's down to you really isn't it
 G1362ha. it's improbable
 G1363fa. yeah i would say that's (.) i'd say it's a minor but
 G1364ha. [if you've done your] [properly]
 G1365ea. COULD happen
 G1366ha. yeah
 G1367fa. [yes]
 G1368ea. COULD happen error (.) human error-
 G1369ha. [yeah sure]
 G1370ea. >what is the cost i think it could < be:: (.) substantial (0.9) it could be serious (.) it could be =
 G1371ea. = between a thousand and well what are you going to spend actually (0.4)
 G1372fa. hm:
 G1373ea. for an office a thousand should nail it shouldn't it
 G374ha. shoud do
 G1375fa. [hm:]
 G1376ea. yeah er::m (.) shall we say (.) it's marginal (0.9) >horses for courses< (.) isn't it
 G1377fa. yeah
 G1378ha. [yes]
 G1379ea. yeah (1.0) not like a generator going yeah (1.2)
 G1380fa. hm::
 G1381ea. shall we say a two
 G1382fa. i think two is ok:
 G1383ea. [and your ti::me err:: (1.3) a three
 G1384fa. [well that's] [no i don't think it is as-
 G1385ea. no;! no;! it's not is it(.)
 G1386fa. no
 G1387ea. well (.)
 G1388ha. if it doesn't fit you have to re-orde:r;!
 G1389fa. well
 G1390ha. long delay (.) at least twenty eight days (1.2)
 G1391fa. [we:ll]
 G1392ea. yeah-
 G1393ha. got to re-order your furniture
 G1394ea. i'd say it could oh::: shall we say three (.) i don't think it comes in the realms of critical
 G1395ha. [three::]
 G1396fa. no (.)
 G1397ea. yeah
 G1398ha. hm
 G1399ea. or do you think it does
 G1400ha. no ° it's just°
 G1401fa. [well:: i just in the scheme of things i am just thinking about (.) i mean that =
 G1402ha. [yeah]
 G1403fa. =worst case it would be is that you would be marginally out on something that doesn't =
 G1404ea. [bu-] [ye-]
 G1405fa. = go through the door or something like that
 G1406ea. yeah
 G1407fa. so what do you do you take the door frame out you take the window out you do something =
 G1408ha. [yes:]
 G1409fa. = i can't believe you would have (.) °your furniture re-made° you wouldn't a project of =
 G1410ea. [it's weird th-] [it's a weird =
 G1411fa. = that scale you'd get ready made-
 G1412ea. = one this] [if it's late delivery
 G1413fa. yeah

G1414ea. yeah (.) if it is a delivery and it's only a week or two late (.) but for a piece of =
G1415fa. [yeah]

G1416ea. =furniture that genuinely doesn't fit you've got another thirty days on your hands

G1417fa. hm: yeah

G1418ea. i think that could be more of a problem than your delivery being late

G1419ha i mean your-

G1420ea. [>these are already ordered<

G1421fa. yeah

G1422ea. yeah it's only (.) a week or two from when they should have been-

G1423ha. as you say the alternative is you actually (.) pay money (.) to have the door taken out =
G1424fa. [yes]

G1425ha. =or whatever (.) yeah (.) right which reduces your time but increases your costs

G1426fa. [yeah] [of course it does yes..

G1427ha. so there's a-

G1428ea. [we're up to a thousand and i think a thousand will take it

G1429ha. course it would yeah

G1430fa. [go with that then

G1431ha. yeah (.) yeah ok (1.6)

G1432ea. [alright] [are we doing whole project

G1433ha. we've got those to do have we

G1434fa. yeah

G1435ha. got those to do have we

G1436fa. yeah but it doesn't which order we do them in does it

G1437ha. no::

G1438ea. finance (.) err::m (0.6) use individual sub-contractors it's as likely as not

G1439fa. yes it is an opportunity isn't it

G1440ea. yeah

G1441fa. this is the one where we felt there was the most significant cost

G1442ea. [yes] [i think =

G1443ea. = it's exceptional (.)

G1444fa. yeah

G1445ea. it's a minus five (.)

G1446fa. yes:

G1447ea. time it's going to take you longer so it's a threat time wise

G1448ha. yes

G1449fa. [yes it will (.) a lot more organisation also-

G1450ea. [but i don't know (.) i only think it is a er::m four (1.7)

G1451ha. yes just over a month

G1452fa. yeah

G1453ea. yeah

G1454ha. yeah

G1455ea. because time is not critical so: (.)

G1456fa. [no]

G1457fa. change that to a () (1.8)

G1458ea. tax benefit potential (1.5) it could happen

G1459ha. [()](audible intake of breath)

G1460fa. it could yeah

G1461ha. [yes]

G1462ea erm: it ah:: ((audible expel of breath)) (0.5) i think it's only a significant (.) opportunity =
G1463fa. [yeah::]

G1464ea. = it's only a minus two (.) time (.) ah: it's insignificant (.) as a as an opportunity isn't it

G1465fa. [ye::s]

G1466ha. [hmm]

G1467fa. that's right yes

G1468ha. no bearing on it so

G1469ea. no

G1470fa.[no]

G1471ea. company sponsorship (1.0) could happen

G1472fa. yeah (.) potentially (.) yeah

G1473ea. [how much would they give you (.) i think (2.1) minus three (2.4) minus four

G1474fa. [hm::]
 G1475ha [hm:]
 G1476ea. three grand ain't a great deal and i (.) i could see them giving it you that (.)
 G1477fa. yeah
 G1478ea. they would do it on a five year plan possibly wouldn't they (1.4)
 G1479fa. [yes] [yes
 G1480ha. [hmm]
 G1481ea. time (.) erm:: has no significance it's a minor isn't it
 G1482ha. [no] [hm:
 G1483fa. [no] [yes]
 G1484ha. that is just arrangement time isn't it
 G1485fa. yeah
 G1486ea. circumstances change
 G1487fa. we've gotta be-
 G1488ea. [potential..]
 G1489fa. we have to change that slightly and define what the change is
 G1490ea. erm:: (2.2)
 G1491ha. unemployed (1.2)
 G1492fa. redundancy (.) just put that it's good enough (.) we don't have to put everything (1.1)
 G1493ha. >[redenuancy]<
 G1494ea. yeah! but it's like some of the risks o: on your jobs you know (.) you still =
 G1495fa. [hm:]
 G1496ea. = but you know the risks (.) you see °this is all about culpability really here yeah (.) =
 G1497fa. [hm: hm:]
 G1498ea. = go ahead with them it's about none of the directors signing off on it do you =
 G1499fa. [hm:]
 G1500ea. = know what i mean ° you know (.) it's making everyone responsible isn't =
 G1501fa. [hm:]
 G1502ea. = it you know
 G1503fa. yes:
 G1504ea. >well you knew about it<
 G1505fa. yes exactly-
 G1506ea. circumstances change (.) now i think it could happen i think this is a two really (2.1)
 G1507fa. [hm:] [yes]
 G1508ea. i think:
 G1509fa. i don't think it'-
 G1510ea. [the threat (.) it's a five
 G1511fa. yeah
 G1512ha. [hm]
 G1513ea. well actually it's a (1.6) a tombstone (0.4)
 G1514fa. well: yes it is
 G1515ha [it is yes
 G1516fa. that's a good one to get in there
 G1517ea. er::m (1.5) and the time (2.4)
 G1518ha. it's:
 G1519ea. [>it's a tombstone again <
 G1520fa. yeah (.)
 G1521ea. do you think (.) was there tombstone's (0.4) there's tombstones and there's er::
 G1522ha. black flags (.)
 G1523fa. yes
 G1524ha. but it is not a threat to the company
 G1525fa. no
 G1526ha. it's a threat to you isn't it (1.4) t- timing is not of: (0.3) any value there is it
 G1527ea. >what's the black flag for<
 G1528fa. black flag is for damaging to the company
 G1529ha. [black flag is]
 G1530ea. hm:
 G1531fa. only you've got to try and read this in: (0.5)
 G1532ea. shall we put another tombstone (1.2) well it's-
 G1533fa. [erm::]

G1534ha. it's timing it's not relevant once (.) once you're (.) once you're (.) dead in the water =
G1535ha. = the timing is no relevance
G1536ea. >it's one< (.) a one then isn't it it gets the lowest mark doesn't it
G1537ha. [ha yes] [it's-]
G1538ea. ok it's a one ((sighing the words as he breathes out)) erm: (1.1) finance (2.0) =
G1539ea. = finance not granted (1.5) er::m (.)well it's as likely as not
G1540fa. >YEP<
G1541ea. you know it's a fickle world (4.7) t::hree
G1542fa. yeah
G1543ea. er::m (.) cost (0.8)
G1544fa. °cost impact (.) y::eah° (1.6)
G1545ea. cost impact (.) i::s (.) >well it's minor really< (.) it just doesn't go ahead does it
G1546ha. hm: (0.9)
G1547a. [hm:]
G1548ea. i:- i:- it's minor it- it's a threat but cost wise it's it's minor isn't it (.) >it's insignificant<-
G1549fa. yes because it happens
G1550ea. [you might as well just waste a hundred pounds=-
G1551fa. [that happens early in the process doesn't it
G1552ea. = in administration really
G1553fa. yeah (0.3)
G1554ea. er::m and time it's a one as well
G1555fa. [again it's the same thing yes
G1556ea.yeah
G1557fa. yeah
G1558ea. yeah interest rate changes (.) now (2.4) phew ((breathes out audibly)) it's as likely =
G1559ea. = as not it's a three-
G1560fa. [but this can be a positive and a negative we have to split it haven't we =
G1561ea. [hm::
G1562fa. = at this point (7.3)
G1563ha. is the tombstone death of the project (0.8)
G1564ea. >well it would b-<
G1565fa. it would if you were:
G1566ha. [if you didn't get finance would that be tombstone (0.4)
G1567ea. yep
G1568ha. hmph ((snorts)) (1.0)
G1569ea. yep
G1570ha. it's death to the project isn't it
G1571ea. yeah (0.7)
G1572fa. yes that's true (6.4)
G1573ea. so it's two threes (1.4) ha:: ((breathes out audibly)) do the top ones first (0.8) your financial =
G1574ea. = impact (1.5) >sorry< (2.2)
G1575ha. °interest rates go up° (2.5)
G1576ea. lifecycle of your mortgage it could be quite significant
G1577fa. ye:s (3.0)
G1578ea. i know what happens if my mortgage goes up even a quarter of a percent (4.3)
G1579fa. is it another three (2.2)
G1580ea. y:eah ((breathed)) it it's a tough one this because over the over the life =
G1581ea. = cycle (.) >it's catastrophic really<
G1582ha. [it could be] [yes:: (2.3)
G1583ea. well it depends on how long you are borrowing the money over doesn't it (.)
G1584ha. and it also depends on how your income keeps in step with:
G1585fa. yeah-
G1586ha. interest rates (.)
G1587ea. >should we hit it middle of the road a three<
G1588ha. it's serious
G1589fa. it is serious yes (.)
G1590ha. yeah
G1591ea. er:: and time (0.5)
G1592ha. it's not really applicable (.)
G1593ea. so it's a one isn't it

G1594ha. hm:: (1.4)
G1595ea. interest rate drops (1.0) it's a three again (0.9)
G1596fa. yeah:
G1597ha. [hm:]
G1598ea. because it goes either way doesn't it (2.2) and it's a minus one because there is no time (.)
G1599fa. [yeah ha ha] ((laughing))
G1600ha. [hm:]
G1601ea. and it's a minus 1(1.3) there is no time
G1602ha. there's no time
G1603fa. hm: (1.7)
G1604ea. no not on the duration of the job no (1.8)
G1605ha. [hm] [hm]
G1606ea. er::m (.) do you want to use this timing of interim stage payments one ((audibly sniffs)) (4.7)
G1607ha. no
G1608ea. no (1.7)
G1609ha. °no we'll leave that° (0.6)
G1610ea. it's not bad it's the only one that has come out so far you know ((audibly sniffs)) (1.0)
G1611fa. yeah
G1612ea. er::m alternative fund arrangement (2.6) it's a-
G1613fa. [yeah this we er: saw as an opportunity =
G1614fa. = didn't we
G1615ea. yeah it's a two (.) could happen
G1616fa. yeah:
G1617ea. er::m (3.2) the (.) opportunity could be exceptional (2.5) or do you want to say =
G1618ea. = very substantial (1.3)
G1619fa. i don't think it would °come into that very substantial° (0.6) depends upon what you are =
G1620fa. = talking about if you are negotiating with another company to lend you the money (.) we =
G1621fa. = are talking about (.) you know (.) are we talking about a few quid month aren't we (.) or =
G1622ha. [yeah hm hm]
G1623fa. = whatever you know it's not (1.2)
G1624ea. is that what you mean alternative fund going to some-
G1625fa. [yeah i mean is it likely we are going to =
G1626fa. = get it else where (0.7) or are we going to say it's:
G1627ea. >different lenders have different policies is that wha-<
G1628fa. [yeah what what about your company (.)=
G1629fa. = >bearing in mind that we are going down the route of saying that it's our
G1630fa. =company that < is-
G1631ea. [>yeah well we have not gone down the lines of sponsorship yet have we<
G1632fa. no
G1633ea. no this is not it yet (.) right ok (.)
G1634ha. it's either significant or substantial i think (.)
G1635fa. yeah (1.8)
G1636ha. if you saved what (.) ten percent (1.5) on your finance
G1637ea. [ah-] [yeah that's minus three then minus three (4.3)
G1638fa. [hm]
G1639ea. ah::m (.) and the time is it a one (.) a minus one isn't it
G1640ha. hm (1.2)
G1641ea. ok then that is that one done (3.3)
G1642fa. [ye:s]
G1643ea. what others have we got left now (.) just that one there isn't it the:
G1644ha. [planning
G1645ea. the planning permission one (.) wasn't it right then well (.)
G1646fa. [planning permission] [yes
G1647ea. right well it's er::m (1.2)
G1648fa. well that's a tombstone isn't it
G1649ea. it's a to- (.) it's a tombstone (.) and that's a one (1.2) that's how we work it isn't it
G1650fa. yeah
G1651ea. >ground conditions unsuitable< (1.1)
G1652ha. improbable (3.9) could happen
G1653ea. [>it could happen<

G1654ha. [could happen (.)]
 G1655ea. >IT'S A TWO < (.) now your cost (.) i mean people get hung about this i me- lets =
 G1656ea. = just say you can't do your normal strip foundations you got to put a raft in (.)=
 G1657fa. [yeah]
 G1658ha. [yeah]
 G1659ea. = how much is that going to cost you to put a raft in on a single (.) story er::m =
 G1660ea. = thirteen by thirteen extension
 G1661fa. hm: (1.5)
 G1662ha. [hm:] (.) i don't know (.) a couple of grand (.) i don't know (.)
 G1663ea. probably an extra grand on top of what you were originally going to spend (0.8) =
 G1664fa. [yes] [might be yes]
 G1665ea. = so it is going to be a::: mar:- (3.2) a marginal threat (1.1)
 G1666ha. hm hm:
 G1667fa. [yes i would say it is only a marginal threat (.)]
 G1668ea. t:ime (.) i don't think it will take you any longer than a week =(0.3)
 G1669fa. no: (.) probably not
 G1670ea. = to put a raft in
 G1671ha. additional time yeah
 G1672ea. to be honest (1.3) pa::: ((audibly breathes out))
 G1673ha. it's probably easier-
 G1674ea. [it is actually easier to cast a raft than put your strips in (.) =
 G1675ea. = er::: it's an insignificant (.)
 G1676fa. yes it is
 G1677ea. >or do you want to go for a marginal two<
 G1678ha. two::
 G1679fa. >yeah because if you know you found that it was a problem< (.) you would have to =
 G1680fa. = go back and get your plans: (.) amended
 G1681ha. [that's right yeah]
 G1682ea. [opposition from neighbours (.)]
 G1683fa. does that not come (.) in:: (0.4) linked in with the first one (0.8) because there is =
 G1684fa. = two things (.) one of the reasons council wouldn't wouldn't grant planning permission =
 G1685fa. = because your neighbours objected (6.9)
 G1686ea. sigh ((audible sigh)) (.) well put it this way if they do oppose it could be a tombstone (0.4)
 G1687ha. hm:: (2.4)
 G1688fa. [yeah]
 G1689ea. and it could happen
 G1690fa. yeah (3.3)
 G1691ha. [yeah]
 G1692ea. because no amount of money you throw at it is going to make a blind bit of difference-
 G1693fa. [i was just wondering if-] [there=
 G1694fa. = is a duplication of effort there because i think it's the same thing as number one (2.1)
 G1695ha. yes it-
 G1696fa. [it doesn't matter why it's not granted it's not granted is it
 G1697ha. [no] [that's it]
 G1698ea. i'll have that (1.2) delay (0.6)
 G1699fa. yeah that's a bit-
 G1700ea. [is a two it could happen (.) ah::m (1.4) c:o::st (1.9) it's a time delay isn't it (.)
 G1701fa. [yes]
 G1702ha. [ho]
 G1703fa. yes it is (.) it isn't significant in terms of cost (0.3)
 G1704ea. it's a one (0.8) and (1.9) >it's a three< (0.5) i would say (.) it's pretty serious (0.7) it =
 G1705ea. = could be anything up to a month (0.9)
 G1706ha. >well yeah because< (.) you've got to meet the planning (.) >what is it four week =
 G1707fa. [yeah that's a point it it it is]
 G1708ha. = cycles months<
 G1709ea. >is it more than< i- is it
 G1710ha. [four week cycles is it for (1.2) i think it is isn't it
 G1711fa. [ye::ah what have we got on time we've another thirty days or:
 G1712ha. yeah serious
 G1713fa. or thirty to forty two

G1714ha. so it's serious it's a: three yeah (1.2)

G1715fa. [hm:]

G1716ea. ok it's three (.) right we've done that now we need to plot it

Red Team Verbal Transcription

R562aa. the only thing that worries me is which risks are they talking about
R563ca. top five risks is it (2.7)
R564aa. top five (.) our top five
R565ca. yeah (3.4)
R566da. we have to break them up rate them all
R567aa. do we (.)
R568da. rate all the risks and then find which is the top five (6.2)
R569aa. didn't he say look for the catastrophic ones look for the minor first and then =
R570aa. = the others will fall into place (2.0)
R571da. yeah but he was saying about pounds wasn't he (.) er: improbable (2.1) less =
R572da. = than ten percent (1.5) cost in po:unds (3.6) °ten quid° (4.6)
R573ca. ten (.)
R574da. ° yeah°
R575ge. >if you had a twenty thousand pounds< (.) project what do you think would be =
R576ge. = an insignificant risk (.) up to what (3.4)
R577ba. °hundred pounds°
R578ge. hundred pounds yeah
R579ca. is that right
R580ge. well it's your project so pencil it in and see (.) you can always change =
R581ge. = it later (.) so: anything a hundred pound or less °is is ()°and then think =
R582ge. = about the worst case (1.0) don't forget this is about any one risk so: what =
R583ge. = would be a catastrophic disaster or an exceptional opportunity (1.1) the =
R584ge. = worst case (.)
R585aa. °ten grand i'd have thought°
R586ca. that would finish it off completely (0.8)
R587da. °you're into your project bill so what is going to cost you:° (1.9)
R588aa. ten grand more
R589da. yeah but that is a huge amount-
R590ge. yeah it is
R591da. that that's an absolutely huge amount (2.2) i mean i would personally say (.) two =
R592da. grand w- w- would would be er:: (0.5) i mean if i had twenty grand to spend-
R593aa. >ten percent< (0.6)
R594da. yeah ten percent
R595ge. the rule of thumb is between ten and thirty percent o- o- on a cash rich-
R596aa. would say most you would deal with on a sub-contract would be more than ten percent
R597ge. yeah it would be a disaster wouldn't it (.) so somewhere between two and five k is the =
R598ge. = answer we always get on this course
R599ca. yeah
R600ge. so it's up to you (.) it's what you're comfortable with as a group (.) but don't forget =
R601ge. then somebody will turn around and say two thousand what if a find a risk that =
R602ge. = costs me five thousand because i might find one
R603da. [yeah]
R604ge. so we say greater than (.) anything greater than two grand (.) stop the =
R605ge. = risk management process (.) let's deal with it
R606da. hm::
R607ge. so you might find (.) b- because the problem you get with this (.) if you put =
R608ge. = five in there then this becomes so coarse that you don't start to get the =
R609ge. = granularity ((?)) so you you want something that is big enough to take all =
R610ge. = comers (.) and if you put greater than that will do it (.) but you want enough =
R611ge. = scale in there so you can decide which ones to tackle first
R612aa. °hm:°
R613ge. and some put two some put five and a half but there or thereabouts is not =
R614ge. = a bad figure is would suggest that would be one to a hundred (.) that =
R615da. [hm:]
R616ge. = would be thousand to two thousand (.) greater than two thousand and you =
R617ge. have a good scale
R618da. [hm:]

R619ge. don't get too hung up here what we are saying is big risk small risk (.) i'll =
R620ge. = manage that first and that second-
R621aa. [call it ten percent anyway
R622ge. >yeah<
R623aa. ten percent of six weeks or whatever
R624ge. ok (.) you've got it (.) >leave you with it<
R625aa. ok (3.8)
R626da. so a minor time would be a: (.) °day° (4.5)
R627ba. s: six month project is it
R628aa. yeah (2.1)
R629ba. i would say two week delay is minor (0.7)
R630aa. minor two weeks no (.) i would say two weeks is a disaster
R631da. yeah i would say that a highly exceptional delay would be er:: two weeks and above =
R632da. = and you are in big shit aren't you (0.4)
R633aa. i would have thought so yeah (2.4) two out of six (0.3)
R634ba. six fours are twenty four lets say twenty six weeks (3.1) so what's that in percentage =
R635ba. = terms (.) that's ten (.)
R636aa. two out of ten
R637ba. yeah i suppose two out of ten (2.9) i- I JUST DON'T () it'll be a bloody miracle if they =
R638aa. [well let's put three then if we want
R639ba. = finish within that (4.3)
R640aa. well we'll put it in pencil we can always come back
R641ba. what about two and a half weeks (.) split it (.)
R642ca. °no (.) greater than°
R643aa [is it an exception
R644ba. it's an exception (.) two and a half (0.4)
R645da. so it's two and a half weeks (1.3)
R646aa. what about a minor then (2.2) days (.) a week; i don't know
R647ba. oh hang on time in days two and a half that's er: (5.0)
R648da. well it's working days isn't it (.) not weekends (1.2)
R649ba. thirteen (.)
R650da. unlucky for some (.) right yeah (.) °so we're looking at (.) what ° (0.9)
R651aa. two days (1.4)
R652da. yeah (1.3) yeah two
R653aa. two as a minor (1.0)
R654da. °two to four (.) yes (.) four to six (.) is substantial (6.6) that's a week isn't it (.) =
R655da. five to ten° (0.3)
R656ba. substantial is five
R657aa. >four to five yeah we've got to use a band< (.) got to put a band in there
R658da. °four to six (.) six to twelve (.) six to thirteen (.)°
R659aa. no you can't (1.6) no you can't have-
R660da. °we've got a problem there°
R661aa. no you can't have six to twelve weeks (.) it's thirteen hours int it
R662da. °right (.) thirteen hours° (3.7)
R663ba. °let's just check we've got the same thing° (.) er: substantial what have you =
R664ba. = got for substantial (1.6) four to five
R665da. four to four to six-
R666aa. [six days (5.8) six to twelve and thirteen onwards (7.5)
R667ba. si- six
R668aa. [now all we've got to do is pick which risk is in there (2.8)
R669ba. hang on we can't have overlaps surely (.) if it's minor it's two (.) significant is three
R670aa. no it's between (.) i- i- it's between two and four (.)
R671ba then it'll fall into two categories won't it
R672da. °that's less than two isn't it°
R673ba. no i've got less than two
R674da. [yeah that's it
R675ba. [next one has to be three
R676da. the next one can be two because it's less than two (.) the first is less than two =
R678da. yeah (1.0) so you are talking less than two less than a hundred pounds
R679ba. oh: (.) all right

R680da. a hundred pounds upward yeah
R681ba. [a hundred pounds (.) oh i see what you mean
R682da. so it's less than two then it's two to four (2.1)
R683ba. two to less than four (2.0)
R684da. y:es (.) yes
R685aa. that's what i was struggling at (.) because i did the hundred (.) you see i have =
R686aa. = done the hundred pounds or less: (.)
R687da. yeah
R688aa. WEL IF YOU LOk what they have done on their side look (.) they have done ten =
R689aa. = to thirty then thirty to fifty so: (.) you know (3.0)
R690da. but is it these risks here that we are then (.) ah: looking at each one of those (0.4) and we =
R691aa. [yes we use those risks]
R692da. = are scoring it now are we (7.8)
R693ca. is that the first one
R694da. yeah (.)what does p stand for (1.2)
R695aa. p: was:: >probability< an impact that's the words impact
R696da. >right< (.) >ok< (.) so failure to obtain planning permission (2.4) is er:m (1.6)
R697aa. exceptional catastrophic call it what you like int it really
R698da. er::m
R699aa. we don't go anywhere
R700da. the probability of it (2.0)
R701aa. well it wouldn't cost us anything
R702da. [slightly improbable is it] [well no
R703ba. er:: (3.7)
R704da. the threat is catastrophic (.) yeah (.) but it is not terribly likely that we will
R705aa. [hm hm]
R706ba. COULD happen i-
R707da. you reckon it could happen (.) yeah it could happen (.) ok
R708ba. it could happen
R709da. so it is a two times five yeah (0.6)
R710ca. but it is not gonna cost you any money if it goes wrong then so it is not going to be =
R711ca. = catastrophic is it (.)
R712aa. wha-
R713ca. [cause it's not going to cost you anything
R714aa. well it is because you can't have a building
R715da. you can't do the building
R716ca. you can't start the project
R717da. yeah (0.5) yeah so: do we give that a ten (.) do we score it on here (.) so it's going to be =
R718ba. [°yeah°]
R719ca. [you see that p and i bit]
R720da. = planning pl one
R721ca. yeah yeah sorry yeah
R722da. so do we put it in here
R723ba. er yeah (.) er yeah
R724aa. ()
R725ba. that's where it goes
R726da. what (.) probability (.) probability is (2.1) er two
R727aa. [probability's]
R728ba. [herm] ((audibly breathes out))
R729ca. yeah (0.8)
R730da. an:d the::
R731ca. impacts about five
R732da. [impact is five
R733ca. yeah
R734aa. [yeah] (0.6)
R735da. and we need a score somewhere do we (.) ten (1.8)
R736ca. yeah i-
R737ba. [>h- hang on< i- if it could happen why are we saying it's catastrophic
R738ca. because the project is knackered before you even start (.) it's totally and utterly done =
R739aa. [because you can't have a building]

R740da [you can't have a building]
R741ca. = it cannot get any worse (.)
R742aa. if it fails they don't give it ya (3.1)
R743ba. yeah you're right if it to- yeah you're right i'm thinking about going back to yeah you're right
R744da. [yeah] [you see =
R745da. = if it is a restrictive permission it is going to cause us a problem but it's not going to be =
R746da. = catastrophic or critical (1.6) er:m it could be a serious problem
R747aa. yep
R748da. so i would put that down as being a serious (1.0) a three (0.8)
R749ca. the impact yeah
R750ba. yeah
R751da. yeah
R752ba. yeah i agree
R753da. and it could be a could happen (.) as well couldn't it
R754ca. yeah it could be a two yeah
R755da. it could be a two (0.5)
R756ba. >yep<
R757ca. yeah
R758da. right (.) additional requirements ie landscaping (1.4) well again that's going to be a two =
R759da. = isn't it (.) it could happen they could ask us (1.7)
R760aa. i think that's er: (.) a bit higher than that
R761da. as likely as not
R762aa. hm::
R763ba. but landscaping drain upgrading i think that is highly unlikely
R764da. wel- well we can still put something
R765aa. you think that's unlikely
R766ba. yeah
R767aa. do ya (3.8)
R768ba. well f- for a small extension i agree if it was a big one
R769da. that's right you see (.) you see people who build extensions and leave builders =
R770ba. [but not for a little extension like this one]
R771aa. [right ok then]
R772da. = rubble around their houses
R773aa. [put it a one; then (.) put a one; then
R774da. yeah (.) right ok
R775ba. a-
R776da. [we'll give it a one (0.4) er::m
R777aa. and if it happened what would happen then (.)
R778da. we:ll (.) if it happened it would cost us a few quid to put it right
R779ca. [()] [yeah
R780aa. marginal
R781da. say:
R782ba. two
R783da. two yeah
R784ba. yeah
R785da. so it could cost us a couple of hundred quid to put it right (.)
R786ca. yeah
R787da. right (0.4)
R788aa. bank restrictions on loan
R789da. bank restrictions on loan
R790ca. [there's gonna be restrictions isn't there (0.6)
R791da. ((sharp in take of breath))
R792aa. i think that is likely as not that (.) definitely (2.3)
R793da. ((sharp out breath)) yeah::
R794aa. mind it's only a twenty grand loan int it
R795da. twenty grand
R796ba. °twenty grand it's°
R797da. yeah : it depends what the equity is on your home (.) whether its °negative or something =
R798da. = like that doesn't it°
R799aa. °a ha°

R800da. could be a two or a three (.)
R801ba. three (.) >as likely as not<
R802da.yeah::
R803ca. i don't know
R804da. i don't know they they yeah: >°sometimes they put restrictions on °<
R805aa. i think they'd always put a little bit of restrictions on you (.) as likely as not =
R806aa. = i think you know
R807da. this is the whole thing with risk though isn't it (.) is that we have to decide (.) whether =
R808aa. [yeah]
R809ca. [whether =
R810da. = or not it is going to happen
R811ca. = or not it is going to happen yeah
R812da. yeah so (.) it is not a hard and fast rule
R813ba. [it could (.) it could happen]
R814aa. i mean (.) what we've got to decide at the end of the day is which risks we want to =
R815da. [yeah]
R816aa. = tackle first
R817ca. [yeah (.) >which are the most important risks
R818aa. [yeah
R819da. [if] [if the bank put a =
R820da. restriction on the loan we could go somewhere else to another mortgage company =
R821da. = (.) yeah (.) get some money from somewhere else
R822aa. yeah it wouldn't be- it wouldn't be a big problem would it
R823da. [SO::] [SO IT WOULDN'T BE- (.) no but it could happen
R824aa. yes (.)
R825da. so we we think it could happen (0.3)
R826aa. °yeah°
R827da. >two<
R828ba. yeah
R829aa. an ok an ok
R830da. [BUT! if it does happen
R831aa. it would only be marginal i would have thought (.)
R832da. marginal
R833ba. ye:ah
R834da. yeah
R835ba. we could go somewhere else (.) > but it could cost us<
R836aa. [well if we were looking at five hundred quid that is all it would costs us
R837da. well yes it would cost us another one percent yeah (0.6)
R838ba. yeah that could work
R839da. so it could cost us another one percent on the whole thing (.) so what is one percent =
R840da. of twenty thousand pounds (.) two grand (2.3) no that's ten percent beg your pardon it's =
R841aa. [yeah]
R842ba [yeah]
R843da. = two hundred quid so it is going to be a two then (3.5)
R844aa. [it- its-]
R845ba. yeah (1.3)
R846da. TURNED DOWN for the loan (.) well that is catastrophic isn't it or is it (.) >or is it just (.)
R847ca. [well i-]
R848da. if we are turned down for the loan wherever we go
R849aa. lets do the probability first (0.4)
R850ca. oh it's go to be improbable hasn't it (1.5)
R851da. HO-
R852aa. improbable
R853ba. improbable yes (1.9)
R854ca. if if you're even considering to do the thing you've got to-
R855ba [IT'S SO SUBJECTIVE THIS =
R856ba.= BECAUSE IT DEPENDS IF YOU'VE GOT EQUITY IN THE PROPERTY THEY=
R857aa. [I WOULD SAY IT'S (.) improbable]
R858ba. = WILL BLOODY JUMP AT YOU
R859da. we haven't got probably sometimes enough detail to be able to make that judgement

R860ba. [yeah sure]
R861aa. *i think it's improbable they will turn you down*
R862da. yeah
R863ca. yeah (.) give it a one yeah
R864da. yeah
R865ca. yeah (1.9)
R866da. we're a big company but on the other hand we said we would do it ourselves (.)
R867aa. and if they did what would it be then (.) critical: (0.8)
R868da. [hm::] c- could have serious implications
R869aa. no well we've just said on the other that-
R870ca. [are we just talking about from the one place here (0.7)]
R871da. well:
R872ca. or are we talking about in total (2.7)
R873da. °i don't know (.) we could go somewhere else° (1.6)
R874ca. no so (.) it's not going to be a great-
R875da. no
R876aa. ah::
R877da. [>so< (.) turned down for a loan of any description (.)
R878aa. is mo:re-
R879da. [is improbable
R880aa. it is yes (0.5)
R881da. right (1.0)
R882aa. but but if we were
R883da. [if we were]
R884aa. >it's catastrophic<
R885da. it could cost us-
R886ba. [catastrophic yes]
R887aa. [well we couldn't build (.) we couldn't build so it'd be a five (0.8)]
R888da. yeah but it is highly improbable that we will get turned down for any kind of loan (1.0)
R889ca. ar: but if we did (0.4)
R890da. if we did
R891ca. [if we did
R892aa. [the impact to the project that is what we are saying
R893da. ok (.) if we did
R894ba. [to the project it would be catastrophic (.) we couldn't do it
R895da. unless granny died (.)
R896ba. unless granny died
R897ca. that that's the next one
R898aa. [na:]
R899da. ok (.) all right then (.) so it is going to be a five then (2.3)
R900aa. [a five]
R901ba. yeah

((DISCUSSION ABOUT KILLING GRANY)) (113.6)

R902da. interest rates alter (1.2)
R903ba. three (.)
R904da. yeah as likely as not i'll agree with that
R905ca. [it just depends what way it is going to go though
R906da. but (.) we then said (.) or they said didn't they (.) erm: that we should put that it =
R907ca. [yeah] [yeah yeah]
R908da. = would go up (.) and that it would go down (1.1) so we are talking three for up and three=
R909da. = or less than three for down
R910aa. no i think it's more for going down int it
R911da. yeah (.) so we could have it three minus three perhaps (0.5)
R912aa. [()] ((mumbles something))
R913ba. yeah
R914da. ok so:
R915aa. what's the others though (.)
R916da. if erm:

R917ca. the impact of it going up (0.7)
R918da. wha- a- (.) if it goes down then it is going to be a minus score isn't it
R919ba. >yep<
R920da. so: (.) er:m (1.5) >it's not going to be a huge amount is it<
R921aa. no i wouldn't have thought so no (.)
R922ba. [no]
R923da. it's going to be a minor (.) a minor one
R924ba. yeah minor
R925aa. [yeah minor one
R926da. yeah
R927ca. and then a one above that then oh-
R928da. and then (1.2)
R929ba. insignificant
R930aa. [it's going to be both same int it surely
R931ba. so: (.) if it is going to be an insignificant increase (.) then it is going to be just an ordinary =
R932aa. [yeha it'll-]
R933ba. one
R934ca. yeah
R935aa. [yeah
R936da. yeah
R937ba. certainly less than a hundred isn't it (2.1) ()
R938da. builders work (2.3) delivery times on materials (0.3)
R939aa. phew ((audibly breathes out))
R940da. well that's as likely as not could happen (.)
R941aa. that could happen (0.4)
R942da. er:m (.) as likely as not though is it
R943aa. yeah
R944da. is it a three
R945ca. yeah give it a three
R946da. give it a three
R947aa. yeah: i think so (0.9)
R948ca. >and it could it be critical<
R949ba. a-
R950ca. [serious (6.1)
R951aa. we're talking about four to five four to six (.) six days here (1.5)
R952da. yeah
R953aa. if the material doesn't come in four to six days:
R954ba. well we've only got-
R955aa. [it's got to be serious and we can't start
R956da. yeah (1.0)
R957aa. if we don't get the material we can't start for four to six days (0.5)
R 958ba. yeah
R959da. [so it's three
R960aa. [that's what we are saying (.) three times three i would have thought = (1.1)
R961aa. = and all we can do is hope he can make that up (0.6)
R962da. >BUILDER< unable to start on time (.) so that could be again up to a week (2.0)
R963aa. a:: well i would say it's improbable if we've chosen the right builder (.) we've =
R964da. [or even two weeks]
R965aa. = discussed it with him you know
R966ca. it's not a great start from his point of view is it
R967aa. a-
R968ca. [we've agreed a date
R969da. [i would say it could happen though (.) because he he- might =
R970da. = have turned round to him and said (.) you know (.) look you've got defects on my=
R971da. = property and if you don't fix them i aint going to pay you any more money at all
R972aa. ok lets loo-
R973da. [yeah so it could happen
R974ba. °yeah°
R975da. could happen
R976ba. yeah i agree there

R977da. two (.) two (.) so if it could happen it could delay us by (.) up to (.) a couple of weeks
R978aa. yeah
R979da. or a week (1.2)
R980ba. yeah i i would say more than that (0.3)
R981aa. no it's days were talking-
R982da. [days so it's up to
R983ba. a week (0.4)
R984da. up to:: (1.3) a three >which is a serious one< (.) just over a week
R985ca. yeah
R986aa. i wouldn't say it's serious i would say it's marginal really (1.4) two to four days out of a =
R987aa. = six months
R988da. [but what happens if we go-
R989aa. [what
R990da. what happens if we go over our six months period (3.6)
R991aa. w- what does happen (1.9)
R992da. perhaps we should have categorised it for: a: (.) month (.) catastrophic (3.7) but =
R993da. = we we have said it is over a week to two weeks haven't we (1.7) how long would=
R994da. = a builder be delayed (2.0)
R995aa. ha ha ((laughing)) easy two and a half weeks
R996da. we-
R997ba. [that's easy
R998da. well it could be couldn't it
R999ca. yeah (1.5)
R1000ba. i think a month (.) it could easily be a month a month is: (2.4)
R1001da. we we haven't allowed (.) so it could be over (.) so it could be a five (1.0)
R1002ba. but what we haven't said is the builder if we choose wisely could (.) take the point you =
R1003da. [yeah tha- that's-]
R1004ba. = made (.) draw in additional people and put it back on programme wouldn't he (0.3)
R1005da. we're not using a two bit organisation so you (.) so you choose wisely (0.8) so (.) but-
R1006ba. [no]
R1007aa. having discussed it firstly with the builder (.) and you are quite happy that he has =
R1008aa. = got the men and the manpower a- a- you know the materials to do it (.) you would =
R1009da. [yeah]
R1010aa. = be quietly confident but (.) it could happen (0.3)
R1011da. it could happen (.)
R1012aa. so i think (.) it would still be a marginal i- i- i- in it's impact really (1.3) cause we make =
R1013aa. = it limit- limited to them
R1014da. well yes but we could then ask him to increase his programme (.)
R1015aa. correct (0.3)
R1016da. or his labour force
R1017aa. his manpower
R1018da. increase his labour force (.) so a two (.) >we all agree<
R1019ca. yep sure
R1020da. yeah (0.6) right weather conditions
R1021aa. [we've got to have both sides of the equation ant we
R1022da. weather conditions (.) well as likely as not they are going to be changing aren't they
R1023ca. yep
R1024da. i would have thought (.) so we're er:: >but exceptional ones< well; i still think it's =
R1025da. = middle (.) middle of the road category (1.7)
R1026ba. b- but this is an exceptional
R1027da. ye:ah (.)
R1028ba. i- is it likely that
R1029ca. it's gonna be ()
R1030ba. could happen
R1031da. are we talking summer here (.) are the expecting nice fine weather or are they (.) in=
R1032da. = six months building time you're gonna bridge through a couple of seasons aren't you
R1033ca. °yeah°
R1034da. so: (3.0)
R1035ba. °you see° i can't help thinking six months for a building extension (.) christ all =
R1036ba. = mighty (.) that's terrible for a single story (0.8)

R1037da. so are we saying that the er: time restraints on (.) on the building of the extension =
 R1038da. = are er: (.) °is not° (1.2) six months form start to finish (.) that was the concept though =
 R1039da. = wasn't it (.) that was thinking about it
 R1040ba. that's right
 R1041da. so we-
 R1042ba. [the building phase i don't think-
 R1043da. [so do you know what the building phase is actually going to =
 R1044da. = be then
 R1045ba. six weeks
 R1046da. six weeks
 R1047ba. if that (1.6) it's not going to be great-
 R1048aa. [yeah but we are only looking for the risk elements =
 R1049aa. = within the bands we have chosen really
 R1050ba. yeah
 R1051aa. so we (.) we are not looking at how long it is going to take it's just looking at the =
 R1052aa. = bands aren't we (.)
 R1053da. so the weather: (.) weather could (2.3) could change
 R1054ba. yeah
 R1055aa. [yeah (.) i still think it could change-
 R1056ba. it could change to-
 R1057da. [so it could change (.) which would be a two (.) and if it does =
 R1058da. = change it is going to be (1.3) marginal; (2.0)
 R1059ca. yeah (.)
 R1060da. what's a couple of days loss of labour (.) is that five hundred quid (1.2)
 R1061aa. °yeah°
 R1062da. so it could be a three (0.9)
 R1063ba. of course so soon as he's got the roof on (.) it doesn't matter about the weather (.) =
 R1064da. [hm- hm-] ((in agreement))
 R1065ba. = it is only when he is doing the outside and and it's the painting
 R1066aa. [i think it could be a three serious that me (.) impact (.) it could be serious
 R1067da. [yeah]
 R1068da. yeah (.) serious impact (.) financially it could be a thousand pounds (2.0) er::m
 R1069ca. only if it's frost you could be held up for a week at a time
 R1070da. [but bu- but would we be liable (.) we are saying that we would be liable (1.2)
 R1071aa. ah no the builder is liable because i challenged that if you recall (1.0) i'm not sure the =
 R1072aa. = builder can be liable
 R1073da. i:: from from what we were saying-
 R1074ba. [how can he be if it's exceptional
 R1075aa. [how can he be (.) no (1.8)
 R1076da. er:m you only get paid for an extension of time for exceptionally incremental weather =
 R1077da. = but you don't get paid you get time (2.3)
 R1078aa. [you get the time]
 R1079da. you get time yeah
 R1080ba. oh i see (1.9)
 R1081aa. you get the time but you don't get the money for it
 R1082da. [so it is the builder then (.) because (1.7) he: (2.1)
 R1083aa. yes but he'll not he'll not get paid for it
 R1084da. no
 R1085aa. but we will give him the time for it
 R1086da. so:
 R1087aa. >[SO WHAT will it cost us for it< (0.3) well it could cost us erm: putting the furniture =
 R1088aa. = into store (.) couldn't it (.) cause it's not ready
 R1089da. we could just defer erm: if it was only going to be (0.5) a week (0.5) we could ask them =
 R1090da. =- to def- delay their (0.4) delivery (.) °maybe° ..
 R1091ba. are we agreed that it IS BETWEEN MARGINAL and serious then
 R1092aa. [two (.) it's a two]
 R1093da. yeah
 R1094ba. we have honed it down to two items then (2.5)
 R1095da. yeah (.) two or a three (1.3) two
 R1096ca. two yeah

R1097aa. ah ha (4.1)
R1098da. below ground problems (2.4) could require piling (.) ohh::
R1099aa. i think there is a serious threat there (0.6)
R1100ca. yes (2.6)
R1101da. it depends if the ground survey had been done before hand and whether you had =
R1102da. = anywhere to go with the problem (1.4) having a having a
R1103aa. [i think it should be a could happen and =
R1104aa. = it could be critical (2.1)
R1105ca. yes
R1106ba. [yeah]
R1107da. could happen (.) it could happen ye:s (0.9)
R1108ca. it could cost you a fortune to put it right
R1109ba. it certainly will cost money
R1110da. [er:: it could be a four] [yeah
R1111aa. yeah (5.0)
R1112da. ok
R1113ca. it could even be catastrophic (3.7)
R1114da. er:m (2.5) chances are they built the house on something didn't they-
R1115aa. [well again in the band] [you're now =
R1116aa. = looking at two grand which is (1.5)
R1117da. if you take that-
R1118aa. [WE'RE LOOKING AT THE BAND AREN'T WE REALLY (5.3)
R1119da. ok (.) so decorations (4.0) ok (.) building not drying out (1.1) er::
R1120aa. i think that is as likely as not (.)
R1121da. well i probably would agree with you (.) you always see dehumidifiers and what =
R1122da. = have you so the chances are you are going to have to go and buy or rent some =
R1123da. = dehumidifiers to dry the building out (.) put the heating on earlier (1.3)
R1124ba. [yeah]
R1125aa. insignificant really isn't it
R1126ba. insignificant
R1127da. insignificant
R1128ba. they can sort it out
R1129da. yeah it's a one
R1130ca. it's not going to take long is it
R1131da. a one (.) maybe a two (.) a one
R1132aa. [a one]
R1133da. a one ok (4.3) long delivery on carpet (1.1) ok (.) so: when you choose the carpet i =
R1134da. = would have thought that they were gonna say: (2.8) we stock one or it will be =
R1135da. = two to four weeks so you could say four weeks is significant
R1136aa. [it could happen but it is insignificant
R1137da. ye:ah (.) so it could happen (.) it is going to be a two (0.4)
R1138aa. and a one
R1139ca. [and a one
R1140da. and at the end of the day (.) if you haven't got a carpet to walk on
R1141aa. you can still go to work can't you
R1142da. yeah (.) you are going to have to move your desk out again but hey (.) insignificant
R1143ca. it would affect your door
R1144da. well yes (.) so one
R1145aa. one yes (1.2)
R1146da. and building (.) drying out (.) too quickly and cracking (1.6)
R1147aa. that's could happen
R1148ca. yeah
R1149ba. it could yeah
R1150da. [it could happen (.) especially if you got a heat wave
R1151aa. could be marginal that
R1152ca. yes
R1153aa. i think it's:
R1154ca. >two and a two< (0.8)
R1155ba. yeah
R1156da. yeah (.) two and a two (.) °ok° (4.4) right

R1157aa. because you can't move in you can't decorate (1.7)
R1158da. ok (.) er:: moving in (6.0)
R1159aa. °ha ha ha° ((laughing))
R1160da. ok (.) final connections of utilities (5.1)
R1161ba. yeah (.) highly probable ((laughing)) (1.7)
R1162da. i don't know(.) bt have this erm (2.8)
R1163ba. isdn lines (.) killer streams huh (.) bloody disaster
R1164aa. [if i was looking for risk i would cover that risk me (.) i think they =
R1165aa. = could be late connecting you up and you could be not be able to use the-
R1166da. [but would =
R1167da. = you not have one in your home (.) if it was bt
R1168aa. you would but you know
R1169ca. [you see that is the problem they are good whe-
R1170da. [extension (.) extension =
R1171da. = lead
R1172aa. you could yeah () but you haven't got your dedicated line or anything like that
R1173ba. [()]
R1174da. yeah your isdn or your direct link to your server in head office or or whatever (.)
R1175ba. are we saying probable (.) have we got that little faith in them (1.3)
R1176da. erm:: (0.9)
R1177aa. i'm saying probable i think so yes (.)
R1178da. you are saying probable
R1179aa. ° hm: ° (6.3)
R1180da. yes right ok i-
R1181aa. [i also think it could be serious
R1182da. ok even if it is probable you think it could be serious do you
R1183aa. yeah; i do because if we can't u- utilise the office we are loosing money aren't =
R1184aa. = we (.) i'm having to go back and forwards to work
R1185da. [if you were: a:: >trader< (2.3) =
R1186da. you know (.) trading on the stock exchange then yes i would totally agree with=
R1187da. = you (.) but at the end of the day have we decided what end client user we are-
R1188aa. we have got round to saying that we are doing a job that you want to do from home so:
R1189ca. but the thing is at the moment as well he was managing to do his job right up till =
R1190ca. = then so (1.5) the phone line will be in
R1191aa. no he's he he's working in his office in the (.) that is why he is having it built
R1192ca. yeah- yeah- (1.0)
R1193da. so can he not stay at his office (.) for another week (0.5)
R1194aa. well yes he can but is that not costing him in petrol and thing as like that
R1195da. yes but is that then (.) a: serious (0.4)
R1196ca. it's not going to cost him much more than a hundred quid is it
R1197da. unless his season ticket's expired but then (.) °his season ticket for this travel°
R1198ba. i am just wondering shall i start doing the er: chart whatever it's called
R1199da. yeah
R1200aa. WELL OK THEN IF YOU THINK SO let's say probable then and er: an =
R1201aa. = insignificant as an (0.7) impact
R1202da. well we can go probable (1.4) and a marginal because it might because it might =
R1203da. = go between one hundred and five hundred quid
R1204aa. °ah: right ok then°
R1205da. right ok so we can go: four
R1206aa. four and two yeah (1.2)
R1207da. yep (2.3) restricted access (6.7) er: restricted access (3.7) i would say (2.1) you know what =
R1208da. size of a doorway is:
R1209aa. yeah (.) improbable i would have thought-
R1210da. yeah so we are saying it is an improbable and: so we are saying one and we are =
R1211da. saying er: (.) well even if it could it could only be a marginal (.) yeah one =
R1212da. = and two
R1213aa. yeah (2.3)
R1214da. problem with the furniture
R1215aa. could happen
R1216da. yeah could happen (0.5)

R1217aa. but insignificant (.) i think we could get something in (.) to work on (1.2)
R1218da. >yeah< (.) >yeah< (3.2) one and a two (.) right ok (2.6) whole project (3.0)
R1219aa. well that is not a risk is it (.) it's a minus really (.) what we are saying is use a portacabin (1.1)
R1220da. er:m (0.3) well that could be a plus side couldn't it
R1221aa. hm:
R1222da. it could be a significant (1.4)
R1223aa. it certainly could yes (1.0)
R1224da. er::m (.)
R1225aa. >i think it could happen and it could be a minus five< (.) we can only go up to five can't we
R1226da. it is still going to cost you some money isn't it but (.) yeah ok (3.3) you could make a =
R1227da. = saving of greater than two thousand pounds (.)
R1228aa. °yeah°
R1229da. minus five (1.1) and the probability of it (.) is: (4.9)
R1230aa. °i think it is a two °
R1231da. two (.)
R1232aa. yeah
R1233da. yeah (2.2) two times minus five is minus ten (2.1)
R1234aa. the only thing with that is it doesn't gives us (1.3) a risk (.) it gives us a high risk or or (.) =
R1235aa. = it's the lowest really in't it
R1236da. yeah because you got the minus value
R1237aa. °yeah° (2.2)
R1238da. er:: (.) >shared additional space for rent< (.) well again (.) that is as likely as not =
R1239aa. [°could be a minus°]
R1240da. =could happen-
R1241aa. yes (.)
R1242da. because: you could do that so that could be a three (0.4)
R1243aa. yeah
R1244da. and that again is going to be a plus side isn't it so: (.) =
R1245aa. it is
R1246da. = so you are going to be looking at maybe (1.6) er:m-
R1247aa. what a four (3.2)
R1248da. what; very substantial; (4.9) oh what financially (0.5) what thousand to two thousand
R1249aa. yeah (3.1)
R1250da. oh:: go three minus three
R1251aa. yeah (8.9)
R1252da. convert garage
R1253aa. °yeah°
R1254da. well again you could do it (.)
R1255aa. yeah it could happen-
R1256da. >why not< (.) it's a possibility (1.6)
R1257aa. and it's significant i think
R1258da. yeah (1.4)
R1259aa. it could be substantial (.) minus three again i think (2.1) so it could happen as =
R1260aa. = a two and a three (.)
R1261da. yeah (.) would it not be more than a couple of grand (0.8) are we saying what did =
R1262da. = we say (.) we said a portacabin was minus five
R1263aa. yes (0.5)
R1264da. because we were saying it was greater than two thousand pounds
R1265aa. because you could load it straight in there but the garage (0.6)
R1266da. the garage is going to cost you (.) what you have got to put a floor in it brick up =
R1267da. = the front of it (.) see yeah (.) you are not going to be saving as much as a =
R1268da. = portacabin perhaps (1.3)
R1269aa. why (.) you're buying a complete portacabin when you think about it (.)
R1270da. yeah (.) true (.) and they are not cheap are they (.)
R1271aa. no it might be the other way around (.)
R1272da. it could be six- i don't know (.) it could be five or six grand (.) i'm still thinking =
R1273da. = if we spend five or six grand on converting your garage (0.9)
R1274aa. °yeah°
R1275da. yeah (0.9) so: possibly slightly more on converting your garage because it is an integral =
R1276da. = part of your house isn't it

R1277aa. yes (.) it could be or:
R1278da. so lets make it slightly less minus four: (0.6) and still call it a two
R1279aa. yeah
R1280da. yeah (2.3) er: family problems due to stress (1.0) well i would say er: as likely as not she's=
R1281da. = going to get fed up with it (0.3) and er:m she's going to move out and she's going to =
RL1282da. = say i'm not living with granny because i really cannot afford to granny (.) i'm =
R1283da. = sorry it's going to become a serious problem a:nd (.) if you don't put me in an hotel =
R1284da. = for six months (.) although it's not a whole six months-
R1285aa. [we are counting in days aren't we
R1286da. yeah
R1287aa. it's either (.) what did we say (.) so we are talking about four to six days (0.8) erm: so: (1.4)
R1288da. no three is as likely as not cold happen
R1289aa. yeah but
R1290da. erm: (.) but it is financial isn't' it (.) you don't have to look at it in time do =
R1291da. = you (1.0) you could look at it as purely as cost (1.3)
R1292aa. °yeah ok°
R1293da. so it could be: (0.4) it could cost you five hundred-
R1294aa. [a thousand pounds
R1295da. yeah (4.5) increased property value enables upgrade (1.5)
R1296aa. this is a minus again in't it
R1297da. yea:h (2.0)
R1298aa. it could happen (2.1)
R1299da. it could happen (.) a two
R1300aa. and it could be significant (.) yeah i think an all (.) two (.) but that is only five hundred quid =
R1301aa. = .. it will be more than that (.) substantial;
R1302da. substantial well it's got to be:: (0.9) greater than two thousand then (.) so it's got to be a =
R1303da. = minus five (.) its got to be an exceptional thing for it to happen
R1304aa. yeah
R1305da. right (.) ok