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Making up one’s mind in the outdoors.

Decision making and the genesis of judgement.

A thesis
submitted in partial fulfilment
of the requirements for the Degree of
Masters of Applied Science
at
Lincoln University

by

Marty Beare

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MAKING UP ONE’S MIND IN THE OUTDOORS: DECISION MAKING AND THE GENESIS OF JUDGEMENT.

By Marty Beare

Increasing numbers of individuals are training for careers as outdoor-adventure leaders. Decision-making training delivered by programmes of outdoor leadership is informed predominantly by classical decision theory. Students are taught to employ procedure-based rational-choice strategies as substitutes for experience-based judgement. A competing rhetoric that reflects the traditionally-held beliefs and practices of expert outdoor adventurers presents an alternative view. Instead of promoting structured training in rigorous procedures of evaluation and option selection, experts talk about the need to acquire a foundation of experience on which to base intuitively-made decisions.

The traditional rhetoric has recently gained theoretical support from new research in decision-making based on real-world operational settings. Termed ‘naturalistic decision-making’, this approach is characterised by claims that experience-based judgement and recognition-driven decision-making methods can generate workable courses of action in dynamic problem-solving environments. Of all the naturalistic decision models, Klein’s (1989, 1998) recognition-primed decision model is the most coherently expressed alternative to the rational-choice model of decision making.

This study explores decision-making strategies used by expert mountaineers and kayakers in New Zealand, and investigates similarities with the recognition-primed decision model and with broader naturalistic decision making concepts. Conclusions reached are that the expert subjects do use recognitional strategies to make up their minds. Experts rely on knowledge and skill to interpret and assess what goes on in uncertain situations, and to devise short-term courses of action that remain relevant and effective within the overall goals of the occasion. Use of rational-choice strategies is limited to rare circumstances where simple choices occur in association with stable contexts.

Implications of findings for outdoor-adventure practice, theory, and education are outlined, and future lines of inquiry are suggested.

Keywords: decision making; judgement; expertise; naturalistic decision making; recognition-primed decision making; rational choice; outdoor adventure; outdoor leadership; situation assessment; critical reflection; mountaineering; kayaking.
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CHAPTER ONE

DECISION MAKING IN THE OUTDOORS

INTRODUCTORY CONTEXT

This study arose from the author's background as climber, kayaker, outdoor pursuit instructor, mountain guide, and lecturer in programmes of outdoor leadership. During the last two decades of involvement in outdoor adventure, the author has noted significant changes in the way that people are introduced to outdoor-adventure activities. Of particular interest has been the development of formal programmes of training and qualification in outdoor-adventure activities. The training and qualification pathways include tuition in the skills and knowledge of leadership in outdoor adventure.

The development of structured programmes of training in outdoor-adventure activities in New Zealand has coincided with period of rapid growth in participation outdoor activities (Davison, 1986; Booth & Peebles, 1995). Contributing to this growth has been a corresponding increase in promotion, education, and commercialisation of the outdoors. The formation of a burgeoning outdoor-adventure industry has caused issues of responsibility and accountability to come to the fore. The credibility of this industry largely relies on the capacity of outdoor leaders to make effective decisions on behalf of others who do not have the knowledge, skills and/or confidence to attempt the activities on their own (Berno, Moore, Simmons & Hart, 1996).

Accidents that befall an identifiable group within the community causing risk and expense to be borne by others are a source of resentment to the wider populace (Sandman, Weinstein, & Klotz, 1993). Decisions made by leaders of an activity that are perceived to have caused harm to members of the public that are under his or her care are especially likely to give rise to public outrage, with the target of the public's anger extending to the wider industry concerned (Brown, 1998). The generalised nature of blame in the event of accidents creates a compelling reason for the entire outdoor-adventure industry to develop and monitor leadership-training curricula and practices (Cory-Wright, 2000). A key aspect of leadership training is the establishment of programmes that can improve the quality and effectiveness of decision making (Boyes, 1999).

DECISION MAKING, AND THE NATURE OF THE PROBLEM

Making decisions is an integral part of outdoor-adventure activities. The settings in which outdoor-adventure activities are undertaken are characterised by natural forces that are inherently dynamic, and largely beyond the control of human intervention. Voluntary participation in outdoor-adventure activities involves challenge, excitement, and the potential to demonstrate competence in contexts of risk (Robinson, 1992). Decision making is a mechanism for maintaining a balance between the unstable combination of uncertainty, challenge, competence and danger (Robinson, 1992). The safety and the
quality of the outdoor-adventure experience is a consequence of the effectiveness of decision-making (Boyes, 1999).

The intrinsic connection between outdoor adventure and decision making has provided a focal point for the intersection of competing perspectives about how to frame knowledge and practice in outdoor adventure. There are two general ideologies that prevail amidst the various crosscurrents of beliefs. Enmeshed in these two ideologies are beliefs about the best methods for gaining expertise in the theory and knowledge of outdoor adventure activities.

One perspective regards expertise as involving the application of procedures that are used to produce an optimal course of action. Within this perspective, use of the correct procedure at the right time and place determines the quality of the outcome. 'Experience' refers to knowledge of what procedures to apply, and when and how to apply them. Such knowledge lends itself to being taught through structured programmes rather than being allowed to 'develop' in an ad hoc fashion. A contrasting perspective regards expertise as a function of skill and knowledge that is based on unstructured, trial-and-error experience. Expertise is acquired in a 'bottom-up' process. The onus is on the learner to undertake extensive and varied activity. Lengthy field experience plus critical reflection of the events that make up the repertoire of experience leads to the development of judgement. Experts use experience-based judgement to determine workable courses of action that satisfy current goals.

The two perspectives of expertise reflect competing theoretical descriptions of decision making. Conventional models of decision making use rational-choice theory as the theoretical principle for determining how decisions should be made. The rational choice decision-making strategy relies on following procedural steps of problem solving in order to determine an optimal solution. The procedures include an initial generation of a large number of options, followed by the weighting and rating of the options according to selected dimensions. Researchers investigating decisions made in realistic settings proposed an alternative conception of the decision-making process. Termed 'naturalistic decision-making' (NDM), this perspective regards decisions as being made by a recognitional process that uses experience-based judgement instead of problem-solving procedures in order to determine a course of action. In this study, special attention is given to one NDM model termed the 'recognition-primed decision model' (RPD) (Klein, 1993, 1998). RPD is claimed to provide a theoretical alternative to rational choice models of decision-making (Klein, 1997c).

A feature of the NDM perspective is its focus on strategies used by expert decision makers who are operating in real-world settings. The term 'real-world setting' refers to an unmodified situation within which people carry out normal tasks that have not been designed or altered for purposes of research. This is in contrast to contrived laboratory settings favoured by conventional research in decision making that concentrate research interest on artificial problems, limited context, and naïve subjects (Klein, 1989). NDM theorists argue that the narrow focus of interest of conventional research has led to incorrect assumptions.
about how decision making is generally conducted, as well as to incorrect applications of decision theory.

It is against this background of contrasting perspectives that this thesis is positioned.

AIMS AND OBJECTIVES OF THIS STUDY

This study is an exploratory examination of decision making in outdoor-adventure. The aim of the study was to investigate preferred decision-making strategies of expert mountaineers and kayakers who were operating in real-world settings. A secondary aim was to compare the strategies with those described by the naturalistic decision making model of recognition-primed decision making (Klein, 1989, 1998). To achieve the aim, the research had the following objectives:

a/ To investigate whether expert decision making strategies made in real-world settings were aligned with theoretical conceptualisations of rational-choice and/or NDM decision-making perspectives.

b/ To describe behaviour and thinking by expert mountaineers and kayakers that underpinned preferred decision strategies.

c/ To investigate the effects of situational context on the way that decision strategies were employed by experts.

d/ To investigate the influence of leadership roles on the use of preferred decision strategies by experts.

VALUE OF RESEARCH

Current decision-making training in outdoor leadership programmes is modelled on classical decision theory that promotes rational-choice strategies as the template for making decisions. It has been repeatedly demonstrated that human decision behaviour only occasionally conforms to the logic of classical theory (e.g., Allais, 1953; Ellsberg, 1961; Kahneman & Tversky, 1979). As a consequence, human judgement has been labelled as error-prone and “irrational” (Pratt, 1986, p. 498). Rather than damning human reasoning, an alternative approach is to replace classical theory with a more relevant theory that is capable of describing the adaptive characteristics of real-world behaviour (Beach & Lipshitz, 1993; Cohen, 1993).

What is needed is the development of descriptive theories and models that closely match how people actually make decisions. This research will increase understanding of what it is that expert outdoor adventurers do when making decisions in real-world situations characterised by change and uncertainty. Increasing our knowledge of real-world decision-making will provide information that can be useful in helping to design increasingly relevant programmes in effective decision making skills.

Chapter 1: Decision making in the outdoors
Investigation of a theoretical perspective that challenges the standard view may reveal information that has more validity and practical application than the conventional direction in decision research and training. NDM offers a coherent alternative to classical decision theory. RPD provides a conceptual base for guidance in the development of personal decision-making skills, and for improved design of the interface between people and tools that support decision making. This guidance is based on enhanced awareness and development of judgement rather than the current tactic of replacing it altogether with strategies for making rational choices among courses of action (Klein, 1997c).

When naturalistic decision requirements are taken into account, trainers will be more likely to use educational approaches that improve performance and support the difficult inferences learners need to make. This is especially true for decisions made under stressful circumstances. In particular, NDM research suggests that by gaining a more accurate understanding of the process of decision making, training programmes can be designed to help novices see situations the way experts do, to increase one's ability to link chains of events so as to more accurately predict future events, to discriminate and prioritise data so as to better manage uncertainty and time pressure, and to use pattern-matching and cue-awareness techniques. In this way, the knowledge gained by NDM can offer a valuable assistance to the development of judgement in individuals who are responsible for making decisions that have significant consequences.

THESIS ORGANISATION

This thesis is structured in eight chapters. This chapter presented the argument that there are conflicting theoretical bases for the practice of decision making, with only the classical perspective being used to inform current training in decision making in outdoor-adventure leadership programmes. A case was made for the need to explore the alternative perspective of NDM using the outdoor-adventure domain as the forum.

Chapter two presents an overview of the theoretical perspectives of decision making that are relevant to this study. Classical decision theory and NDM theory are described and compared. The RPD model is outlined, with emphasis paid to the three problem and identification variations of the model, and the four defining features of the model. Decision making theories and models that are specifically designed for outdoor adventure contexts are mentioned. Priest and Gass' (1997) theory of decision making and Boyes' (1999) outdoor adventure decision making model offer different perspectives of how outdoor adventurers can go about making up their minds. Finally, two models of expertise are introduced. Both models propose a link between levels of competence and strategies for decision making.

Chapter three describes the context in which mountaineers and kayakers develop the leadership skills that give them the ability as well as the opportunity to make decisions on behalf of others. The decision-making activities of
mountaineering and kayaking are briefly described, and a historical survey of past and present strategies for developing leadership ability in mountaineers and kayakers is summarised.

Chapter four presents the research methods used in this study. The research problem, research aim, and research questions are revisited, and the interview and observation processes are described.

Chapter five uses findings from the fieldwork to move towards an understanding of how expert mountaineers and kayakers make decisions in dynamic, open-ended real-world domains. A central recurring theme of expert practitioners is that of constantly seeking to enhance their ability to understand what is going on in a situation.

Chapter six continues interpretation of fieldwork data. The theme of the chapter is that of the close alignment of expert decision-making behaviour with the defining features of the RPD model.

In chapter seven an analysis of prevailing ideologies in the outdoor adventure domain is presented from the perspective of the acquisition of decision-making skills. This chapter links knowledge gained from interviews and observations of expert decision makers with current and prospective methods for training and developing proficiency in decision making.

Chapter eight concludes the thesis. The current state of outdoor-adventure decision-making practice, theory, and research is outlined, and future lines of inquiry are suggested.
CHAPTER TWO

DECISION MAKING AND EXPERTISE

CHAPTER OUTLINE

This chapter reviews research in the field of decision making. Competing perspectives of decision making are summarised and compared. Of particular interest is the debate between conventional decision-making research that is based on norm-referenced theory (what decision makers should do) and the so-called “naturalistic” perspective of decision making that describes decision behaviour without reference to ideal outcomes. The recognition-primed decision model (Klein, 1989, 1998) is highlighted as one naturalistic decision model that has particular relevance to the study of decisions made by experts in real-world (i.e., non laboratory) settings.

Contemporary theory and research regarding decision making in outdoor-adventure contexts is reviewed. Priest and Gass’ (1997) decision theory and Boyes’ (1999) outdoor-adventure decision-making model are described, and key concepts that underpin each model are compared with those that underpin Klein’s (1989, 1998) recognition-primed decision model.

The naturalistic decision-making perspective regards individuals who demonstrate expertise in a domain as being the most appropriate subjects for investigation of how decisions are made in real-world settings. This study recognises that there exists the closely related theoretical issue of how decisions are made by individuals with little or moderate expertise in a domain. This issue is introduced by presenting two models of skill development – the (un)consciously (in)competent model, and the skill acquisition model. Both models propose that there is an association between the use of qualitatively distinct cognitive decision-making strategies and the development of expertise in a domain.

THEORETICAL PERSPECTIVES ON DECISION MAKING

“The intuitive people tend to act before they think, if they ever think; and the analytic people think before they act, if they ever act.”

Curtis and Greenslet (1945, p. 18)

Overview of decision making perspectives

Decision making may be broadly defined as the dual process of identifying and solving problems. The two phases of problem-identification and problem-solving each involve further stages. The detail of these stages is subject to great variation depending on the aspect of the decision process under scrutiny. For example, the focus of decision models may be regarded as the predictive and explanatory power of the decision (Carroll & Johnson, 1990). Alternatively, attention may be directed at the cognitive and behavioural tasks of decision
making (Klein & Methlie, 1990). The result is a plethora of decision-making models, each with a distinct theoretical lineage. The relative epistemological location of the dominant theoretical and methodological perspectives appears in Figure 2-1. A description of these dominant perspectives follows.

Theorising in decision making conventionally starts from the position that a decision is a rational-analytical process of comparative evaluation that prescribes an optimal (i.e., ‘best’) course of action (Carroll & Johnson, 1990). Decision models that use rational choice strategies in order to determine norm-referenced behaviour are referred to in this study as ‘classical’ models. Perspectives from the classical genre consider decision making to be “a sequential process in which decision alternatives are generated, the consequences of each alternative are evaluated, the consequences of each alternative are compared in terms of objectives, and finally a decision is made” (Borgatta & Borgatta, 1992, p. 424). Experimentation and research in this branch of decision theory typically draws on laboratory-based methods, artificial problem situations, and naïve subjects. The research focus rests on the consistency of alignment of decision-making processes with rational-analytical prescriptions for how to structure problem solving. Formality and predictive rigour of problem-solving processes that influence the outcome of decisions are emphasised over contextual features of the decision task that impact on identification, interpretation, and assessment of what constitutes problem situations. In particular, personal factors such as the decision maker’s knowledge and experience relevant to the task are not considered important.

In contrast to the above is the approach to decision theory that is described here as ‘intuitive’1. The ‘intuitive’ approach regards decisions as a non rational-analytical process driven by awareness and understanding of the environment. Experimentation is conducted either on real-world field studies or on simulations that closely represent actual situations. These theoretical and methodological characteristics are a reflection of the fact that the main interest of researchers who study intuitively-made decisions is the understanding of relevant cognitive processes, and not the development of increasingly accurate predictive constructs.

Embedded within these two broad approaches to decision making are the normative, prescriptive, and descriptive perspectives. Both the normative and the prescriptive perspectives favour the use of quantitative methods in order to derive a rational course of action. The normative perspective is concerned with what people ought to do in order to optimise their outcomes when confronted with a decision (for example, the subjective expected utility theory of von Neumann & Morgenstern, 1944). By defining conditions for perfect utility maximisation, quantitative models are used to propose ideal outcomes of decision making (Levi, Cook, O’Brien, & Faye, 1990, p. 3-4). The prescriptive

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1 The particular use of the term ‘intuition’ to describe this approach to decision-making is a construct of the author, and not an established label. In this study, intuition always refers to “the use of experience to recognise key patterns that indicate the dynamics of the situation” (Klein, 1998, p. 31). It does not refer to paranormal phenomena.
Figure 2-1 Dominant conceptualisations of decision making, and their relative theoretical and methodological foundations.
perspective, although often confused with normative decision making, refers to what people are required to do in order to conform with pre-established norms (as distinct from what people ought to do in order to attain an ideal result). Examples of prescriptive decision choices are those that are recommended in teaching or decision-aiding contexts, whereby the individual is required to follow a pre-established protocol (Doherty, 1993).

The descriptive perspective on decision making differs from the above perspectives in that it utilises qualitative methods drawn from behavioural social science to examine the decision process. Many (but not all) of the decision models within the descriptive perspective conform to the tradition of using a rational choice strategy to develop norm-referenced solutions to decision events. Models of this type are often grouped under the "behavioural perspective" label. Norm-referenced, optimal courses of action are deduced using psychological theory. Conditions under which the decisions are made plus the mechanisms and limitations of human perception and cognition are considered important factors that shape strategies.

The behavioural perspective includes two further categories of decision research that have bearing on this discussion. One is that of non-rational problem-solving behaviours that give rise to decision biases known as heuristics. The way an individual perceptually "frames" a decision event is said to influence how they evaluate choices (see Kahneman, Slovic, & Tversky, 1982, and Tversky & Kahneman, 1974, for an introduction to the principal heuristics of representativeness, availability and anchoring). The other category within the behavioural perspective to be mentioned here is the field of research into decision-making in business management and administration. This category is further divided according to the use made of rational or cognitive decision processes.

While many behavioural models that are designed to aid administrative decision-making are based on rational choice, there is an alternative line of research that seeks to account for systematic deviations from rational choice theory made under conditions of "indeterminacy" (for example, limited information or time). Established by the behavioural economist Herbert Simon, this research introduces the concepts of bounded rationality (1955) and satisficing (1957) to account for decisions that are suggestive of innate tendencies in human behaviour. Simon's theorising and the related study of heuristics and biases represent examples of how cognitive intuitive processes can replace rational methods when making decisions. Despite the attention paid to human cognitive reasoning in natural settings by both these research areas, intuitively-derived options that deviate from rational choice selection are still regarded as examples of the tendency of human thinking to err from correct processes for making decisions.

There remains one further sub-set of the descriptive perspective on decision-making. This is the body of research labelled (in the USA) "naturalistic decision making". Characteristic of this perspective is a focus on cognitive appraisal of
situational variables rather than on norm-referenced predictive and evaluative efficacy, an adherence to non rational-analytical decision strategies, the use of qualitative methods for data collection, and the use of real-world field studies or else realistic task simulations. Unique to naturalistic decision-making research is an emphasis on how experience-based expertise informs and directs decision making in operational settings.

The labelling of decision-making research as 'naturalistic' is a deliberate statement by supporters of this perspective. 'Naturalism' is a term used to describe research practices that have minimal influence on, or manipulation over, the research setting and/or the behaviour of the subjects of the investigative process (Willems & Raush, 1969, p. 46). Naturalistic decision researchers wish to highlight the fact that their focus of interest is on the way that individuals 'naturally' make decisions in realistic settings about matters that have relevance to their lives. Naturalistic decision researchers are not interested in pursuing traditional research that uses laboratory studies to investigate rational choice behaviour in contexts constrained by pre-established assumptions of efficiency.

The discrepancy between the accounts of the decision-making process presented by the classical perspectives and the NDM perspective indicates a deep division in orientation within the community of decision researchers. Writ large, it is the difference between investigating the making of a decision process that is logical and rational versus investigating how humans actually make decisions. In particular, it reflects a basic disagreement over whether a prescribed set of generic guidelines for action should be imposed on the decision maker, or whether confidence should be invested in an individual's experience-based judgement to guide the decision process. It is the examination of this distinction between decisions-as-procedure in outdoor-leadership educational settings and decisions-as-judgement in outdoor pursuits practice that forms the foundation of this study.

NATURALISTIC DECISION MAKING

Background to NDM

Naturalistic decision making (hereafter referred to as 'NDM') attempts to understand and describe problem identification and problem solving strategies in situations that are "complex, messy, and challenging" (Klein, 1993b, p. 15). The first Naturalistic Decision Making Conference, held in 1989, heralded the view of participants that their approach was so novel and promising as to warrant labelling it the "reinvention" of decision making (Orasanu & Connolly, 1993). NDM researchers regard rational-analytical methods as incapable of real-world analysis and practice (Zsambok, 1997a), impractical (Klein, 1993b), and focused on "making decisions correctly" as opposed to "making correct decisions" (Beach and Lipshitz, 1993, p. 28). Furthermore, NDM supporters criticise classical decision theory for its neglect of psychological constructs such as reasoning, memory recall, and imagination. The result is "an inability to
account for the richness of goal-directed thought in real-world situations" (Smith, 1997, p. 372). NDM researchers also argue that their (varied) accounts of the decision-making process are more than just accurate descriptions of how decisions are made in the field. They are descriptions of decision-making strategies that, in the field, are more efficient and effective than those promoted by rationalist-analytic theory (Cohen, 1993; Klein, 1993a; Lipshitz, 1997a).

Precursors to the NDM theorists’ interest in real-world decision studies date back some decades. Karl Duncker (1945) proposed a decision theory based on pattern recognition that has been largely ignored until recently. In Europe, naturalistic studies have been conducted for some time (e.g., Rasmussen, 1974; Rasmussen & Jensen, 1974). NDM theorising has as its primary source “Brunswick’s lens model”, a probabilistic representation of judgement. Brunswick (1955) argued for recognition of the role of intuitive perception as a support for conscious thinking. Brunswickerian principles were used to develop “social judgement theory”, a quantitative representation of the interplay between the environment and cognitive functioning (Hammond, Stewart, Brehmer, & Steinmann, 1975). Ken Hammond’s enquiries led him to examine the idea of cognitive activity that can move along the cognitive continuum between analysis and intuition (Hammond, McClelland, & Mumpower, 1980). Hammond et al.’s cognitive continuum theory forms a link with naturalistic decision making enquiry (Hammond, 1993).

NDM has retained the concentration of research interest in ambiguous and complex settings initiated by Brunswick and Hammond, and continues to examine the apparently intuitive nature of problem solving methods in operational settings. NDM models, in keeping with those of other perspectives, divide decision-making process into the two phases of problem identification and problem solution. Beyond this basic structure, little else is similar. The problem-identification phase begins with an initial on-going period of assessment of the situation. In the view of NDM researchers, the quality of this assessment is in direct proportion to the level of expertise of the assessor (Lipshitz & Shaul, 1997). This merges into a recognitional process reliant on memories of similar situations from previous events that intuitively generates one or more problem solutions. If the problem situation is novel, then potential problem solutions are suggested by mental simulation, and sequentially assessed for worth (Canon-Bowers & Bell, 1997). This strategy allows rapid formulation of a course of action rather than a laborious breaking-down of the situation into elements followed by comparative analysis of options. Only in completely unfamiliar situations where experience is irrelevant and time pressure of no consequence will rational-choice methods be used (Klein, 1998).

Zsambok (1997a) identified four defining criteria of NDM research. The first is a list of contextual factors detailing key tasks and settings of real-world decision-making events (originally identified by Orasanu and Connolly, 1993). They are: ill-structured, non-artificial problems; uncertain, dynamic environments; shifting, ill-defined or competing goals; action/feedback loops; time stress; high stakes; multiple players; and organisational goals and norms. Second, the research
participants are identified as experienced and competent in their field. Third, the purpose of the research is "discovering how people actually make decisions in context-rich environments, not how they ought to make decisions in approximation to a rational standard" (Zsambok, 1997a, p. 5). Fourth, the locus of interest of research lies within the entire decision episode. This distinguishes NDM from rational perspectives that concentrate on the study of choice and neglect the above mentioned criteria as well as other complicating factors to do with evolving perceptual awareness of the decision maker, which Zsambok (1997a, p. 5) termed "situation awareness".

Based on the above descriptors of the scope of NDM, Zsambok provides the following definition:

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

This blanket definition encapsulates a variety of research interests within NDM. Development and testing of models and theories occurs at both ends of the conscious-intuitive continuum of thinking and action. The explanatory intent of the various NDM models varies from hypothesis testing to descriptions of domain-specific behaviour. The methodologies include direct observation and self-reports from real-world events, as well as a burgeoning collection of studies based on carefully crafted simulations (Klein, 1997b).

Amongst this diversity, one theme stands out as common to all NDM models. This theme is how people use their expertise to make decisions in field settings (Zsambok, 1997a). As described by one NDM researcher, "the familiarity of the situation (or the expertise of the decision maker) is one of the most important factors in how decisions are actually made" (Lipshitz, 1993, p. 137). Expertise makes possible intuitive understanding of a specific situation rather than the following of a rational procedure prescribed independently of the situation.

NDM's emphasis on the role of expertise in decision making contrasts with the focus of attention in classical decision-making research. In the latter, research interest rests on decision processes that lead to optimal outcomes, with little or no attention paid to individual factors. In fact, the classical perspective regards human variability as a source of error in decision making, and therefore something to be compensated for by increased adherence to strict rational-analytical procedure. NDM interest in the significance of expertise for decision making is based on studies in problem solving that demonstrate fundamental differences in interpretation and management of problem resolution between novices and experts (for a review of the influence of expertise in problem solving, see Chi, Glaser, & Farr, 1988).

The youthfulness of the NDM perspective has meant that as yet only minor attention has been directed by NDM researchers towards the study of novice
decision makers. Limited research comparing experts and non-experts has been conducted in the domains of urban fire-fighting command (Calderwood, Crandall, & Klein, 1987), wilderness fire-fighting command (Taynor, Klein, & Thorsden, 1987), chess tournament play (Calderwood, Klein, & Crandall, 1988), critical care nursing (Crandall & Calderwood, 1989), U.S. Armoured Division personnel (Brezovic, Klein, & Thorsden, 1987), battle planning (Thorsden, Galushka, Klein, & Brezovic, 1990; Drillings & Serfaty, 1997; Serfaty, MacMillan, Entin, & Entin, 1997), and aviation (Stokes, Kemper, & Kite, 1997).

Findings from these comparative studies suggest that experts do not have innately superior reasoning skills compared to non-experts. What the studies suggest is that the richer, more extensive domain knowledge of expert performers allows them to apply specific decision making skills in particular situations more effectively than naïve performers. NDM researchers regard the cognitive processes associated with situation assessment and evaluation of a course of action as aspects that are most likely to be enhanced in experts. Examples of decision processes that are claimed to be used more effectively by expert decision makers include critical cue recognition (Druckman & Bjork, 1991; Means, Salas, Crandall, & Jacobs, 1993), automatic action selection (Klein, 1989), pattern matching (Klein, 1993a), mental simulation (de Groot, 1946, Klein, 1993a), organisation of knowledge through memory-retention and memory-access mechanisms (Druckman & Bjork, 1991), and the self-monitoring of decision making processes (Canon-Bowers & Bell, 1997). A survey by Klein (1993a) of preferred decision strategies of expert and non-experts across five separate domains shows a consistent trend for experts to use 'recognitional' strategies, and for non-experts to resort to concurrent deliberation of options.

While NDM research findings demonstrate an association between domain expertise and strategies of cognitive processing, various questions remain. One area that remains uncertain is whether the differences in cognitive processing represent qualitatively different procedures, or are simply a result of differences in degree of application of domain knowledge. Also lacking is an understanding of whether acquisition of expert decision-making skills is a gradual incremental process, or a staged process. More understanding is needed about the way that naïve and 'merely' competent performers make decisions in real-world settings. Further research in these areas will aid the development of effective training methods and programmes in decision making.

The following section is a description of one NDM model that provides an account of decision making by experienced and knowledgeable individuals in real-world settings.

**Recognition-primed decision making**

Gary Klein's recognition-primed decision making (RPD) model is the best known of all NDM models. It has been under development since first formulated fifteen years ago (Klein, Calderwood, & Clinton-Cirocco, 1985; Klein, 1993a;
Klein, 1997c; Klein, 1998). The RPD model shares with other NDM models the thesis that experts distinguish decision-making cues more effectively than novices, and that experienced decision makers manage to make good decisions under time pressure, ambiguous information, ill-defined goals, and changing conditions (Klein, 1997c, p. 287). The unique aspect of the RPD model is its claim that experts are capable of generating and evaluating workable courses of action without comparing options and without having to create large option sets. Indeed, the RPD model claims that "experienced decision makers can usually identify an acceptable course of action as the first one they consider, and rarely have to generate another course of action" (Klein, 1993b, p. 147).

The RPD model describes expert decision making as comprising three distinct variations depending on the nature and complexity of the situation (see Figure 2-2). The first variation is labelled simple match, and corresponds to a straightforward case where both the situation and a plausible course of action are recognised as typical. The second variation is diagnose the situation. This is the attempt to assess and resolve uncertainty about an indeterminate situation that does not clearly match a single case, or that breaches expected occurrences. The decision maker attempts to resolve inconsistencies by generating explanations for initial observations (termed variously as "story building" or "mental simulation"), or by comparing explanations of events (Klein, 1997c; Zsambok, 1997a). Diagnosis is deemed significant since decision makers "often will spend more time and energy trying to determine what is happening, and distinguishing between different explanations, than comparing different courses of action" (Klein, 1997c, p. 290).

The third variation is evaluate a course of action. The problem-situation may be complex or especially serious, requiring prior deliberation before performance of action. Deliberation occurs in the form of mental simulation of a proposed course of action in order to think through the tasks and resources involved and the direct and indirect consequences. "A decision maker who anticipates difficulties may need to adjust the course of action, or maybe reject it and look for another option" (Klein, 1998, p.26).

The RPD model has four defining features (Klein, 1989, 1998). First, experts are "primed" to quickly recognise prototypicality in a situation. The claim is that experts are able to monitor and recognise situational variables in a more discrete and discerning way than novices. Not only do competent individuals recognise familiar events, they also readily recognise differences from past events or deviations from expectancies. Operating in tandem with recognition of prototypical events is the second defining feature of situational understanding. Information either used or sought after by experts in order to establish what is going on comes in the form of plausible goals, critical cues, expectancies and typical actions. Both recognition of typicality and situational understanding are enhanced by the use of "pattern matching" (Klein, 1998, p. 42). This refers to the matching of combined situational cues with "chunks" of memorised information grouped together in patterns. Experts are said to be
Figure 2-2 Recognition-primed decision model. From Sources of power, Gary Klein, 1998. Cambridge, Massachusetts: MIT Press.
able to "parse" the pattern of cues rapidly, ignoring those that are less relevant (Canon-Bowers & Bell, 1997, p. 103).

The third feature, singular evaluation, refers to the tendency of experts to generate and, if necessary, carefully consider one option at a time, rejecting each in turn if necessary until a satisfactory one is found. Klein initially (1989) referred to this concept as "serial evaluation"). In his latest writing (1998) he reserves the term "singular evaluation" for the assessment of one option in isolation from others, even when sequential assessments of a series of options take place. Klein claims that economies of time and "mental energy" gained through a "satisficing" strategy (see Simon, 1957) are compounded by the ability of experts to consistently propose a plausible course of action as the first one considered (1989, p. 50; 1997c, p. 288). The rationale of singular evaluation is in stark contrast with rational-analytical concurrent evaluation strategy. Rational-analytical models are predicated on the theory that the ideal mechanism for option selection is generation of multiple courses of action followed by evaluative comparison by attributes in order to "filter down" to obtain the optimal choice (1997c, p. 291).

The last defining feature of Klein's model is mental simulation, or "the process of imagining how an option will be carried out within a specific situational context" (1989, p. 58). A decision maker's capacity for mental simulation is largely dependent on their repertoire of relevant experiences. Within the RPD model's second-level stage of diagnoses, mental-simulation strategies include feature matching and story building. In the third level of evaluating a course of action, mental simulation is used to think through the current preferred option and imagine what might happen (1997c). This remains in accord with singular evaluation, where only one option at a time is checked for suitability.

Klein emphasises that the RPD model is intended to describe dynamic situations "where the situation changes and goals can shift", and where decision makers can monitor effects of actions in order to modify further their understanding of the situation (1989, p. 53). In this way, multiple consecutive short-term workable responses to time-pressured situations can be made with confidence, since it is understood that what is important is to act now rather than to calculate slowly and meticulously an optimal course of action. The RPD model is therefore a representation of the ever-changing situation, with constant up-dating of the situation signified in the diagram by the arrow linking "Clarification" (of anomalous expectancies) with "Experience the situation in a changing context" (refer to variation 2 in Figure 2-2).

Klein (1998) has designed an integrated version of the three-stage RPD model. The combination of the three decision strategies into a single model represents Klein's conceptual understanding of how cognitive decision processes occur. A situation that requires decisions to be made and actions to be taken confronts an individual. Depending on the circumstances of the situation, the individual initiates a sequence of cognitive events. The sequence that is initiated gives
rise to an identifiable decision structure that can be described in terms of the four defining features. This integrated version is represented in Figure 2-3.

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Figure 2-3  Integrated version of recognition-primed decision model. From Sources of power, Gary Klein, 1998. Cambridge, Massachusetts: MIT Press.
The familiarity and complexity of the situation and the level of complexity of the decision strategy determine which of the defining features is activated. In the case of a "simple match" strategy there is no activation of the element of mental simulation because of the high level of intuitive understanding of the situation as well as the implicit awareness of an appropriate response. What is happening 'now' and what needs to be done 'next' are immediately self-evident to the expert; in fact, so self-evident that evaluation of the single proposed course of action is not warranted. If the situation requires "diagnosis" before sense can be made of what is going on, then feature matching and story building are employed in order to make the current situation congruent with past experience and with expected events. Once this is achieved to the expert's satisfaction, the course of action becomes obvious in accordance with the defining feature of prototypicality. Occasionally the anticipated outcome of a course of action remains problematic. If so, the decision maker mulls over the preferred plan (selected according to the principle of prototypicality) and tries to imagine how it can be adjusted and made to work in terms of the situation and the overall goals. If it is rejected, then the next most likely option is considered according to the principle of "singular evaluation".

Klein refers to the problem identification and solution aspects of the three variations of the RPD model by the abbreviations "if...then", "if???...then", and "if...then??" (Klein, 1998, p. 26). As mentioned above, both the familiarity and the complexity of the decision strategy influence which of the four defining features is activated. Readily recognised situations trigger patterned understandings and responses. Complex or serious situations involve more deliberative cognitive processes. The relationship between the increasing familiarity and complexity of the decision strategy and the activation of defining features of RPD is represented in Figure 2-4.

![Figure 2-4](image)

Figure 2-4 The relationship between the defining features and the decision strategies of the RPD model, based on Klein (1998).

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The RPD model has particular relevance to the study of decisions made in natural settings. Its focus also rests on the way that experts make decisions, as opposed to how inexperienced people learn to become effective decision makers. Empirical support for Klein's model has been demonstrated in a variety of natural settings. These include civilian command and control environments (Klein, Calderwood, & Clinton-Cirocco, 1985), chess players (Calderwood, Klein, & Crandell, 1988; Klein, Wolf, Miltiello, & Zsambok 1995), aviation (Mosier, 1991), critical-care nursing (Crandall & Calderwood, 1989, Miltiello & Lim, 1995), military command and control environments (Driskell, Salas, & Hall, 1994; Kaempf, Klein, Thorsden, & Wolf, 1994; Cohen, Freeman, & Thompson, 1997; Drillings & Serfaty, 1997), electronic warfare (Randel, Pugh, Reed, Schuler, & Wyman, 1994), and outdoor-adventure settings (Boyes, 1999).

The RPD model offers scope for strategies to be designed for the purpose of improving and even teaching decision-making skills. Research that is based on RPD methods has the potential to produce findings that are specific and relevant to particular settings. RPD research into the cognitive-processing strategies of experts allows comparison with related research concerning strategies made by trainee decision makers, leading to an understanding of how decision-making strategies change with increased experience. This is a crucial step in the formulation of training programmes in decision making. RPD theorising suggests that coaching in decision making needs to be predicated on an awareness of how people are naturally inclined to make decisions, and that non-natural mental training techniques may be counter-productive. Another educational opportunity offered by RPD is related to the fact that the RPD model is not a representation of an ideal decision-event. Indeed, it highlights the potential for decision errors to occur as a result of faulty situation assessment and mental simulation, and because of over-reliance on a personal repertoire of experiences. Awareness of these factors and tendencies presents further scope for analysis of decision errors and subsequent training in modified decision-making modes.

THEORIES AND MODELS OF OUTDOOR-ADVENTURE DECISION MAKING

The outdoor-adventure context

Outdoor adventure involves people deliberately putting themselves in problematic situations and then resolving the problems. Outdoor environments are dynamic and unstructured, and require on-going monitoring and evaluation of hazards. Outcomes are both meaningful and fateful, and are dependent on the actions of participants. These factors result in a strong incentive to increase the probability of success over failure, and people who are skilled and experienced typically gravitate to the role of key decision maker.

Most decision research in the field of outdoor adventure begins analysis from the premise that the elements of risk, arousal and personal competence are the prime motivators of adventurous behaviour that lead to the necessity to make decisions. Of these three factors, ‘risk’ is the most ambiguous in meaning. A

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recent New Zealand collection of writings on risk management described that risk as a combination of the three components of chance (meaning 'likelihood'), consequence, and context (Elms, 1998, p. 44; Keey, 1998, p. 93; Peet & Ryan, 1998, p. 273). Risk is intrinsically associated with decision making. Elms (1998, p. 45) points out that "...unless there is a decision to be made, there is no point in trying to assess or manage the risk".

It is important to note that in this study the concept of risk refers not only to potential losses caused by dangerous events, but also to opportunities for gain. Risk may be experienced in various forms. Cheron and Ritchie (1982, p. 145; cited in Priest, 1993, p. 31) identify risk in terms of physical, psychological, social, financial, functional [mechanical or technical], and chronological outcomes, and according to quality of experience and/or expectations about results. The element of risk of most significance to outdoor adventure researchers and the general public is that of the potential for unwanted physical outcomes as a result of a decision made in the outdoor environment. Analysis by Ewert (1989b) of injury and fatality rates as a result of outdoor-adventure programmes demonstrated levels of harm comparable to every-day activities such as automobile riding.

The interrelationship between arousal and competence within a context of risk has been explored on a variety of theoretical fronts. Atkinson (1957) and Mitchell (1983) developed theories of motivation based on expectancy of success in compromising situations. Csikszentmihalyi (1975, 1982) and Iso-Ahola (1989) examined the intrinsic satisfaction (referred to as "flow") gained through the matching of risk and competence. The central tenet on which their theorising rests is that people choose to optimise levels of arousal through demonstrations of personal competence in the context of an uncertain outcome.

The adventure-challenge model devised by Colin Mortlock (1984) is an early attempt to compare psychological experiences of outdoor-adventure participants who are of varying ability. This model describes a sequence of four experiential stages defined by the variables of danger and competence. Mortlock’s stages of "play", "adventure", "frontier adventure", and "misadventure" were adapted by Martin and Priest (1986) and amalgamated with Csikszentmihalyi’s theory of flow to form the "adventure experience paradigm". In this model, perceived challenge and actual challenge are formed by the interaction of the variables of perceived and actual risk and competence. The intent of the model is to represent both the anticipated and the actual levels of arousal (expressed in increments of psychological adventure) that an individual may experience as a result of engaging in a selected course of action. A mis-match between perceived and actual variables of risk and competence leads to undesirable levels of arousal (either too low, or too high). Martin and Priest’s adventure-experience paradigm was designed as a conceptual aid to enhance the leadership abilities of facilitators in charge of outdoor-adventure situations (Priest & Baillie, 1987).
A related model developed by Alan Ewert (1989a) emphasises the developmental nature of the level of participant engagement in response to changes in individual, social and environmental motivational factors over time. Ewert’s "adventure model" represents introductory-level participants as having low skill levels, infrequent participation rates, and preferring structured programmes with low levels of risk in familiar settings. In contrast, committed adventurers are characterised as preferring higher levels of risk, solo or small group experiences, natural settings, and the opportunity to take direct responsibility for decisions. Associated research by Ewert (1994) demonstrates that the level of expertise relative to the degree of difficulty of the activity influences the ability to make decisions and manage risk. From the perspective of experts, the dangers are apparent but so are the risk-management strategies. Experts recognise what needs to be done in order to control the risks, and also have faith in their ability to carry out the required control-tasks.

Nonetheless, the fact remains that experts do take risks. The risks may be highly managed, and even subsidiary to the exercise of competence in the minds of expert participants. However, if experts miscalculate the match between their abilities and the dangers present, then loss in some form will eventuate. There remains the question why people should want to put themselves in risky situations. Bandura’s (1977) research into the concept of self efficacy links the demonstration of competence in mental and physical performance to a psychological need to strive for the exercise of control over events in one’s life. The argument is that there is a compelling link between risk, competence, and satisfaction:

"Inability to exert influence over things that adversely affect one’s life breeds apprehension, apathy, or despair. The capability to produce valued outcomes and to prevent undesired ones, therefore, provides powerful incentives for the development and exercise of personal control" (1995, p. 1).

The implication is that demonstrations of ability to exercise control over unpredictable events are logically only possible in contexts of uncertainty. This creates the ironic situation whereby people deliberately seek out uncertain situations in order to satisfy an innate desire to impose predictability through the use of expertise. In outdoor-adventure contexts the inherent uncertainties have potential for both serious physical injury as well as great satisfaction. The successful management of outdoor situations requires the use of effective decision strategies in order to provide reasonable assurance that dire outcomes will be avoided and beneficial outcomes will be obtained.

**Priest and Gass: Judgement, problem solving and decision making**

Priest and Gass (1997) outline an inter-related sequence of three models that together comprise a unified conceptual understanding of decision making. Although Priest and Gass do not claim that it is a distinct theory, for ease of discussion the integration of the three models will be referred to in this study as
the Priest and Gass decision theory, and shortened to 'P&GDT'. The three models that make up the P&GDT invoke the concepts of judgement, problem solving, and decision making. Priest and Gass designed these models with outdoor-adventure contexts in mind, and treat them as conceptual training aids for outdoor-adventure leaders.

Priest and Gass (1997, p. 264) describe judgement as "a process of logical reasoning used to reflect on past experience and substitute for the missing information" (p. 264). Judgement is said to inform both problem solving and decision making. "Problem solving" is defined as the process of determining a range of feasible solutions to a problem (p. 264). "Decision making" is the process of choosing the most likely option from the range of possible options (p. 281). Both problem solving and decision making utilise judgement to varying degrees as a creative tool to concoct alternatives for information that is missing, vague, or unknown (pp. 256, 264).

Judgement is regarded by Priest and Gass as a cognitive facility that can be developed, although it remains resistant to teaching and is limited by individual capacity (1997, p. 260). Through recall and evaluation of successful and unsuccessful experiences, lessons can be learnt and then used to inform future behaviour. Priest and Gass view this as a cyclic reflective process involving inductive, deductive, and evaluative phases. The model of the cycle of experience-based judgement is based closely on process models of experiential education (e.g., Dewey, 1938; Kolb, 1984). It also borrows from Piagetian equilibrium theory and heuristics to explain cognitive information-processing mechanisms of memory storage and retrieval.

Based on preliminary work by Priest (1988), Priest and Gass (1997) developed a multiphase problem-solving model (see Figure 2-5). The process of problem solving is represented as a series of inter-linked phases of assessment, analysis, and option-creation. The assessment phase involves recognition of whether or not a problem exists. Both subsequent analytical and creative phases of the problem-solving model are described as being undertaken in a conscious and purposeful manner. Following initial recognition of a problem situation, the process enters an analytical phase made up of a staged sequence of logical steps. The steps for analysis involve finding the crux of the problem, anticipating goals and outcomes, identifying a range of solutions, and the final decision-making step of choosing a solution that will be put into action (Priest & Gass, 1997, p. 266).

Problems are categorised as either "simple" (all variables are known) or "complex" (several unknown variables exist) (Priest & Gass, 1997, p. 267). Simple problems are tackled by applying logical analysis to each of the steps in the analytical phase. A range of answers for each analytical step is apparent without recourse to imaginative means of option-creation. The role of judgement in deciding the best answer at each step is restricted, but is never abandoned (1997, p. 267). Complex problems require the intervention of the creative phase whenever likely solutions are not readily forthcoming at any

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point in the analytical phase. This involves the use of inventive strategies mediated by experience-based judgement to come up with a range of options for each stalled step in the analytical phase.

Decisions are made at each step in the analytical phase of problem solving (Priest & Gass, 1997, p. 266). This applies even for “simple” problem situations. The method of decision making described by Priest and Gass is a dual process of divergence and convergence of options. Divergence involves “building up a range of several options” using the same techniques as in the creative phase of problem solving, with the recommendation that “the wider the range of options...the better” (1997, p. 275). A divergent process of option generation is advised to extend into “wild and crazy” areas, in the hope that the unfamiliar will provoke a creative solution. A theoretical case-example described by Priest and Gass (1997, p. 267) of a single incident of “identifying a solution” (step 5 in the analytic phase of the multi-phasic model) gives rise to the generation of “well over a hundred ideas”.

Convergence is described as the process of narrowing the field of options to a few “stand out” examples (Priest & Gass, 1997, p. 280), followed by the choosing of the option that has “the best overall probability of success” (1997, p. 278). Choosing the final option involves the use of the methods of “gathering”, “weeding out”, “organising” and “weighting” (1997, p. 275-278). These are a combination of discrimination techniques based on sorting and comparative evaluation. In the case-example mentioned above, Priest and Gass (1997, p. 267) describe how, after “careful consideration” of each of the over one hundred options, nine are eventually short-listed for more thorough mental and real-life evaluation in order to determine the one optimal course of action. Further case-examples of convergence offered by Priest and Gass (1997, pp. 277-280) describe the use of specific comparative-evaluation strategies as field methods for outdoor decision makers. The strategies described equate with rational-analytical techniques of multi-attribute utility theory, elimination by aspects, and conjunction.

Comparison of the P&GDT with the RPD model
The emphasis placed by P&GDT on the importance of judgement gives an early impression of commonality with Klein’s RPD model. Both conceptualisations of decision making involve the application of experience-based knowledge to resolve uncertainties and to inform actions. Closer inspection, however, reveals great discrepancy between the ways that P&GDT and RPD consider decision making to be enacted.

P&GDT advocates the use of a mechanistic, analytical approach to decision making. A sequence of five problem-solving steps is worked through in a consciously calculated way, with each step requiring resolution before attention is focused on following steps. Preliminary steps involve the determination of the precise issue at hand and of goals for action. Experience-based judgement
supports the making of decisions at each step, but to be most effective must remain a clinical and emotionless exercise of reasoning (Priest & Gass, 1997, p. 271). Emphasis is placed on a thorough generation and assessment of options for solution rather than on initial assessment of the situation. Time pressure is acknowledged to be a factor in decision making, but leaders are cautioned not to make hasty decisions. Instead, P&GDT advises decision makers to "take the time to seek out diversity in resources and information" (1997, p. 271). In practical terms, this means the generation of as many options as possible for comparison and evaluation. The processes of divergence and convergence are exhaustive, with logical evaluation and rigorous comparative testing used to determine the eventual course of action that is chosen.

In contrast, RPD emphasises the rapidity of decision making by experienced decision makers. Situational assessment is the most important aspect of the decision making process, with typical courses of action becoming apparent as the context is understood. Fast decision making is dependent on recognition of relevant features in the situation. The efficacy of recognitional processes (e.g., feature matching, analogical reasoning, mental simulation) is a function of the extent and quality of experience in similar situations. RPD is typified by the generation of very few options for action and the use of singular evaluation of options to find the first course of action that works. Rapid decision making is possible because the problem-solving process is not halted while goals are defined. Rather, there is a simultaneous search for goal clarity and for problem solutions. Subsequent evaluation of partial or inadequate solutions leads recursively to a better understanding of goals, but in the meantime decisions have been made and actions carried out. Experience-based recognitional processes generally occur in intuitive fashion, or as deliberation in the form of mental simulation.

Along with these opposing conceptualisations regarding the structure and process of decisions, P&GDT and RPD differ in their perceptions of the role of experience-based judgement in decision making. RPD views experience as a trustworthy tool that is used to assess the situation and to draw inferences based on understanding of the context (Klein, 1993, p. 27). P&GDT views judgement as a tool used to support the rational-analytical problem-solving process of choosing an optimal course of action. RPD merges the phases of problem-identification and problem-solution into a holistic decision entity, whereas P&GDT retains the classical division between these phases, and restricts the use of judgement to the latter problem-solution phase.

The outdoor adventure decision making model

The outdoor adventure decision making (OADM) model was developed by Boyes (1999) to guide research in decision making by outdoor-adventure leaders. The OADM model describes the interaction of physical, psychological and cognitive factors during decision making by experts in outdoor-adventure contexts. The model is presented from the perspective of the experienced leader. Decision making is described as an ongoing process that seeks to find
an ideal balance between risk and competence such that the resulting challenge gives rise to a safe and rewarding adventure experience for participants (1999, p. 52). A diagram of the OADM appears in Figure 2-6.

Figure 2-6 Framework model of outdoor adventure decision making. From Outdoor adventure decision making, M. A. Boyes, 1999, p. 53.
The theoretical foundation of the OADM model stems from research in the psychology of risk. Of particular influence is the study by Lopes (1987) that proposes an integration of dispositional tendencies towards risk with situationally driven aspiration levels. Other important influences on the OADM model acknowledged by Boyes are the models and ideas of the NDM theorists Klein (1989) and Orasanu (1990), and the adventure-challenge model devised by Martin and Priest (1986).

The OADM model describes the interconnections between the leader's mental modelling of the situation ("leader's situational awareness") and the mechanisms used for assessing the situation ("situation assessment") and for interacting and altering the situation ("resource management"). The leader's mental model is formed by the interaction of environmental, group participant, and personal factors. Environmental and social factors are dynamic and require constant review and interpretation. Personal factors include experiences, beliefs, values, and goals. The leader's mental model of the specific situation develops as understanding of the environmental and social contexts is gained. Boyes (1999, p. 54, p. 309) highlights the significance of McLennan and Omedei's (1996) concept of "prepriming" to the formation of a leader's situational assessment. Research by Boyes (1999) reinforces the thesis that mental rehearsal in the form of pre-trip preparation can increase the relevance and accessibility of information that can be used to build up an accurate mental model of factors associated with the environment, participants, and goals.

In the situational assessment phase of the OADM a mis-match between risk and competence results in feedback to the leader in the form of cues from the environment and/or participants. Cues that suggest a degree of challenge that is outside the level of acceptability "trigger" a decision response by the leader in an attempt to rectify the imbalance (Boyes, 1999, p. 309). The imbalance may be in the direction of either too much challenge, causing fear in the participants, or too little challenge, causing boredom. Either state is unsatisfactory, and if intervention is not effective then a crisis may ensue. The recognition of situational cues is suggested by Boyes to occur in a singular fashion according to the precepts of RPD, especially in situations characterised by time pressure. In situations of minimal time pressure Boyes (1999, p. 294) suggests that concurrent evaluation may be enacted according to the processes described by P&GDT.

Effective intervention by the leader in order to restore and maintain an ideal level of challenge requires the management of social and environmental resources. Boyes employs Priest and Chase's (1989) conditional outdoor leadership theory to provide an explanation for differential allocation of social resources vis a vis environmental resources. Conditional outdoor leadership theory (COLT) integrates a modified version of Blake and Mouton's (1964) managerial grid model with situational factors. COLT describes orientation towards 'relationship' or 'task' leadership style by a leader as dependent on his or her perception of the favourability of environmental and social conditions. The level of competence of the leader is regarded as a further situational factor.
to be considered. Leaders of different ability are theorised to desire differing amounts of risk in order to produce individually acceptable levels of challenge.

Boyes used the OADM model to guide his investigations about processes of decision making as used by outdoor leaders. The focus of Boyes’ (1999) study was the relevance of the NDM concepts of mental modelling and recognitional decision making to the outdoor leadership context. Boyes concluded that expertise in outdoor leadership was associated with greater emphasis on situation assessment and on serial search strategies, and reduced reliance on comparative consideration of options (1999, p. 289). The finding that recognitional decision strategies are used by experts in outdoor-adventure contexts provides support for NDM/RPD theorising about the way that individuals make decisions in real-world situations.

A caveat must be noted in relation to the research carried out by Boyes (1999). Boyes’ findings were derived from observations of expert and intermediate outdoor leaders in response to computer simulations of outdoor-adventure scenarios based on real incidents. The adoption of computer simulations as a mechanism for re-enacting real-world decisions is somewhat contradictory. The distinction between realistic models of real-world events and laboratory-based research can become blurred. Boyes’ use of semi-laboratory based methods is in keeping with a tradition in NDM of employing research methods based on realistic simulations and computer modelling, as well as ethnographic fieldwork (Orasanu & Connolly, 1993, p. 15; Klein, 1997b, p. 391). The frequent use of simulations in NDM research is largely driven by difficulties in gaining access to expert performers in real-world settings, and because of the problems inherent in carrying out controlled experimentation in such settings. A danger of such methods is that in reducing the complex real world to a simpler version, the conditions necessary for the expression of strategies of naturalistic decision making are negated. This may impact on the validity and generalisability of findings that arise from research based on simulated settings.

EXPERTISE

"The expert does not seem to compile the rules he or she uses as a beginner. Rather, the expert seemed to put them aside just like training wheels."

Hubert Dreyfus (1997, p. 25)

Expert decision makers

The way that decision-making strategies are used by expert decision makers is the dominant research theme of this thesis. Related research themes include the way that expertise is acquired, and the way differing levels of decision-making expertise influence the process of making decisions. NDM researchers claim that individuals who possess expertise in a problem area will consistently use decision-making strategies that are identifiably different from those used by novices, especially under stressful situations. Furthermore, NDM researchers contend that traditional research methods have produced models of decision
making that are derived from studies made in contexts where experience is irrelevant.

Expertise is special skill or knowledge derived from training or experience (Merriam-Webster’s Collegiate Dictionary, 1993). In order to examine how experts use their experience and knowledge to direct strategies of decision making, two models of expert behaviour are elaborated below. The models describe sequential stages in cognitive awareness as novice decision makers develop into expert decision makers.

The outdoor-leadership development cycle model

Edward Raiola’s ‘outdoor-leadership development cycle’ model (1990, p. 237) describes the learning of the skills of leadership as involving four sequential stages of cognitive awareness (see Figure 2-7). Raw beginners have no awareness of the skills and understanding that it is possible to gain, and consequently are not conscious of the extent of their current naivety and (in)competence. After being introduced to the topic at hand, they discover that there exists an established body of knowledge and recognised standards of performance. They now become conscious of their level of (in)competence. With practice, conscious awareness of the correct thing to do gradually transforms into more competent behaviour, albeit subject to deliberate attention. The final stage is that of consummate familiarity and ability in the procedure such that it can be reliably performed to a high standard without self-scrutiny.

Raiola describes the development of expertise as involving two distinct types of learning. First, there is ‘training’, or the learning of techniques. Second, there is ‘education’, or the process of understanding the correct use of techniques and their implications (1990, p. 235). The stage of ‘unconscious competence’ attained by the expert signifies that the individual has integrated the training and the educational experiences. This distinction between technical training and education parallels the distinction between behaviour based on the following of rules (‘explicit’ behaviour) and behaviour motivated by the understanding of information (‘implicit’ behaviour). The similarity is so close that although Raiola does not say so, the assumption can be made that training is equated with rote-learning, whereas education is conceptual understanding based on experience.

Raiola’s (un)conscous (in)competent model of outdoor-leadership development has intuitive appeal. Outdoor-adventure instructors can be regularly overheard using the terminology generated by this model to discuss stages of development reached by their students. However, to the author’s knowledge, the model has not been tested, and therefore its explanatory power must remain hypothetical. The main significance of Raiola’s model to this study is its thesis that expert leaders can operate in familiar environments in ways that appear ‘intuitive’ to an onlooker. Also relevant is its proposal that experienced-based, automatic responses to complex situations involve decision making that

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Figure 2-7 The outdoor leadership development cycle, Edward Raiola, 1990. In J. C. Miles & S. Priest (Eds.), Adventure education (p. 237). State College, PA: Venture Publishing.

is of a qualitatively different type to that of methodical, rational-choice strategies.

Nonetheless, the outdoor-leadership development cycle model incorporates ideas that definitely require investigation before acceptance of their validity is assured. One of these claims is that expert decision makers must return to a state of 'unconscious incompetence' when confronted by an altered situation. What needs to be specified is the amount of change between situations before an expert loses their ability to rely on tacit knowledge and must resort to procedures for action. To be subject to this possibility every time an evolving situation changed character would severely compromise a reliance on 'intuitive' decision strategies. Such a conclusion is not supported by observations of expert decision makers when confronted by changing circumstances (see Klein, 1989, 1998). In such situations, experts usually still operate too efficiently (and
successfully) to account for the use of decision strategies directed by rule-based decrees or by comparisons between alternative courses of action.

Accounts of how experts may be able to use their competence to maintain an ‘intuitive’ style of decision making that is moderated, but not overwhelmed, by conscious awareness are given in the next two models.

**Dreyfus and Dreyfus’ Model of skill acquisition**

Independent of Raiola, Hubert and Stuart Dreyfus (1986, 1996) also propose a model of the development of expertise. Their model of skill development describes how initial reasoned responses become largely replaced by intuitively evoked behaviours as individuals progress from naïve to expert practitioners. The result of this transition is a qualitative shift in mental strategizing away from rigid adherence to rules of behaviour and towards reflexive situational discriminations and associated responses. The culmination of this process is the interaction of theory and practice in the form of intuitive deliberation. A representation of Dreyfus’ model appears in Figure 2-8.

The starting point for this model is the hypothesis that skilled behaviour in complex domains is developed through a mutually-supportive combination of theory and practice (Dreyfus & Dreyfus, 1996, p. 29). Although at face-value this statement appears unremarkable, for Dreyfus and Dreyfus its significance is that it promotes the role of trial-and-error practice to its rightful place alongside the role of theoretical knowledge. This is in contrast to what they regard as the prevailing rationalistic, scientific view that perceives subtle, refined theory as underpinning all technical acts, and that relegates experience to the role of mere refinement of theory (1996, p. 34). In fact, Dreyfus and Dreyfus consider it plausible to regard practice as more likely to produce skilled behaviour than theory alone (1996, p. 35). This, however, could only occur in simple activities. Expert behaviour in complex coping domains is dependent on acquiring and using both theoretical knowledge in the form of “articulatable scientific knowledge” and “rules of thumb” as well as practical knowledge (1996, p. 35).

Dreyfus and Dreyfus (1996, pp. 37-43) present a model of skill development that, for heuristic purposes, is described as a five-stage continuum of competence. The stages involve a gradual shift from initial self-conscious awareness of significant cues and potential responses to intuitively-evoked goals, plans, and strategies. The initial stages of “novice” and “advanced beginner” are characterised by a reliance on rules, priorities, and codes of conduct presented to the learner under the guidance and tutelage of a more experienced practitioner. The early learning stages are also characterised by a gradual increase in ability to recognise situational elements that acquire their meaning through the context in which they are found. The “advanced beginner” learns to apply the rules for action to these meaningful events.

With accumulated experience and with increased level of challenge comes the
The dotted line represents the "path" taken by learners as they progress through the stages of (1) using rules that were given to them, (2) combining situational cues with rules, (3) devising their own hierarchy of rules, (4) relying on their experience-based intuition to supplement rules, and (5) use of context-based, intuitive understanding plus theoretical awareness to determine a course of action.


Discomfting realisation that rules alone are a deficient means of guiding behaviour due to the vast array of meaningful situational features that are now recognised to exist. In order to continue developing, the "competent" learner-performer must agree to accept the risk and responsibility inherent in devising a course of action that has no guarantee of delivering the desired outcome. This course of action involves replacing rigid adherence to a detached, rule-following stance with goal-directed, emotionally-contingent rule-based decisions. It is at this point in the process, for the first time, that outcomes are attributed to one’s own decisions and actions. Emotional responses to successful outcomes are
deeply satisfying, whereas disasters are emotionally painful. Either way, they are memorable, and offer opportunities for reflection at a later stage.

Progress from a level of "competence" to that of "proficiency" comes to those performers who repeatedly commit themselves to the stressful process of determining their own hierarchy of rules for action under conditions of uncertainty. In this way they develop their skills of assessment of the situation for relevant cues and contextual feature. Eventually they attain a level of proficiency in situational assessment such that "the goal is simply obvious rather than the winner of a complex competition" (Dreyfus & Dreyfus, 1996, p. 41). No longer do they need to laboriously evaluate a situation according to analytical steps in order to determine what are the essential issues at stake. However, while the "proficient" practitioner is able to readily recognise relevant goals, they do not yet have enough experience to allow them to similarly recognise which option to select from among many in order to attain those goals. They still must rely on conscious determination in order to decide a course of action.

The final stage of the competence continuum is that of expertise. The focus of the decision maker is on understanding the situation and judging its familiarity. Using experience-based knowledge, similar situations are mentally distinguished according to the course of action required. The expert's response, driven by a highly refined ability to discriminate between situational components, is almost instantaneous. Such expert behaviours that appear to occur without contemplation or hesitation are characteristically referred to as 'intuitive':

"In short, the expert not only sees what needs to be achieved, but also how to achieve it. When things are proceeding normally, experts don't solve problems and don't make decisions; they simply do what experience has shown normally works, and it normally works" (Dreyfus & Dreyfus, 1996, p. 42).

However, this is not yet the end stage of the model. Hubert Dreyfus (1997) considers that experts (but not those of lesser ability) shift between experience-based, intuitive decision making and rule-based, rational-analytic decision making depending on the demands of the situation. Dreyfus cites Heidegger's (1962) three-tiered typology of problem situations as a framework for analysis. Heidegger's three problem situations of "ready-to-hand", "present-at-hand", and "unready-to-hand" are outlined below.

"Ready-to-hand" situations are those about which the decision maker has intimate understanding and familiarity. Responses to these are entirely intuitive and reflexive. Notwithstanding the immediacy and apparent ease of the response, the "ready-to-hand" situation may be subtle and complex in nature. What allows the response of the decision maker to be routine is her or his extensive experience-based expertise.
In contrast, "present-at-hand" situations are characterised by context-free features and formal rules. According to Dreyfus (1997, p. 27), "The things in a person’s world approach in present-at-hand situations are so unfamiliar that no experience is relevant". In such circumstances, decisions require detached, logical analysis afforded by classical decision theory.

In between lie the vast majority of problem situations that confront the expert, titled "unready-to-hand". Perhaps a situation is only partially familiar, or else the stakes are especially high. In such circumstances, "the best of experts, when time permits, think before they act" (Dreyfus & Dreyfus, 1996, p. 42). Whereas the unskilled performer resorts to rules and procedures for choosing goals and possible actions, the expert reflects directly on the goal that seems intuitively evident and the responses that seem intuitively appropriate in order to check and refine both in accordance with the current context. The length of the reflection process is subject to time constraints of the particular situation. Reflection is a subtle process of verification that, while purposeful, is driven by an abstract understanding of the relationship between the present context and previous circumstances (Dreyfus & Dreyfus, 1996, p. 43).

The term used by Dreyfus and Dreyfus for "unready-to-hand" reflective responses as used by experts is "deliberative rationality" (1996, p. 43). Dreyfus and Dreyfus emphasise that strategies of deliberative rationality that utilise intuitive understanding are distinct from the purely theory-based calculations and inferences used by performers of sub-expert ability. They describe deliberative rationality as "detached, reasoned observation of one’s intuitive, practice-based behaviour", and liken it to meditative reflection designed to challenge and supplement (but not replace) solely practice-based behaviour (1996, p. 44). Deliberative rationality thereby forms a way of thinking that "stands at the intersection of theory and practice" (1996, p. 44).

The Dreyfus and Dreyfus (1986) model of skill acquisition offers a conceptual foundation for the use of both recognitional and mental-simulation strategies as described by RPD. Experts are capable of ongoing, non-reflective behaviour ("ready-to-hand" responses), as well as intuitive behaviour mediated by reflective deliberation ("unready-to-hand" responses). Dreyfus & Dreyfus' skill acquisition model presents a more integrated version of the role of rule-based and experience-based behaviour in the development of expertise than does Raiola’s model of the leadership development cycle. Dreyfus and Dreyfus reject the relationship described by Priest and Gass (1997) between rational analysis and experience. In P&GDT, experience is regarded as a belated fine-tuning mechanism for ensuring that procedures, principles, and rules are appropriate. For Dreyfus and Dreyfus, experience-based intuition and practice operate in tandem with theoretical rationality in order to fashion understanding about complex situations. At the most basic level, awareness rests on a background of intuitive practice since rules and principles ultimately rely on the use of knowledge that is indefinable by theory but recognised in action.
Support for the Dreyfus and Dreyfus (1986, 1996) skill-acquisition model comes from two sources. First, NDM-based research comparing the use of preferred decision strategies by experts and non-experts has demonstrated an association between intuitive-based recognitional strategies and level of expertise. Caldenwood, Crandall, and Baynes (1988) found that experts are more likely to engage in situation assessment than novices, with novices more likely to engage in option evaluation. Klein's (1989) analysis of non-routine command decisions made by expert and novice Fireground Commanders revealed a higher proportion of recognitional decisions being made by the expert subjects (58%) than by novice subjects (46%), with novices more inclined to engage in systematic comparison of options. Endsley (1995) reported that experts differ from novices in that they spend more time searching for information, search for larger amount of information, and are more able to make fine discriminations between critical cues. Lipshitz and Shaul (1997) compared expert and novice Israel Defence Force gunboat commanders. Their conclusions were that experts collected more information before committing to a decision, engaged in more efficient information search, diagnosed the situation more accurately, made fewer bad decisions, and communicated more frequently and elaborately with key personnel. Di Bello (cited in Klein, 1998, p. 287) claimed to be able to distinguish between experts and those who were merely competent by observing that only experts were able to provide viable solutions at times when routine situations were punctuated by rule violations.

The second source of support for the Dreyfus' model comes from investigations of clinical judgement in nursing practice. Over the last fifteen years studies in this domain have pointed to the significance of experientially-derived intuitive understanding in the care and interpretation of a patient's physio-psycho condition (refer to Benner, 1984; and Benner, Tanner & Chesla, 1996 for key publications). Further research into the validity and the generalisability of the Dreyfus and Dreyfus skill acquisition model with regard to other domains is still needed in order to consolidate understanding of its usefulness.

**IMPLICATIONS OF THEORY FOR THIS STUDY**

This chapter has outlined key perspectives in decision making and the development of expertise, with special reference to models that apply to the outdoor-adventure setting. Subsequent chapters will discuss decision making from the contexts of the domains of mountaineering and kayaking. The nature of research is such that what is examined is largely contingent upon the theories and methods that underpin the process of investigation (Ackroyd & Hughes, 1995). In this study, the research perspective of NDM has played a significant role in directing investigation of how mountaineers and kayakers make decisions.

Research directed by NDM principles emphasises the way that decisions are embedded in larger, ongoing activities (Orasanu & Connolly, 1993). Individual decisions are not an end-point, but a step on the way to achieving a larger goal.

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The NDM perspective holds that there is an integrated, seamless process involved in carrying out the dual tasks of figuring out what constitutes a problem, and determining a problem solution that remains in keeping with the overarching goal/s. The decision maker's interpretation of problem situations and solutions is influenced by her or his understanding of the current environmental and socio-cultural context. The decision maker's knowledge and experience relevant to the task are a critical factor in influencing how he or she goes about making decisions.

Consideration of these features influenced the focus of this study, and helped to shape research aims and methods. The realistic settings for decision-making research favoured by NDM (see Orasanu and Connolly, 1993) were a further issue for consideration in research design. Four aspects of this study stand out as having been guided by the attempt to explore the NDM perspective of decision making. These aspects are detailed below:

1. It was felt important to consider decision making by mountaineers and kayakers as an active and on-going process. This consideration included holding a perception of decision making as situated amidst social, organisational and sub-cultural norms and procedures that affect one's interpretation of the decision-making process.

2. It was considered necessary to investigate the decision-making behaviour of expert mountaineers and kayakers. NDM researchers are united in their belief that experienced performers do not prefer to use traditional decision-making strategies in most real-world settings (Zsambok, 1997a). Less clear is the NDM perspective on preferred strategies used by naive decision makers.

3. It was assumed that experienced and skilled mountaineers and kayakers are capable and competent decision makers. This premise is contrary to alternative conceptions constructed on the basis of traditional decision theory. Such conceptions regard humans as flawed and irrational decision makers, and propose the use of rational decision aids to correct the fallibility of human decision making (see Kahneman, Slovic, & Tversky, 1982).

4. In keeping with the NDM perspective, this study concentrated research interest in description of how mountaineers and kayakers actually make decisions, as opposed to how they ought to make them.

CHAPTER SUMMARY
Models of decision making may be categorised as either ‘classical’ or ‘intuitive’ according to adherence to distinctive theoretical and methodological principles. The distinguishing feature of models within the classical approach is the design and application of analytical rules and procedures used to determine rational
solutions to problems. In contrast, the research interest of the ‘intuitive’ approach is the holistic cognitive process used by people when assessing situations and inventing solutions. Naturalistic decision making (NDM) is one of the perspectives that forms the intuitive approach. NDM emphasises the decision features of situation assessment, intuitive recognition of typical courses of action, and mental simulation of courses of action in unfamiliar circumstance. Other perspectives view poor decisions as arising out of faulty reasoning, whereas NDM researchers point to a lack of experience.

Three models of decision making that have application to outdoor adventure settings were presented for discussion in this chapter. Klein's (1998) integrated RPD model conforms to the NDM approach. RPD describes how experienced people use intuitive cognitive processes of recognition, situational diagnosis, and mental simulation of a likely course of action when making decisions. RPD claims to offer particular application to the study of expert decision makers who are undertaking dynamic activities that are skill-based and that involve decisions made under stressful conditions that have meaningful consequences. The Priest and Gass (1997) P&GDM decision-making model describes decision making in terms of a rational-analytic process that is moderated by the application of experienced-based judgement. The P&GDM model is intended as an educational tool for outdoor leaders of all abilities. Boyes' (1999) outdoor decision-making model provides an explanatory framework for the making of decisions by outdoor leaders. OADM describes decisions made by outdoor leaders as the outcome of the three interacting components of situational awareness, situational assessment, and resource management. The task of the outdoor leader is to assess, evaluate, and manage (by making and carrying out decisions) the various factors that determine the levels of risk and competence in order to optimise the overall level of challenge. OADM considers that both RPD and P&GDM may be utilised in the decision-making process depending on the pressures of time-stress.

Of these three decision models, P&GDT and RPD offer opposing conceptualisations of the decision-making process, with OADM aligned with the NDM-based perspective but allowing for the possibility of rational-analytical procedures when time-pressures are relaxed. The rigorous analytical process described by P&GDT strategy allows the decision maker the satisfaction of knowing that decisions are based on a thorough process of collection and examination of evidence. Also, such decisions are capable of being justified to others since there is an easily identifiable process of decision making. Klein (1993, p. 19) argues that such decision strategies are not practical for many real-world tasks since people tend to use simpler strategies when faced with contingencies such as time-pressure and uncertainty. Furthermore, comparative strategies may confuse rationality with accuracy, since the neglect of contextual features that are hard to specify and analyse can lead to distorted conclusions (Klein, 1993, p. 55).

Klein's criticism leaves open the question of how naïve decision makers make decisions. The decision maker who has only limited experience and knowledge
presumably is an ineffective user of RPD strategies that require a repertoire of experience on which to base recognitional and mental-simulation techniques. In this chapter, two models of skill acquisition were presented that propose the use of qualitatively different styles of decision making by non-experts and experts. Raiola's (1990) (un)consciously (in)competent model and Dreyfus and Dreyfus' (1986, 1996) skill acquisition model provide a hypothetical description of a learner moving through a continuum of dependence on pre-established procedures for action, to an ability to consciously appraise a situation and reorder the procedures to the occasion, to a final expert stage characterised by reflexive action in response to environmental cues. Dreyfus' model includes the proposal that experts use deliberative reasoning to supplement intuitive, practise-based behaviour when confronted with unfamiliar or especially significant situations.

A conclusion suggested by the skill acquisition models is that naïve decision makers both need and prefer to use rational analytical procedures, while expert decision makers tend toward intuitive, experience-based processes that are moderated by theoretical understanding. If this is correct, an implication for trainers of outdoor-adventure leadership is that methods and models used for teaching decision-making should be designed to accommodate the level of expertise of students. There exists a body of field-based evidence that supports the thesis that naïve decision makers do not regularly use the cognitive procedures preferred by experts for making decisions, or else are not capable of using them effectively.

An alternative interpretation is that the skill developmental models may be wrong in their assumption that individuals alter their decision strategies as expertise is gained. Instead, perhaps all people prefer to use intuitive strategies akin to the recognitional strategies proposed by RPD regardless of their level of expertise in a particular domain. If so, this provides a different set of implications for the manner in which decision making should be taught to students by outdoor-adventure trainers. Detailed exploration of these specific issues is too great a task to include within the exploratory objectives of the current study, but their relevance to the study of decision making does mean that they help shape research questions and interpretation of data.
CHAPTER THREE

DEVELOPING LEADERSHIP SKILLS IN MOUNTAINEERS AND KAYAKERS

CHAPTER OUTLINE

This chapter outlines the common ways used to develop leadership skills, including those of decision making, in the activities of mountaineering and kayaking in New Zealand. The chapter begins with a description of peer and professional participation in mountaineering and kayaking. A summary of trends in the education of the technical and leadership skills of mountaineering and kayaking in New Zealand follows.

MOUNTAINEERS AND KAYAKERS

Mountaineering in New Zealand

The term ‘mountaineering’ generally is reserved for the ascent of mountains that have alpine characteristics as well as being features of high elevation. Most New Zealand mountaineering is restricted to three alpine locations: Aoraki/Mt Cook National Park, Westland National Park, and Mt Aspiring National Park.

Decision making is a critical feature of mountaineering. The task of climbing mountains requires circumventing hazards that are varied, numerous, and occasionally extreme. In general, the level of danger is a function of the interplay between the environmental hazards, the characteristics of the equipment being used by the mountaineer, and the skills, knowledge, and personal attributes of the mountaineer. The most obvious hazards are environmental. They include steep slopes, serac collapses\(^1\), avalanches, rock fall, unseen crevasses, extreme winds, wet and cold weather, and even the extremely hot conditions that occasionally prevail in New Zealand alpine regions. Equipment can moderate the effects of the environmental hazards. Alternatively, incorrect or inappropriate use of equipment can greatly exacerbate the danger. Basic climbing equipment includes boots, ice-axe, crampons, and a rope. Steeper climbs call for more equipment in order to provide greater security in the event of a fall. Snow, ice, and rock climbs each require specialised equipment in order to obtain points of purchase for use as 'fixed' or 'running' belays. Selecting the appropriate piece of technical equipment from among many, and learning where and when to use it, is just as important in mountaineering as learning how to use it.

While the range of environmental hazards and equipment that is used to manage the hazards is great, the variable that has greatest significance is that of the human

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\(^1\)Seracs' are towers of ice that form at the cliff-face of a glacier as it plunges over a steep drop.
element. The technical competence and general knowledge of mountaineers are critical factors in determining whether or not hazards are recognised and equipment is used appropriately. Equally crucial are the skills of leadership. The ability of individuals to take effective decisions on behalf of others, and to influence others to carry out courses of action that result from those decisions, can be the vital factor that differentiates success from disaster.

Amateur mountaineers make decisions that are subsumed beneath the two overarching and occasionally competing goals of making efficient ascents of mountains and maintaining personal safety. Mountaineers rate the difficulty of mountain climbs according to a numeric scale that encapsulates the dimensions of technical difficulty and commitment. In mountaineering guidebooks a verbal description of each climb generally supplements the grade, and often elaborates on relevant information such as objective dangers or remoteness of the climb. The grade of a climb serves as a source of information about not only the climb itself, but also the ability of the climbers who wish to ascend that climb. Prestige is granted to those mountaineers who make efficient ascents of highly graded climbs. The desire to establish a reputation of being a ‘good’ mountaineer (i.e., one who makes difficult ascents) complements the feelings of intrinsic satisfaction gained from achievement (Csikszentmihalyi, 1975; Iso-Hola, 1989). Both extrinsic and intrinsic motivational factors influence the decisions made by climbers during ascents of mountains.

While the ascent of difficult new routes remains the benchmark for determining who are the elite amongst amateur mountaineers, mountain guides recognise a separate set of criteria for defining the quality of guided ascents. The main goal of mountain guides is the efficient ascent of established climbs in a manner that is enjoyable for their relatively untutored clients. Whereas it is common for amateur party members to apportion responsibility for leadership of the climb according to individual skills and attributes, mountain guides make all the important decisions for their clients and physically lead all sections of the climb. Mountain guides employ many different climbing techniques to those used by amateur climbers. Some of the techniques used by guides to safeguard their clients have a small threshold of safety. The effectiveness of these techniques relies on the judgement of mountain guides to match them to the appropriate situation.

**Kayaking in New Zealand**

In this study, the term ‘kayaking’ refers to the descent of river rapids in boats known as kayaks. The distinguishing design features of kayaks are that they are decked boats propelled from a sitting position by the use of double-bladed paddles. The paddler of a kayak wears a tightly-fitting cockpit shield to permit the kayak to be righted without taking on water after a capsize.

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2 See Logan (1987) for an example of a New Zealand guide book of mountain climbs.
3 Objective danger refers to hazards that cannot be directly managed; e.g., the calving of seracs from ice-cliffs cannot be predicted, nor prevented from occurring.
Decision making in kayaking centres around the very real prospect of drowning in the event of a boat pin, strainer accident, limb entrapment, or failure to remain in one's boat after capsize. Hazards that increase the possibility of accidents and drowning include hydraulics, undercut rocks, and tree or rock sieves\(^4\). Water volume, water velocity, and waterfalls are other factors that are associated with danger, since they increase the level of difficulty of kayaking. Preventative teamwork is common amongst kayakers to minimise the consequences of a 'swim' in the event of failure to recover from capsize. Physical trauma that may be experienced by kayakers (other than cuts, abrasions, and bruises) include dislocated shoulders, compressed spine, and head injuries (Bechdel & Ray, 1999).

Decisions made by kayakers vary according to the style of kayaking that is undertaken, and the type of kayak used. Short, low volume kayaks are preferred for surfing and acrobatic manoeuvres. The performance by paddlers of acrobatic kayaking manoeuvres (known as 'rodeo'), apart from being an end in itself, is used by kayakers as an effective way to become familiar with reacting to unintentional tail-stands, cartwheels, or being re-circulated by a hydraulic. Larger volume boats that have more flotation are preferred for 'big-water' situations characterised by aerated water, crashing waves, re-circulating hydraulics, and tight channels between rocks.

Kayak slalom involves paddling a short section of whitewater while negotiating a series of 'gates' suspended above the river. The intention of kayak slalom is to simulate paddling a sustained and varied set of rapids that requires the paddler to employ a range of paddle strokes and body contortions in order to control the boat positioning. Slalom boats are distinctly low-decked, long, and relatively fragile. While kayak slalom is beneficial in increasing the skills of whitewater kayakers, it is a competitive sport in its own right.

The difficulty of paddling a river is a function of technical difficulty and danger. Every known paddle-able river is positioned on a scale from class 1 to class 6. Information about rivers (including location, access to put-in and take-out, length of river section, scale of difficulty, special features) is shared publicly via guidebooks\(^5\). Similar to the mountaineering community, kayakers confer prestige on those who are accomplished performers at the higher levels of difficulty. This, plus satisfaction in personal achievement, provides an incentive for individual kayakers to paddle rapids that require expert decision-making skills and physical competence.

Unlike mountaineering, the dynamic nature of kayaking does not lend itself to kayak guiding. It is not possible for one kayaker to guarantee the security of other

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\(^4\) In a boat pin, the kayaker is 'pinned' to rocks by the water flow; 'strainers' are submerged tree branches or boulder fields that act as sieves, trapping paddlers underwater.

\(^5\) See Charles (1999) for the most comprehensive current kayaking guide to New Zealand white-water.
kayakers in moving water. The assistance that an expert kayaker can give to another kayaker in a river scenario is restricted to that of advice, role modelling, and, if the seriousness of the situation allows, rescue in the event of un-recovered capsize. Consequently, it is crucial that kayak party leaders are able to recognise hazards, and match the level of danger (both 'real' and 'perceived') to the abilities of the party members before encountering the hazards. It is also crucial that the leader can make effective decisions on the basis of an assessment of the situation, and is able to direct the party members to carry out courses of action that she or he has determined are necessary.

Acquiring mountain leadership skills – past and present

A distinction can be drawn between traditional and contemporary ways of developing skills in mountaineering in New Zealand. The distinction extends beyond the skills of technical competence into the more complex skills of leadership. The traditional pathway to competence values long practice, genuine experience, and personal responsibility. Methods for developing technical and leadership skills are, traditionally, characterised by the acquisition of extensive experience gained through undertaking progressively more serious mountain climbs under the paternalistic, albeit 'arm's length', guidance of experienced mountaineering practitioners. More recently, there has developed an approach that favours abbreviated periods of intensive tuition in specialist areas of mountaineering taught by professional mountain instructors. The contemporary conception of the pathway to mountain leadership emphasises the ability to learn technical knowledge and skill through exposure to sequenced teaching progressions and contrived teaching environments. The intention of these educational strategies is to shorten the period of learning, and to augment – and even replace – genuine experience.

The first generation of New Zealand mountain guides began their careers as self-taught amateurs (Harper, 1946; Wilson, 1968). However, early chief guides Jack Clarke and Peter Graham quickly instituted a training regime for future mountain guides. The design of the training scheme suggests that it was directed by a belief in the ability to develop expertise in mountain guiding techniques and leadership/decision-making skills through extended engagement in 'hands-on' activity rather than through pedagogical methods of instruction. Wilson (1968, p. 154) describes mountain guides’ training in the early era as comprising a gradual and graded approach that was intended to establish a foundation in guiding techniques. Trainee mountain guides were required to undergo a preliminary period of many seasons of basic work such as hut stocking and glacier walks (Mahoney, 1982, p. 23, p. 39; Wilson, 1968, p. 156). Following this, trainees graduated to the role of 'second' guide, enabling them to observe an expert

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6 The tradition of learning from an expert mountain guide began early in New Zealand, with Jack Clarke, later to become New Zealand's first chief guide, working as second guide for the famous Swiss mountain guide Mattias Zurbrüggen during the latter's first visit to New Zealand in 1895 (Wilson, 1982, p. 103).
mountain guide at work (Mahoney, 1982, p. 64; Wilson, 1968, p. 156). After a lengthy period as an apprentice on serious mountain ascents, the chief guide then determined whether the trainee was ready for the role of party leader. Wilson (1982, p. 156) maintains that only certain individuals were recognised by the reigning chief guide as possessing the necessary attributes that singled them out as able to assume the responsibility of being the leader of a party on serious climbs. The discerning attitudes of the chief guides suggests that leadership was not believed by them to be a skill that was able to be taught and learnt in entirety – at least, not by the training scheme then in use.

Most ascents of high New Zealand mountains in the early decades of the twentieth century were achieved by parties that were led by professional mountain guides (Johnston & Pawson, 1994, p. 182). Parties made up of and led by New Zealand amateur mountaineers were not common until the late 1930’s (Logan, 1987). The prevailing belief was that safe practice was dependent on the amount of experience in genuine mountaineering activities that was possessed by an individual, and the party leader in particular (Johnston & Pawson, 1994, pp. 181-183). The logistical and financial constraints of the early era of mountaineering meant that mountain guides who lived literally at the foot of the mountains were more likely to attain the pre-requisite experience than amateur mountaineers who could afford to allocate only small amounts of time and money to their climbing.

Amateur climbers were almost always members of mountain or tramping clubs. The New Zealand Alpine Club (NZAC) and the Canterbury Mountaineering Club (CMC) have long been the two dominant mountaineering clubs in New Zealand. Both clubs provided a reservoir of written and oral information regarding mountain lore7, as well as offering the advantage of easy access to like-minded individuals. In this way, club membership facilitated the process of learning the skills of mountaineering and of forming climbing partnerships. Johnston and Pawson (1994) describe how sub-cultural and societal beliefs in the value of an extended apprenticeship in learning mountain skills acted as a conforming and moderating influence on the behaviour of individual club members.

Operating in tandem with the mountain clubs was the Federated Mountain Clubs (FMC), and the more recently formed New Zealand Mountain Safety Council (NZMSC). The latter is a government-funded body that was established on the initiative of the FMC in 1966 (Burrell, 1983, p. 60). Over the last thirty years, NZMSC has built up an extensive network of regional club-like organisations known as ‘sections’. By 2000, the NZMSC had become an extensive organisation with 30 branches, 1,300 volunteer instructors, 15 member organisations, and a paid staff of nine (NZMSC, www). NZMSC has taken over the education of mountain safety practices that were the former raison d’être of the FMC. NZMSC has also established training, qualification, and instructor-certification schemes in

7 See NZAC’s annual journal (New Zealand Alpine Journal), and CMC’s journal (Canterbury Mountaineer).

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the domains of mountaineering and ‘avalanche awareness’, as well as tramping and First Aid.

The development of training and certification courses in mountain-related activities by NZMSC complemented the running of mountaineering instruction courses by NZAC and CMC. Since the early 1980’s, NZAC and CMC have regularly hired professional mountain guides to teach club instruction courses. Prior to this development, the clubs had organised occasional instruction courses for members. The origin of the club instruction courses was that of early ‘training camps’. The training camps were orientated towards peer climbing in the company of more experienced mountaineers (Harper, 1946, p. 179). The legacy of the training camps lived on in subsequent attempts to shift the emphasis of club training trips towards instruction. The club members who provided the instruction gained their positions of authority on the basis of self-selection and enthusiasm, rather than on technical or leadership ability. The safety management of the instruction courses was consequently “very loose” and “free-wheeling” (Entwisle, pers. comm., 2000). The more competent amateur club members preferred to climb with each other, with novices being left to the care of lesser-skilled enthusiasts (Cullen, pers. comm., 2000). The introduction of professional mountain guides as instructors was a deliberate attempt to shift the focus of club training away from peer-controlled, ad hoc systems of learning, and towards that of concentrated tuition in technical knowledge. It was also a reaction to what was seen to be an unsafe culture of group management (Cullen, pers. comm., 2000). It was hoped that the leadership skills of mountain guides would impose professional standards of safety and tuition on the training process.

The use of mountain guides as club instructors followed a renaissance in the fortunes of mountain guiding in New Zealand. The numbers of professional mountaineers had declined significantly during the late 1950’s and throughout the 1960’s. The few individuals who operated as mountain guides alternated between bouts of amateur climbing and professional climbing, as well as conventional employment. This behaviour resembled the climbing habits of the original generation of New Zealand mountaineers. Subsequent increased demand for the services of mountain guides, combined with a growing awareness of international professional standards in outdoor instruction, stimulated the New Zealand Mountain Guides Association (NZMGA) to become affiliated with the International Union of Mountain Guides Associations (UIAGM) in 1981 (Monteath, 1983). Acceptance into the UIAGM was dependent on the development of a New Zealand mountain guides’ training and certification scheme that was markedly different from the traditional scheme. Instead of a reliance on long experience followed by subjective assessment of ability by the chief guide, aspiring mountain guides were now required to demonstrate satisfactory performance during a battery of formal assessment courses. Today, to become an internationally qualified mountain guide

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8 See Vervoorn (1981) for an account of the peripatetic lifestyle of skilled mountaineers of the 1960’s and 1970’s era.
9 The NZMGA was established in 1974.
via the NZMGA training pathway requires successful completion of a minimum of eight domain-specific training and assessment courses during the period of apprenticeship\(^\text{10}\).

The trend in mountain leadership training schemes towards short, intensive periods of preparation that are based on pedagogical principles of instruction and formal assessment did not occur in isolation. The rapid development of a broader outdoor-adventure leadership training industry raised issues of professionalism and accountability. In order to accommodate these concerns, instructor-training courses were instituted that addressed issues of safety and quality in leadership practice. One outcome of the demand for competent outdoor instructors was the establishment of the New Zealand Outdoor Instructors Organisation (NZOIA) in 1986. NZOIA administers an award scheme for bush, alpine, kayaking, sea kayaking, abseiling, rock climbing, canoeing, caving, and sailing activities\(^\text{11}\). The NZOIA alpine award is a two-tiered mountain instructors’ qualification that is limited to non-glaciated alpine terrain. NZOIA qualifications, along with NZMSC alpine qualifications, are generally recognised as being the minimum level 'industry standard' qualification necessary for employment as an instructor in the burgeoning outdoor-adventure training industry (Cory-Wright, 2000).

Alongside the establishment of independent professional bodies and assessment schemes was the associated proliferation in the 1990’s of tertiary education courses in outdoor adventure and leadership. By 2000, a total of twelve polytechnics/institutes of technology offered 52 outdoor adventure programmes\(^\text{12}\). The programmes ranged in length from one semester to three years. Qualifications offered included certificates of attendance, certificates, and diplomas\(^\text{13}\). Universities such as Lincoln University and Otago University also offered degrees and post graduate qualifications in outdoor leadership.

Amongst the many courses offered by tertiary institutions are training courses in mountain leadership. The style of mountain leadership education that has been adopted by the tertiary educational institutions conforms to pre-established curriculum structures. Some concessions in design of courses have been made in order to account for the practical nature of mountaineering activities, but the end result is a relatively unified training scheme that is markedly dissimilar to traditional conceptions of mountain training.

Both theoretical and practical instruction is delivered in accordance with structured and sequenced course units\(^\text{14}\) that enable the use of formal teaching and assessment techniques. Successful completion of individual course units is a requirement for graduation to more advanced studies. Practical instruction is often

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\(^\text{10}\) Information gained from NZMGA web site: www.nzpga.co.nz/
\(^\text{11}\) Information gained from NZOIA web site: www.nzoia.org.nz/
\(^\text{12}\) Information collected from a search of sites of tertiary educational institutions on the www.
\(^\text{13}\) Christchurch-CantecPolytechnic is about to launch a degree in outdoor leadership in July, 2001.
\(^\text{14}\) Many polytechnics use New Zealand Qualification Authority units to structure the teaching and assessment of outdoor leadership programmes. Some polytechnics devise their own.
scheduled around standard working hours, or the standard working week. Skills and knowledge are often learnt in isolation from genuine mountaineering situations. The performance of skills and application of knowledge are represented as having a recognisable minimum acceptable level. Individual polytechnics have instituted different methods for facilitating the gaining of personal experience by students (Wheeler, pers. comm., 2000; Logie, pers. comm., 2000.). Nevertheless, most emphasis is invariably placed on learning that occurs during programmed sessions of instruction delivered by paid experts, rather than on learning gained through watching an expert ‘in the field’, or through trial-and-error personal experience.

The impression given by the contemporary approach towards training to be a mountain leader is that leadership skills are best learnt by attending formal instruction courses. During these courses, trainee mountain leaders are advised to apply procedures and rules that substitute for their lack of experience in managing clients in mountain environments. Courses delivered by Polytechnics and Institutes of Technology are structured as if an individual with no mountain experience whatsoever can enrol, complete two or three years of structured tuition, complement this tuition with a minimal level of personal experience, and graduate as an outdoor leader.

Employers generally require further evidence of competence. Qualifications such as NZMSC alpine leader, NZOIA alpine instructor, or NZMGA mountain guide offer evidence not only that the holder of these awards has demonstrated competence during standardised assessment situations, but also that he or she has achieved a minimum number of days of work experience. In this sense, they combine the contemporary vision of mountain leadership training with a key element of the traditional conception of long-term apprenticeship training.

Qualifications vary in the length of experience that is required of candidates. An individual who is licensed under the NZMSC and NZOIA awards as an alpine instructor (level 1) may have attained only the minimum pre-requisite of 20 days of personal experience in alpine environments. This does not constitute a significant body of experience for an individual who is acting as a leader of others in mountain environments. The NZMGA training scheme is the award that has most affinity with the traditional version of mountain leadership training. In order to enter the mountain guides’ training scheme, an individual must demonstrate proof of three seasons of mountaineering involving “serious alpine undertakings” (NZMGA, www.nzmga.co.nz/). Once accepted into the scheme, the trainee guide must complete a total of 140 days of work as a mountain guide under the supervision of a qualified mountain guide before being eligible to apply as a candidate on her or his final assessment course.

In this way, trainee mountain guides are subjected to a lengthy period of apprenticeship. The mandatory supervision that occurs during this time means that trainees have the opportunity to observe and learn from more experienced

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15 Information gained from NZMGA web site: www.nzmga.co.nz/
mountain guides. The extended trainee:mentor relationship allows the trainee mountain guide to acquire a foundation of experience on which to base future decisions, rather than relying on rules to shape the decision-making process.

Acquiring kayaker leadership skills – past and present

The history of the evolution of conceptions of the best way to becoming a competent kayak leader is an abbreviated version of the mountaineering example. Kayak clubs were once the mainstay of kayaking participation, and played a significant role in the training individuals in the skills of kayak technique and kayak party-leadership. Club trips to a variety of whitewater locations were held regularly on weekends, and cohort groups would decide what was the appropriate venue commensurate with their abilities. Slalom events – typically requiring a large number of helpers – were organised according to a calendar in combination with other clubs so as to allow a programme of racing to be conducted. Keen slalom paddlers teamed together for practise sessions during week-nights.

In the last decade, the significance of kayak clubs has declined (Charles, pers. comm, 1999). Today, polytechnic outdoor-adventure courses and private commercial courses provide a popular alternative to clubs for the learning of kayak skills, as well as in the skills of instruction and leadership of others in kayak-related activities. The peer-based learning structure of clubs has been largely replaced by the formal training methods of professional instruction courses. NZQA units and NZOIA awards, used individually or in tandem, are regularly used in polytechnic courses to structure training and assessment in kayak technical and leadership skills. Instruction courses run by commercial operators rarely assess students in a formal way, but the organisation of instruction is generally even more intensive and systematised than that of polytechnic kayak courses.

The amalgamation of New Zealand Canoe Association and NZOIA kayak awards that was undertaken during the mid-to-late 1990’s consolidated the position of the NZOIA awards as the pre-eminent kayak instructors’ award in New Zealand. The current NZOIA kayaking award is a tiered scheme of three levels of assessment: ‘flat water’ instructor, kayak 1 instructor (moving water), and kayak 2 instructor (moving water). As with all NZOIA qualifications, candidates must attain minimum experience levels in personal as well as instructional skills before putting themselves forward for assessment. Compared to NZOIA alpine awards, NZOIA moving water awards are widely recognised as requiring more base-level skills and greater ability to manage students. The increased level of skill that is required in the area of group-management decision making is reflected in the greater number of ‘logged’ days in the role of teacher of students that candidates must undergo before presenting as a candidate for assessment. NZOIA alpine 1 candidates must have evidence of only ten days in the role of instructor. In contrast, NZOIA kayak 1 candidates must have evidence of 50 sessions in which he or she has acted in the

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16 Outdoor-adventure instructor assessments require that candidates provide evidence of pre-requisite experience in the form of a written record. This record is referred to as a 'log-book'.

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role of instructor of a kayaking group, plus 20 sessions of instruction of students in kayak ‘rolling’\(^{17}\).

The emphasis on a lengthy apprenticeship as trainee instructor is in keeping with the traditional conception of how kayak leaders should develop their skills. It also is aligned with current amateur kayaking practice in New Zealand. Despite the decline of kayaking clubs, groups of kayakers still band together and organise regular paddling trips. The polytechnic kayak courses have become de facto kayak clubs, with student cohorts paddling together in their personal time. Expert kayakers train year round, and congregate in summertime at locations renowned for difficult, adventurous paddling. Many of the expert paddlers include the same individuals who are the instructors and assessors employed by polytechnics, NZOIA, and commercial operators.

Overall, the historical process of the development of kayak leaders is very similar to the mountaineering context. Leaders of kayak trips are currently exposed to two different models of leadership development, with each model directed by a distinct philosophy. The traditional model emphasises long-term exposure to the activity of kayaking. Experience is gained through personal adventuring with peer kayakers, and also in association with more experienced performers. Leaders of kayak trips emerge through group consensus, or are elected or appointed by other group members. Personal attributes and situational context are important variables in determining the effectiveness of the leader. Today, kayakers continue to follow the precepts of the traditional approach during their personal kayaking recreation, and in preparation for assessment as instructors.

The former dominant profile of the traditional model of leadership development in kayaking has recently been largely subsumed beneath a new model that is orientated towards active training of kayak leaders. The contemporary model advocates undergoing a process of structured tuition and assessment. The training programme is typified by short-term instructional sessions followed by assessment of learning. Learning is presented in sequenced modules, and progress is acknowledged by the awarding of qualifications on completion of a pre-established number of learning modules. While lengthy ‘hands-on’ experience remains an integral component of the current training and assessment schemes, this traditional aspect of outdoor-adventure education tends to be easily overwhelmed by the intensity, formality, and emotional and financial costs involved in presenting for formal tuition and assessment.

**CHAPTER SUMMARY**

Mountaineering and kayaking are adventurous outdoor activities that require both physical skill and a body of knowledge for their effective performance.

\(^{17}\)‘Rolling’ refers to the basic self-rescue technique for kayakers. The paddle and body are used to turn the boat right-side-up after a capsize.
Mountaineering and kayaking occur in environments that are inherently dynamic as well as potentially hostile. Decisions and actions need to be taken in order to achieve goals and to avoid dangers. Failure to make appropriate decisions and actions may have severe consequences for mountaineers and kayakers. Decision making is an integral component of leadership. The role of leaders to make critical decisions on behalf of others makes the development of effective leaders a priority.

The development of leadership skills in the fields of mountaineering and kayaking in New Zealand has followed very similar paths. The evolution of those pathways can be categorised as forming two general types. The skills and knowledge associated with leadership and decision making in mountaineering and kayaking were traditionally acquired through loosely structured club-based programmes or professional training schemes. The rationale directing the traditional model was that of exposing the trainee to sufficient situations involving a variety of circumstances to enable the individual to have assembled a repertoire of responses for any future occasion. The abilities to inspire others and to make good decisions were regarded as founded on ineffable personal attributes that were not readily subject to alteration by training.

In the last decade, training in mountaineering and kayaking has become increasingly formalised. Training pathways now exist whereby a novice mountaineer or kayaker can enrol in a programme that eventually leads to professional standing as mountain guide or kayak instructor. The philosophy that underpins the contemporary model holds that the skills of leadership, including those of decision making, can be trained. Belief in the trainable nature of leadership skills resides in the principle that leadership is made up of a collection of procedures that can be learnt, rather than being comprised of indefinable personal qualities. Consequently, considerable emphasis is placed on methods of education for teaching the correct ways of applying the procedures. Training in leadership procedures, including those of decision making, is considered to be more effective if the delivery of instruction is refined in accordance with conventional pedagogical techniques.

The current relevance of the issues of accountability, professionalisation, and expediency of curriculum delivery are key factors that promote the use of qualification-orientated, short-duration training and assessment schemes for the education of skills in outdoor-adventure leadership. The consequent dominant profile that formal qualification schemes have in the current outdoor-adventure training field belies the co-existence of the traditional practice of developing leadership and decision making skills through extended, relatively unstructured experience. Whereas the profile of lengthy trade-based experience may now be relegated to an almost covert stature, the significance of this form of learning continues to be recognised by educators, employers, and practitioners.

The implications of the existence of co-existing but differing approaches to the development of leaders who are charged with making decisions for others in outdoor-adventure contexts is discussed in chapters seven and eight.
CHAPTER FOUR
METHODS

CHAPTER OUTLINE
This chapter describes the research methods used in this study. Research methods were selected with the aim of facilitating exploration of contextual features associated with decision making such as situation, time, personal factors, and historical circumstances. The intention was to develop an ideographic interpretation of what mountaineers and kayakers do when making decisions that reflected the complex interaction of variables involved in the decision process (cf. Lincoln & Guba, 1985).

STATEMENT OF THE PROBLEM
There is a need in outdoor-adventure for competent leaders (Boyes, 1999; Cory-Wright, 2000). This need is particularly evident in outdoor-adventure activities where risk is greatest (Boytes, 1999). A key task performed by leaders is that of making decisions on behalf of other people (Daft, 1999, p. 456).

Over the last decade, instruction in outdoor leadership skills has become a focus of many New Zealand-based programmes of adventure-based education, recreation, and tourism. Training in decision making is a central component of outdoor-leadership curricula, especially in contexts involving the management of risk. Traditional methods of acquiring leadership skills emphasised the experiential, peer-orientated, and ad hoc nature of acquiring judgement (Boytes, 1999). Good judgement acquired over time through long practice was regarded as the foundation of effective decision making. Current conceptions of leadership are characterised by rational-analytical methods based on knowledge and application of correct procedures. The process of becoming a good decision maker involves learning what rules to apply and when to apply them. The dual themes of experience-based judgement developed through long practice and procedurally-based decision making learnt through structured training form an uneasy partnership in contemporary leadership and decision-making curricula.

In order to resolve the tension between these perspectives, there is a need to examine how individual outdoor leaders go about making decisions in real-world settings. Investigation of the preferred strategies of expert decision makers in outdoor contexts can provide knowledge that may enhance the development of theories and models of outdoor decision making. Further investigation of the theory and practice of decision-making in outdoor-adventure contexts can provide outdoor-adventure programmes with increasingly reliable and relevant tools for the development of effective leadership skills in student leaders.
RESEARCH AIM AND QUESTIONS

The aim of this study was to investigate preferred decision strategies of expert mountaineers and kayakers who were operating in real-world settings.

Specific research questions that guided investigation in this study were as follows:

1. What strategies do expert mountaineers and kayakers use for making decisions in real-world settings?

2. What beliefs underlie the use of decision-making strategies by expert mountaineers and kayakers when making decisions in real-world settings?

3. How does the situational context influence the strategies used by expert mountaineers and kayakers when making decisions in real-world settings?

4. How does prior training in leadership influence the strategies used by expert mountaineers and kayakers when making decisions in real-world settings?

5. What is the role of experienced-based intuition in shaping decisions made by expert mountaineers and kayakers?

6. How do descriptions of real-world decision making by expert mountaineers and kayakers compare with NDM perspectives of the process of decision making?

7. How do expert mountaineers and kayakers believe judgement and decision-making skills are best developed?

PREVIOUS RESEARCH METHODS IN STUDIES OF OUTDOOR-ADVENTURE DECISION MAKING

The author is aware of only one other study of decision making in an outdoor-adventure setting. Boyes (1999) used a combination of qualitative and quantitative methods to investigate outdoor-adventure decision making from a naturalistic perspective. Qualitative methods were used to undertake semi-structured interviews with expert outdoor leaders from the domain of tramping. Quantitative methods were used to analyse the decision-making behaviour of outdoor leaders of varying experience and ability who responded to computer simulations of problem situations in outdoor (tramping) contexts.

Information gained from ten initial interviews was used to construct seven outdoor-adventure scenarios. Each of the scenarios described an over- or under-challenging situation that could develop into a crisis situation. Guided by the OADM model (Boyes, 1999), a hypothesis was constructed that predicted that outdoor leaders would identify the imbalance in risk and competence and take steps to achieve a balance in the level of challenge presented in each scenario. The seven scenarios
were then reproduced as computer simulations. The use of simulations was an attempt to create a controlled experimental setting to allow investigation of the key decision processes used by a large number of outdoor leaders of varying levels of expertise (Boyce, 1999, p. 128). One hundred and six outdoor leaders from the Otago outdoor community completed each of the seven scenarios (Boyce (1999, p. 131)). These outdoor leaders who completed the simulations were categorised by Boyce as being of either intermediate or expert ability (Boyce, 1999, p. 128).

Boyce's use of computer simulations of realistic outdoor settings to provide a context for investigation of decision-making behaviour is the principal difference in research methods to those used by this study. Boyce (1999, pp. 128 & 138) justifies the use of computer simulations in his study on the grounds that the advantages gained through clarification of research variables, consistency of application, and reliability through sheer numbers of subjects outweigh the disadvantages of removal of experiential context and consequences. Boyce also points out that computer simulations have been used as effective perceptual, procedural, and decision training aids in a variety of fields (1999, p. 138).

While acknowledging advantages that computer simulations may confer on the research and training processes, this study also recognises that there is a significant risk that the use of such tools may introduce errors into the research design that may not be easily identified or compensated for. There is a danger that attempts to strive for methodological rigour by the substitution of real-world events with controlled, simulated experiences may lead to the investigation of irrelevant incidents that give rise to falsely-drawn conclusions. It is difficult to ascertain at what point the simulated representation becomes so removed from reality that the subject's understanding of what constitutes a problematic situation or a workable course of action remains aligned with his or her response to a similar situation in a real-world setting.

The construction of simulated experiments that have the ability to utilise large samples also has the potential to compromise the validity of results. The desire to observe a large number of subjects may lead the researcher to set loose criteria for selection of subjects in order to ensure that a large population sample eventuates. Alternatively, the researcher may not be inclined to enforce strictly the established selection criteria if it means that only a small number of subjects are available. In Boyce's study, the large number of outdoor leaders designated as "intermediate" and "expert", all from the small Otago population, suggests that the criteria for selection of proficient outdoor leaders was set at a relatively low level of competence (1999, p. 131).

Finally, it is not possible to justify the use of simulations for research purposes on the grounds that simulations make effective training tools. The use of simulations as training aids needs to be distinguished from the aims of exploratory research. Initial goals of exploratory research are to identify key variables in the real-world setting, and to gain an understanding of the interplay between those variables. The value of simulations for research depends on the effectiveness of the simulation to accurately mimic the situation that it purports to embody. The use of simulations can be useful.
tools in subsequent investigations into the effects of controlled manipulations of significant variables. The gaining of knowledge through such measures represents a different undertaking to that of using simulations to train individuals in perceptual, motor, and cognitive skills.

In this study, investigation was restricted to unstructured, real-world events as experienced by subjects in the course of undertaking 'everyday' activities in their chosen domains of mountaineering and kayaking. This methodological construct was in keeping with the exploratory nature of the study.

RATIONALE FOR RESEARCH METHODS

This study used naturalistic research methods for the collection and interpretation of data. Shaffir and Stebbins (1991, p. 12) point to the problems inherent in maintaining validity and reliability of data when using qualitative methods. They describe how the use of research methods that require the direct involvement of the researcher in the investigative setting create the potential for human subjectivity and fallibility to distort the impression gained of the phenomenon under study. Further complicating this concern is the issue of engaging in a process of open-ended investigation in which the topic for study is not readily determined. How does the researcher ask the right questions or make the correct observations when she or he has not yet figured out what the correct questions are? (1991, p. 18).

Supporters of naturalistic investigations argue that the use of qualitative methods of inductive analysis permits the researcher to gradually develop an understanding of what forms the central issue of investigation, as well as an accurate estimation and what observations are relevant to the investigation (Patton, 1990, p. 44). Lincoln and Guba (1985, p. 43) claim that the direct involvement of the researcher as "human instrument" in the research setting allows for the combination of qualitative research methods with pre-established tacit knowledge and inductive data analysis. As the investigation continues, the relationships and ideas that emerge out of this process form an increasingly inter-connected body of knowledge known as "grounded theory" that eventually encompasses and explains all aspects of the current case for study (Lincoln & Guba, 1985, pp. 204-208).

This study attempted to follow the process of naturalistic investigation outlined above. The starting-point for investigation arose out of the researcher's background of twenty years of experience as a participant, instructor, and guide in outdoor-related activities. The combination of previously acquired background knowledge with recently acquired theoretical and field work information generated questions and conjecture that slowly developed into understanding and theorising about how experts go about making decisions.
COLLECTION AND ANALYSIS OF DATA

Data collection

Data was collected from expert mountaineering and kayaking participants by the use of interviews and participant observation. A review of relevant literature was undertaken prior to the fieldwork. The review provided a conceptual base for undertaking the ongoing process of determining questions for research and integrating new information into theories. An account of the subject recruitment process is given below. Descriptions of the three stages of interviews, observation, and data analysis follow.

Description of sample

Mountaineers and Kayakers

The sample was comprised of active mountaineers and kayakers. Fifteen of the sample were mountaineers only, six were kayakers only, and two were both mountaineers and kayakers. Six of the seventeen mountaineers climbed as peers with their climbing partners. Eleven mountaineers regularly worked as mountain guides. One of the eight kayakers paddled as a peer member with their kayaking partners. Seven kayakers regularly worked as kayak instructors. The activity designation (mountaineer or kayaker) and the role of the subject (peer, or mountain guide/kayak instructor) are represented below in Figure 4-1.

![Sample composition diagram]

Figure 4-1. Sample composition

Chapter 4: Methods
Gender and Age

The sample for this study was made up of twenty-three outdoor adventurers. Two of the sample (one mountaineer and one kayaker) were females, and twenty-one were males. The average age of the subjects was thirty-eight years, with a range from twenty-eight to fifty-three years.

Peers and Leaders

Six mountaineers and one kayaker were classified as peers. Eleven mountaineers and seven kayakers were classified as leaders.

'Peer' mountaineers and kayakers were defined as those who typically shared the responsibility of making decisions with other party members of equal competence. The category of 'leader' was applied to those participants who regularly made decisions on the behalf of the entire party. In such cases, the leaders were also the individuals who were accountable for outcomes of the decisions that she or he made.

Categorisation of individual mountaineers and kayakers as 'leader' was helped by using established outdoor industry awards as benchmark criteria. Mountain guides were required to have passed at least one NZMGA Climbing Guides' course (plus pre-requisite criteria), and to have completed at least one season of summer work as a mountain guide. Alternatively, training and experience of a similar nature was considered acceptable. Kayak instructors were required to have completed NZOIA Level 2 Kayak course, plus 4 seasons of kayak instruction. Once again, training and experience of a similar nature was considered acceptable.

Possession of industry qualifications was not always a guarantee of designated leadership role. For example, one subject categorised in the research as a 'peer' had completed the first NZMGA Summer Climbing Guides course eight years previously, but had minimal experience working in the role of a guide. Another subject who did not have specific industry qualifications was classified as a 'leader' on the grounds that he operated a mountaineering and kayaking business in the U.S.A., and had undergone similar training and experience to New Zealand mountain guides.

Skill Level and Experience

Selection criteria were applied to ensure homogeneity in the sample for study. Ericsson & Simon (1993) suggest that in a limited study on decision making the focus of research should be skilled subjects who have a long history of experience. This strategy enhances opportunities for investigating patterns of pre-established behaviours. Summaries of the NDM perspective (e.g., Orasanu & Connolly, 1993; Zsambok, 1997) describe levels of experience and skill of decision makers as fundamental to the type of decision strategy that is used. With these issues in mind, subjects were recruited on the basis of established competence and duration of engagement in mountaineering and kayaking activities.

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The selection criteria regarding technical competence and duration of involvement in an activity were as follows:

- Mountaineers were required to have accomplished at least five mountain ascents of grade 5 difficulty (Logan, 1994) or equivalent.
- Kayakers were required to have been paddling white water at grade 4 standard or above for at least four seasons.
- All mountaineers and kayakers, including mountain guides and kayak instructors, were required to have attained at least eight seasons of active involvement as peers in one or other activity.

The technical selection criteria were designed to ensure that only individuals who were regularly making decisions that were of a complex nature and that had serious consequences were included in the sample for investigation. The establishment of high-end technical selection criteria did present problems for the researcher, since it meant that the population of mountaineers and kayakers who conformed to the criteria was of a small size, and suitable subjects were consequently difficult to locate. Expert subjects were sought after for interviews until the researcher felt that the same themes and comments were repetitively emerging, and little information that was novel was being gained. By this time, a total of twenty three expert subjects had been investigated.

The pre-requisite time limitation of eight seasons of active 'peer' involvement in either pursuit was selected by the researcher on the grounds that it was of long enough duration to compensate for variability in individual activity levels. In order to achieve eight seasons of active involvement in a pursuit, most individuals will have begun the activity at least ten years ago. Almost all subjects selected for this study had experienced considerably more than the minimum requirement of eight years of active involvement as either a mountaineer or kayaker. The average number of years of experience of the sample was over nineteen years.

Educational Attainment

Formal educational background of the subjects ranged from attainment of university degrees (twelve subjects) to no formal educational qualifications (one subject).

Nationality

Eighteen of the sample regularly spent at least half the year in New Zealand. Two were based in the United States, two were based in Australia, and one was based in Europe.

Mode of Investigation

Twenty-two of the subjects in the sample were interviewed. Four of the interviewed subjects were also observed. One subject was neither interviewed nor observed, but gave a public lecture that was attended by the researcher. Details of the interview, observation, and public lecture process are included later in this chapter.
Table 4-1 A summary of a description of the sample

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Symbol

- PR = Peer participant (mountaineer or kayaker)
- mtn = Mountaineer; moderate skill &/or experience level
- MTN = Mountaineer; expert skill & experience level
- gd = Mountain guide, trainee
- GD = Mountain guide; fully qualified
- kay = Kayaker; moderate skill &/or experience level
- KAY = Kayaker; expert skill & experience level
- INST = Kayak instructor

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Recruitment of subjects

Using the skill and experience criteria as a baseline, subjects who were known to the researcher as prolific and competent mountaineers and kayakers were contacted, their skill and experience levels were confirmed, and a request was made for an interview and/or for an observation period. Further subjects were located through the process of 'snowballing'. The setting of the above selection criteria and the selection of subjects was carried out by the researcher without recourse to peer evaluation. This independence does introduce the potential for bias in selection of subjects, but facilitated progress of the research within the time and resource constraints that existed.

All subjects who were interviewed satisfied the selection criteria. Two subjects did not instil confidence in the researcher that the performance criterion was adequately met. Both subjects were removed from the sample, and their interviews were not included in the data.

The Interview Process

Twenty separate in-depth, semi-structured, audio-taped interviews were conducted between December 1998 and May 1999. Sixteen of these interviews were conducted in a one-on-one format between the subject and the researcher. One of the sixteen individual interviews was conducted as a phone interview. Four of the twenty interviews were conducted as pair interviews. For two of these pair interviews, it was later decided that one subject in each interview had not satisfied the selection criteria, and so they were removed from the sample. Refer to figure 4-2 for a flowchart representation of the interview process.

The use of interviews for the collection of data has been criticised on the grounds that errors of validity and reliability may be introduced if subjects fail to give accurate self-reports. The most likely cause of error is memory deterioration with time (Cohen, 1989). Another possibility is that memory recall is influenced by the questioning process (Philipchalk, 1995). The trustworthiness of data may consequently be compromised by forgetfulness, inaccurate reconstruction of events, and retrospective erroneous justification of events (Carroll and Johnson, 1990, p. 33).

The interview process adopted for this study attempted to minimise the occurrence of these errors through the use of three main strategies. The first strategy was to focus on recent events recent events. Subjects were encouraged to discuss their most recent trip, and other trips from the current (summer of 1998/1999) season.

The second strategy was to focus on decision events from earlier years if they were deemed to be non-routine and were of special significance to the subjects. Support for this strategy comes from two theoretical perspectives. Research suggests that events of special significance to an individual remain readily available for recall to memory and are resistant to being forgotten Woike (1995, p.
From a different perspective, "memorable" events are theorised to be of more value to researchers of decision making behaviour than are mundane events (Klein, Calderwood, and MacGregor, 1989). There was also a pragmatic reason for adopting this strategy. One topic under investigation was that of the link between an individual's backlog of experience and their current judgement. With this in mind, questions pertaining to the subject's history were intermittently spread throughout each interview. Forays into the mental past were consequently undertaken on the grounds of salience, theoretical rigour, and logical consistency.

Figure 4-2. The interview process (Note: one further subject gave a public lecture)
The third strategy for attempting to ensure the trustworthiness of the interview process was to provide a format that was of personal interest and relevance to the subjects. This was achieved by having the subjects play a major role in determining the content of the interview. For example, large parts of the interview involved the subject ‘telling stories’ about their own climbing and kayaking experiences. Open-ended questions were used to concentrate the subject’s attention on aspects of the story that were of interest to the researcher, but otherwise the subject did most of the talking. The intention was to create an atmosphere of purposeful conversation about issues that were of relevance to both the subject and the interviewer. As the interview progressed, topics that were of a controversial nature were gradually introduced. For example, subjects might be asked to recall mistakes they had made or witnessed, or asked for their opinions about formal teaching of risk management. At the end of interviews, subjects often commented on how the act of directed retrospection had been surprisingly interesting for them.

All interviews were audio-taped and subsequently transcribed. All except one interview ranged in length between eighty minutes and one hundred and twenty minutes. The exception was the only interview not conducted face-to-face: a phone interview of 40 minutes duration. Every interview took place at a location decided on by the subject. All interviews were preceded by a request to undertake the interview. The purpose of the interview, the background of the interviewer, and issues of confidentiality and consent were outlined before each interview.

Every interview began in a similar way with the collection of personal details, and a request for the subject to describe recent mountaineering or kayaking experiences. During the first interview the interviewer attempted to integrate a formalised set of questions into the discussion. This proved awkward and disruptive. It was difficult to place pre-established questions into a suitable context. Also, the subject reacted defensively to some questions, perhaps because they considered them irrelevant or inappropriate. In all future interviews a ‘go-with-the-flow’, discussion-orientated approach was taken. Questions were worded so as to refer to the specific behaviour being described by the subject. The reliance on the strategy of ‘story telling’ ensured that every interview had a life of its own.

A list of themes of interest was compiled in an ongoing way as the interview process progressed. The themes were used to frame the questions asked by the interviewer, and to curtail discussion that was deemed to be trending off into disparate and fractured topics. The eventual list was as follows:

- Outdoor background of subject
- Recognition of cases as typical, versus each case as atypical
- Situation assessment
  - goals
  - prototypicality of cues & causes
  - typical actions
  - typical consequences
- Evolving decisions, versus independent decisions

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- Environmental factors (including presence of others)
- Expertise and experience
  - link between these two concepts and (good) judgement
  - willingness to make temporary decision
  - 'satisficing' versus pursuit of excellence
- Singular evaluation versus concurrent evaluation
- Mental simulation
- Emotional feedback
- Risk
- Rules versus guidelines
- Peer participants versus leaders
- Training and development of judgement

Events considered to be of significance to the research that were raised as a consequence of reference to this list of themes were repetitively revisited from a number of different perspectives. The tactic of reiterative questioning gave each subject a number of opportunities to respond to key issues. The collective interview process was consistent with the concept of “emergent design” in that insights gained from each interview led to enhanced understanding of what were the pertinent overall issues, and influenced the direction of questioning taken in subsequent interviews (Lincoln & Guba, 1985, p. 102).

The observation process

Five separate instances of participant observation were conducted in association with four subjects for a total of twenty-six days between December 1998 and March 1999. The subjects accompanied during the participant observation process included three mountaineers (subjects #8, #9, and #11) and one kayaker (#20). All subjects were observed in the role of leader, and one subject (#9) was observed on a separate occasion in the role of peer participant. The observation periods for each participant and their roles during the observation process appear in Table 4-2.

Table 4-2 Participant observation details

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<tbody>
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<tr>
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<td>peer (mountaineer)</td>
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<tr>
<td>11</td>
<td>leader (mountain guide)</td>
<td>6</td>
</tr>
<tr>
<td>20</td>
<td>leader (kayak instructor)</td>
<td>4</td>
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</tbody>
</table>

Chapter 4: Methods
All subjects who were observed were notified in advance, and gave permission for the process to occur. Observations of mountain leaders were conducted with the investigator fulfilling an equivalent leadership role alongside the observed subject. Eight days of leader observation occurred in the context of guiding clients during ascents of 3000 metre mountains in Westland and Aoraki/Mt Cook National Parks, and ten days occurred while instructing clients in mountaineering skills in less serious alpine terrain at the head of the Tasman Valley. Observation of the sole kayak leader took place with the researcher in the role of student while attending a kayak skills instruction course based at Murchison. Observation of the sole peer mountaineer occurred during ascents of an alpine rock route and a mountain route in Aoraki/Mt Cook National Park. In this last case, the decision making roles were shared.

Very brief field notes were taken at convenient moments during the observations. The fine weather that characterised the observations resulted in sustained activity, and required the collation of notes to be done at the conclusion of each observation. Subject interviews were conducted as soon as convenient following each observation period, with this generally being the next day. Other observations of mountaineers and kayakers took place throughout the field-work period. As well as giving context to the settings, these further observations provided background information that helped to clarify and confirm ideas.

**The public lecture**

One audio-taped session was obtained during a public lecture. World-renowned U.S.A.-based climber Steve Schneider gave a talk and slide-show organised by the New Zealand Alpine Club in the Christchurch Town Hall on 18th May, 1999. Schneider described various climbs he had made in Argentina, including his solo ascent of a formerly unclimbed route ("Colloso", 5.10 A4+, East Face Central Tower of Peigne; summit day 12 March '99). The section of Schneider's lecture describing his solo ascent was audio-taped. The researcher approached Schneider at the end of the lecture, and permission was gained from him for use of the taped portion in this study. Schneider is identified in this study as subject #1.

**Data analysis**

All interviews were transcribed verbatim and analysed manually. Pertinent quotes were recorded under themes that were repetitively emergent. Many of the emergent themes were equivalent to factors suggested in readings from the literature search. The interpretation of data gained from interviews and observations drew extensively on contextual knowledge derived from the researcher's past experience as a mountaineer, mountain guide, outdoor instructor, and kayaker.
Limitations of methods

Two areas for concern regarding use of methods that may have compromised the validity of the data are the use of non-random sampling methods and the possibility of a reactive effect between the researcher and some of the subjects during the interview process.

Interviewing and observation of subjects who were either known to the researcher, or who presented in an opportune way during the fieldwork process, meant that there was the possibility of biased selection. The researcher’s long involvement in the outdoor-adventure leadership industry in New Zealand provided a sound basis for deciding which individuals were suitable for selection as subjects. The non-random method of selection of subjects ensured that a significant proportion of the small population of expert participants in kayaking and mountaineering in New Zealand were studied. It allowed the researcher the opportunity to target mountaineers and kayakers whose expertise was widely-acknowledged. In light of the time and logistical constraints faced by the study, it allowed the construction of a timetable for interviews and observation of subjects that took into account the subjects’ work and travel commitments. It also allowed flexibility in order to take advantage of the coincidental presence of experts who were not able to be contacted during the preparatory phase of the research.

Concerns about a reactive effect between subjects and interviewer are raised for the following reason. There is ongoing debate regarding the structure and direction of outdoor-adventure training initiatives in New Zealand. The current role of the researcher as a lecturer in outdoor leadership at a New Zealand university may have caused some subjects to identify the researcher with one side of this debate. During the interviews, an effort was made to lessen the effects of a reactive response by the use of open-ended, theme-based interview methods. The researcher’s previous active involvement in mountaineering and kayaking pursuits was a further factor in alleviating the concerns of subjects regarding the intent of the research. Participant observation allowed the data gained from interviews to be supplemented and informed by a fuller understanding of the decision-making context under study.

CHAPTER SUMMARY

Qualitative methods of data collection and analysis were used to investigate strategies of decision making used by mountaineers and kayakers. Interviews and observation of participants over a six months period resulted in an extensive body of information being gathered. This was analysed manually by the researcher. The process of investigation and analysis was an evolving one, with themes, concepts, and theories emerging out of the research process while it was being carried out.
CHAPTER FIVE

WHAT THE EXPERTS SAY

"Inexperienced amateurs are a source of danger to any party, and should only be taken where the difficulties are well known, and not serious."

William Spotswood Green, 1983.

CHAPTER OUTLINE

The aim of this chapter is to present an overview of what it is that skilled New Zealand mountaineers and kayakers do, think and feel. This chapter provides a foundation for further analysis of decision-making strategies and theories in the following chapter. Five key themes that identify the essential qualities of skilled participation in mountaineering and kayaking are proposed. The information that is used to form these five themes is gained from interview transcripts and from personal observation by the author.

THEMES OF SIGNIFICANCE FOR EXPERT MOUNTAINEERS AND KAYAKERS

Introduction

This chapter presents five dominant themes that are common to mountaineers and kayakers. The most significant theme is that of striving for the 'perfect performance'. The irony associated with this theme is that it is apparent to skilled activists that perfection will always remain an ideal, and therefore is an impossible goal. Encapsulated within this overarching theme of striving for the unattainable goal of perfection are particular themes that offer practical means for improvement.

A second theme is that of 'ease of long practice'. This refers to the steady development in knowledge, skill, and understanding achieved through sustained experience. Another theme is that of the use of 'feelings' to guide actions. Feelings, whether in the form of intuition or emotions, are a response to the current situation in which the individual is located. Their confident use as a means of maintaining situational awareness is a characteristic behavioural trait of expert adventurers.

Another recurrent theme is that of 'situational management'. This refers to the capacity of experts to manage decisions in accordance with changing situations. 'Situational managers' are typified by their ability to focus on matters that require immediate attention or resolution, and yet still maintain an overall awareness of the setting within which the particular moment is situated. In this way, experts are able to remain in control in contexts where plans are still unresolved and situations are evolving.

The last theme derived from interviews with expert mountaineers and kayakers is the reliance that they place on judgement rather than rules to direct decisions and actions. Experienced participants realise that most situations in which they are engaged involve multiple threats. Furthermore, the threats shift and interact
depending on what course of action is selected. Rules are too prescriptive to allow enough flexibility for efficient and effective action under such circumstances. Instead, experts typically restrict rules for use as planning aids, and rely on their own experience-based judgement to prioritise courses of action in the field.

The actions, thoughts, and feelings that are encapsulated in these five themes together comprise an integrated picture of what is going on inside the mind of expert mountaineers and kayakers during the on-going process of decision making.

**Theme 1: The ideal vision of the perfect performance**

"Only the mediocre are always at their best." (Somerset Maugham)

A readily observable characteristic of outdoor adventurers is the fervour with which participants communicate with like-minded people about their outdoor activity. Mountaineers in particular are renowned for writing about their glorious and inglorious successes and failures. Kayakers regularly supplement written accounts of their most significant white-water occasions with hours of video film that records the dynamic nature of their activity. More commonly, committed adventurers take every opportunity to talk with one another about their outdoor activities. They are constantly re-living their own experiences and vicariously living out the experiences of others.

This concentration of interest in arcane knowledge may, to the non-participant, seem narcissistic to a fault. The question that is raised is "Why bother?" Reliving past adventures offers no apparent material benefit for society. Even for adventure specialists, nostalgic story-telling appears to provide only limited intrinsic value compared to actual engagement in the activity. The answer that will be suggested here is really no more of an answer than is Mallory’s perverse reply "Because it’s there" to the question why one should try to climb Mt Everest. Nonetheless, the answer is integral to an understanding of what it is that expert adventurers do. Expert adventurers are on a journey of self-improvement. Simply put, they want to become better at what they do. Through discussion, reflection, and collection of records the enthusiast is able to construct narratives of adventure that can be used to enhance future performance. These narratives are more than useful information; they also provide a baseline of current standards of performance for comparison with personal achievements. In metaphorical terms, the expert enthusiast is seeking to attain the ‘perfect performance’.

The above metaphor comes direct from a comment by a mountain guide who was attempting to explain his constant fascination with his trade. His words were:

>You’re aiming for the perfect performance, aren’t you? You’re aiming for the hundred per cent score, where you’ve done the perfect job. (Int. #11)

The attainment of “perfection” is the ultimate goal for the expert. Established ideals of perfection direct action, thought, and aspirations. Climbers talk

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mystically about the ‘purest’ style of ascent. Debates about climbing style are founded on the belief in the superiority of minimalist endeavour. In a recent public lecture in Christchurch, American climber Steve Schneider spoke proudly of his solo, “capsule” ascent of a sheer 1,400 metre rock face in Patagonia, describing how he:

...pulled all the ropes up behind, none of this siege-ing thing....because I wanted to climb the mountain more on it’s own terms, and just go get committed up there. (Int. #1)

Schneider’s satisfaction in his ascent was magnified by the “purity” of the route he created. Schneider was ascending a thin, often incipient crack that, like Comici’s1 ideal climb, followed the line traced by a drop of water falling from the summit:

...it’s just a fantastic straight shot of a line, absolutely amazing. And there were only two places where the route jogged; difficult tension traverses that got me back into the crack system. And it really seemed too good to be true. (Int. #1)

Kayakers have similar ideals of perfection. Top kayakers pride themselves on their abilities to “keep the deck clear of water” (Int. #19) in difficult rapids, to deftly spin their craft into and out of tight eddies, and to maintain mental control even in those moments when the river has temporarily gained ascendancy over their destiny. When scouting rapids, kayakers ponder over the ideal ‘line’, conscious of the distinction between paddling the main flow of the river in good style versus avoiding the difficulties or of being dominated by the difficulty of the rapid:

If someone doesn’t run the trickier line, did they really run that rapid? ....I mean, there’s paddling a river, and paddling a river too. Like those people I was talking about who do the whole rapid up-side-down, well, I don’t think that’s really paddling the river. (Int. #20)

Guides and instructors are also conscious of an ideal set of standards. Presumably their awareness of ideal standards is initiated through exposure in earlier training to established practices and course curriculum. This is not to claim that attainment of the ideal standards remains a distant goal. Observation of guides and instructors reveals a near obsession with discussion of climbing-related technical and environmental matters. The impression is that there is more to the pattern of constant learning and rehearsal of guiding an instructional practice than mere attainment of a minimum level of ability. The best of the guides and instructors appear ambitious beyond the level of average attainment. This overflows into their desire to make high quality decisions in the field:

Q’n: What are you trying to find when you’re making a guiding decision?
Answr: Well, definitely the best solution. (Int. #14)

1“I wish some day to make a route and from the summit let fall a drop of water, and this is where my route will have gone” (Emilio Comici, c. 1930, cited in Unsworth, 1975, p. 63).
The decisions made by professional mountaineers and kayakers are a function of both the overall philosophy that they have with regard to what they are attempting to achieve with their clients (e.g., performance orientated, educational, social, etc.), and also of their ability to apply this philosophy through their own actions. Therefore, when one reads the following quote by an outdoor leader ....

*I think we have a strong educational philosophy here.... We tend to be working to a particular image. We are looking to produce a river runner who has got pin-point slalom skills, and can roll immaculately in at least four different roll positions. That's what we are trying to produce.* (Int. #21)

.... what needs to be understood is that the model for the intended "image" is that of the instructor/guide. This awareness of the central role that they have in the setting of standards for others to emulate places great responsibility on the individual who has this leadership role.

Of course, the motivation to reproduce the perfect performance is inspired by more than aesthetics. The record of accidents witnessed by the subjects of this study includes severely broken bones, numerous near-death experiences, drowning, decapitation, and death due to rock-fall, hypothermia, altitude sickness, and falls from mountainsides. The subjects also gave innumerable examples of near misses. It is not surprising, therefore, that awareness of the consequences of incompetence in mountain and river environments should inspire climbers and kayakers to improve their abilities. As one subject explained,

*Safety was the big thing....'cos it's pretty exposed up there. It only takes one trip, and it's all over.* (Int. #23)

A blunter analysis of the dangers of mountain guiding is given by another,

*Your life is so f***ing on the line, and you know it. When you're in there all the time, and it's your job, you don't feel good about just getting away with things...* (Int. #10)

The hazardous nature of adventurous activities is especially apparent to those with long experience in alpine and wild-water environments. Simply through the process of being there, they have witnessed countless incidents, some of them tragic:

*The average age of the group I normally paddle with is over 30, and sometimes it's over 40. So there's a huge amount of experience. I mean, Peter's watched four people die on the river. How much experience do you want?* (Int. #21)

Through exposure to folly and tragedy, the best of the adventurers become highly attuned to the potential for future accidents. This concept will be elaborated further in the themes of 'ease of long practice' and 'big picture'. At this point in the analysis it is enough to point out that rather than becoming sensitised, blasé, and inured to the negative consequences of their activity, experts seem to gain increased sensitivity and awareness towards the factors that lead to accidents.

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The key strategy reported by subjects as furthering their path to the perfect performance is that of critical reflection on past events. Exposure to experience alone does not guarantee that an individual will develop, or be able to use, sound judgement. What also appears to be integral to the development of judgement is evaluation of past events that leads to modification of future practice (Priest & Dixon, 1990, p. 5; Teschner & Wolter, 1990, p. 88; Williamson & Mobley, 1984, p. 5). Reflection takes two main forms. First, it may take the form of personal introspection. All respondents referred to the importance of thinking back over their actions in order to advance their personal development and learning. The following comment was a typical example:

Q'n: Is that retrospective sort of thinking common for you?
Answr: Oh, yes. I think you're foolish if you don't do that.
Q'n: How often does that go on for you?
Answr: Well, all the time. I think it is very critical. (Int. #15)

Second, an expert may seek information from others through either discussion or reading. Discussion amongst peers is equally acknowledged by the respondents to be a crucial learning strategy. Notwithstanding the keenness of respondents to point out the significance of consciously initiated group discussion, observations suggest that by far the greatest proportion of critical discussion occur in an informal and largely unacknowledged fashion. Mountaineers may climb in relative isolation from each other, but in evenings and during bad weather they congregate in mountain huts. Kayakers spend lengthy periods together while driving to and from rivers, and also in the bars of hotels near padding locations. In each case, the dominant topic of conversation is always the activity at hand. This includes detailed dissections of past ‘epics’, plus discussion of current hazards and issues. Only two subjects in this study made (unsolicited) reference to the deliberate seeking out of literature regarding accidents. However, it is a rare expert kayaker or climber who does not avidly read the latest magazine or watch the latest film clip about their activity. There is considerable information to be gained from these popular sources.

Evidence from the interviews suggests that the willingness of professional outdoor guides and instructors to engage in reflection is influenced by the nature of the typical assessment process undergone in order to attain their qualifications. In the mountain guiding arena, there is a formal requirement that a fully-qualified mountain guide must supervise the work of trainee mountain guides (New Zealand Mountain Guides Association, 1998). Not only does this provide for an apprenticeship system, it also helps create a culture whereby mistakes are shared without fear of shame or retribution. Furthermore, both guiding and kayaking assessment courses utilise ‘self and peer feedback’ systems as a means of reflecting on performance of assessment tasks by candidates. One benefit claimed of this assessment process is that it provides useful learning opportunities for all concerned, including the ‘expert’ assessors. A possible further side effect is that once again there is a promotion of the culture of sharing information about one’s mistakes. This can help establish a permanent mind-set towards perceiving criticism by others as constructive, and not destructive. Perhaps this explains the following positive attitude of a highly

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accomplished mountain guide towards critical comments by other guides regarding his decision that led to himself and another guide becoming avalanched:

Now, when I got back down, I was extremely admonished by the other guides about the decision-making that involved me getting myself into that position, which I took on board and I think was completely constructive and fair enough....it was a very bad mistake to make. (Int. #14)

The humble attitude of this mountain guide belies the difficulty in accepting criticism about a less than perfect performance in an endeavour that in many ways is more than a career, but is a way of life. A crucial factor that facilitates both the receiving as well as the giving of criticism by outdoor adventurers is the general recognition of the impossibility of always making correct decisions. The vagaries and dynamic nature of outdoor environments means that most decisions are inherently complex and indeterminate, and hence subject to interpretation. Climbers and kayakers understand that they are engaged in a process of ‘satisficing’ based on imperfect information and human fallibility.

In an associated sense, expert outdoor adventurers recognise that the “perfect performance” (Int. #11) can only be sought after, but never achieved. In an ironic twist, the ideal perfect performance that they seek to emulate is, inevitably, always out of reach. Yet, like a carrot on a stick attached to a horse’s nose, it serves to inspire the expert to ever-increasing standards of competence. Each subsequent performance is informed by knowledge gleaned from previous attempts and from the accounts of others. The ‘engine’ for this recursive process is the satisfaction gained through the combination of thrill and skill in contexts of risk mentioned previously. The accumulation of knowledge provides further evidence of the complexity of each situation, and therefore of the hopelessness of applying standardised rules for action that could ensure an ideal outcome. The following comment summarises many others that echo this sentiment:

It’s not like you have an iron-bound contract saying this is going to work. You think it’s going to work. But it’s complex, because you’re relying on a lot of judgement. You’re judging decisions in a really quick and instantaneous way. And you’re changing them based on the immediate feedback that you recognise. You can’t take a set of experiments or measurements, quantify them and put them down in a book for anyone to follow. What you’re measuring, what you’re judging, is your ability to gauge changes; it’s a lot more subjective. It’s hard to explain except to say that you need to know about those things. (Int. #10)

Theme 2: “The ease of long practice”

“How do I know that? Just through mileage, really.” (Int. #7)

Implicit in the previous theme of self-improvement through reflection is the notion of the accumulation of experience. The precondition of repetitive and
varied experience for the development of technique and judgement is the single most prevailing theme throughout the interviews that inform this study. In keeping with the conceptual link between the pursuit of the ideal of perfection and the acquisition of experience, the remainder of the last quote from the previous theme is continued below:

...And the way you know about these things is by spending time in that terrain, in a huge variety of conditions, and getting feedback from that. And the feedback is actually surviving, really, in a lot of ways. I don't know anyone who hasn't had near misses and close calls in their significant learning experiences. You can't just give someone those skills. You can't go out there and schedule those lessons. They need to come when people experience those conditions as they change, and experience the fact that it is all so different. Talent comes into it, but time in the mountains is probably the most significant, measurable thing that gives someone the ability to cope with things. (Int. #10).

The essence of the comment by this mountain guide, and the recurring element in every interview, is that expertise is the end-result of 'hands-on' performance. The repetitive reference by subjects to "time" (Int. #’s 2, 10, 15, 21), "mileage" (Int. #’s 7, 20, 23), "learning from doing" (Int. #’s 16, 18.), "building up a repertoire of knowledge" (Int. #’s 10, 17, 20), "taking the knocks" (Int. #’s 11, 19), and to learning and judgement based on "experience" creates a persistent and compelling argument for the development of expertise through applied learning. This thesis is succinctly summarised by the saying 'ease of long practice'. This phrase is an English 'folk' saying recently popularised in New Zealand in an article of the same name by expatriate British outdoor commentator Pete McDonald (1998).

McDonald claims that the way towards excellence in outdoor leadership is by the accumulation of knowledge gained through direct engagement in activity. His concern is that current outdoor recreation philosophy promotes theory-based learning over practice-based learning (McDonald, 2000). McDonald does not deny the value of literature as a method of transmitting experience. He would rather, however, that accounts and descriptions of actual events took precedence over models and theories. Nor does he discount learning gained through discussion. McDonald reserves his criticism for what he considers to be the current emphasis of outdoor academics on formalised 'peer feedback' sessions, and the trivialisation of what he terms "beer feedback" amongst friends and enthusiasts (1998, p. 3).

The previous quote also highlights one other area of current controversy in outdoor adventure; namely, to what extent is it possible to teach an individual the skills of outdoor adventure and outdoor leadership? The quote suggests that the skills of task performance, judgement, decision-making, and general leadership are not readily transferable. Rather, they are the result of intensive pursuit of the relevant activity under varied environmental circumstances. How can this mountain guide who spends approximately seventy five per cent of his working life in the role of instructor balance the apparent contradiction between the above comment and the nature of his work?
In fact, most of the interviewed instructors and guides described the difficulty they had in reconciling personal educational philosophy with the safety-management requirements of organisations and institutions. The level of compromise required was felt to be so great by two mountain guides as to cause them to give up working as an instructor altogether and only pursue guiding work. This is how one mountain guide rationalised his decision not to engage in instruction:

*I find that I can’t enjoy transferring knowledge in a structured educational way as is presented these days, for example by polytechnics and schools. That is why I don’t instruct. You learn by watching someone who has more experience or by doing it. You don’t really learn in a structured environment, apart from obvious basic techniques. The subtler side of the equation, which is usually the decision-making, still comes from experience. It can’t be taught; you’ve got to actually put the pupil in the situation where they have some risk and they can feel the danger. If you run a course and remove from it all risk then it’s not giving the pupils a true picture of what situations they can get themselves into. If you’re in a really structured situation, which avoids doing that, then I think that people may learn the techniques, but they won’t learn recognition of risk.* (Int. #14)

The issue for this mountain guide was that there existed (perceived) obstacles to presenting students with realistically dangerous experiences. The obstacles arose out of societal and legal prohibitions regarding duty of care of those under one’s charge. For those who sympathise with this perspective, the result is an ironic shifting of the burden of risk onto the student. The argument is that the student is ‘sold’ a career-training opportunity that cannot live up to its claims, and which ultimately produces graduates with insufficient personal experience to allow them to be knowledgeable, physically competent, and therefore (because these concepts are related in outdoor environments) safe. The situation is compounded for those who take instructor-training courses. A very experienced amateur mountaineer offered the following comment:

*I think what they are doing with these polytech courses is a farce. They are taking all the students’ money off them. They are not giving people opportunities to drive themselves along. If you were doing it for yourself, you’d take a lot more risk.... What are the goals of such a course? Are they really trying to set up mountaineers for the rest of their lives, or what? You can’t be a mountaineering instructor without first being a mountaineer. Otherwise it’s dangerous.* (Int. #5)

In any instructional situation, ultimate responsibility for making decisions and final accountability for errors always rests with the instructor in charge, not the students. Yet, without the opportunity for students to experience total responsibility and to be accountable for their own mistakes, how much learning is possible? Outdoor instructors are aware of the distinction between perceived and real risk, and the possibilities of substituting the former for the latter. Some outdoor recreation commentators suggest this is the only ethical way for

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instructors to operate. The issue remains that any substitution of perceived risk for real risk is exactly that: a substitution and, therefore, the construction of a false reality. As one respondent said, "the general feeling is that [professional] outdoor recreationists are trying to absolve themselves from risk" (Int. #14).

Despite widespread acknowledgement by the subjects of the inability of instructional contexts to fully replicate reality, many were nonetheless satisfied that instruction was a worthwhile endeavour. They justified the instructional process as being simply one component in the learning progression of a student. These instructors believe that instruction provides students with accelerated learning in technical procedures through the provision of comprehensive advice and critique. As one instructor said, "I'm interested in helping [students] to see what I can see" (Int. #20). Another instructor believed that they were able to give students a sense of "discipline" for learning skills "in a sound manner according to the physics of the sport" rather than leaving individuals to an untutored approach of "hammering away and building habits that suit you physiologically" (Int. #19). The same instructor lauds the virtues of "perseverance" so that "by doing an activity over and over it becomes ingrained" (Int. #19). In general, the instructors believe that their expert tuition provides a foundation of technically correct and safe practice, thereby allowing students to competently pursue their own adventures in their own time.

Both supporters and critics of instruction are in agreement that it is through repetitive experience that gains are made in ability. The problematic issue recognised by both sides relates to the development of expertise in decision-making skills, since this is the area that is most difficult to provide realistic settings for practice. How are students to learn skills of judgement before finding themselves in situations where good judgement is required? The issue in the New Zealand workplace is described below by a mountain guide/kayak instructor with extensive background in outdoor instruction:

You've only got to look at Polytech courses and see how people can pick up the actual technical skills, and be very, very good performers. But there again, what they need of course is to get mileage in judgement. And where do you get judgement from? Judgement's all about scaring the pants of yourself when you're doing it for yourself and then having some barometers for saying, "I'm in charge of a group of people now, I've got to think differently, I can't push the limits, I've got to have the margins a lot tighter". (Int. #23)

One long-standing strategy of trades and professions for attempting to resolve the dilemma of how to learn judgement in isolation from genuine risk and responsibility is to provide mentored work-experiences for trainees. Many (but not all) training and/or assessment organisations within the outdoor-adventure instruction industry have incorporated the strategy of apprenticeship training into their programme of tuition for outdoor instructors. For now, what is important to note is the emphasis placed by experts in 'long practice' for both

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2 See Bunting (1999) for an example of an argument in favour of managing risk in outdoor recreation settings such that all real risk is eliminated, and subjects experience only perceived risk.
improving technical skills and for providing a knowledge base and philosophical approach that shapes future decisions.

**Theme 3: Feelings and intuition**

"I tend to go with instinct a lot. What you feel is instinctively right is often the best way to work. I went with what was happening, and what I felt was best for the clients on the mountain." (Int. #9)

Self-reports of mountaineers and kayakers are peppered with words and phrases that describe their immediate emotional response to the environment. Internal feelings about the situation are monitored and used as feedback to indicate surrounding hazard levels. Emotional feedback in the form of 'intuition' is a key indicator for experts of the correctness of otherwise of current behaviour. Certain of the respondents were quite emphatic that intuitive, empathic responses to the situation were a direct result of their accumulated experience. For them, intuition is not an 'extra' sensory perception; rather, it is a form of induction based on prior events. The following two quotes exemplify awareness of this process:

*So I guess you're drawing on your experience, just basing it on your experience is what it comes down to. There's that flag in the back of your head that starts waving and the lemons start stacking up; you may call it intuition, but that's all based on years of experience.* (Int. #23)

*I don't know what intuition is when you aren't very experienced, I haven't really got an answer for that. My theory on intuition is that it is all the situations you've been through in life. Intuition is using your memory to solve a problem, or make a decision. It is not a conscious thing, it is something that happens.* (Int. #14)

Feelings, therefore, are a form of experience-based reflection that are used to assess current performance, and guide future actions towards successful outcomes.

The visual, tactile, and aural nature of mountain and river environments is undoubtedly a factor in the significance of intuitive feedback for mountaineers and kayakers. Successful and unsuccessful negotiation of hazards gives rise to emotional responses. The situational variables present at these times become associated with the resulting feelings. Many environmental cues are difficult to explain or describe in words, and therefore are stored in memory in non-verbal format. As one kayaker explained, "You take in what that hydraulic looks like, and it gets stored away in the memory banks for retrieval at some other time" (Int. #19). Cues are typically of little immediate relevance in isolation, but become significant when combined with other variables. Ongoing, non-analytic 'mental monitoring' of the evolving situation may give rise to feelings of well-being or un-ease as the situation develops and is gradually recognised as being similar to memories of previous situations of consequence.

Subjects describe how the accumulation and combination of 'emotional feelings' eventually reaches threshold level. The intersection of feelings is likened to the
formation of a pattern that is gradually recognised as significant, causing them to take stock of the overall situation.

*Generally you can see a pattern in the things around you. If you get a few flags waving you're going to sit down and start thinking "What is it that I'm concerned about here? What's my intuition saying?" And you need to listen to that and then define why you are concerned, why have you got that gut feeling?* (Int. #23)

At this point, the individual becomes aware that the situation requires adjustment. Actions must be taken. While it may be assumed that decisions are required in order to formulate and initiate actions, the subjects occasionally denied this. For example, one kayaker who undertook a series of actions in order to rescue a partner from a critical situation claimed that ‘*I didn't make any decisions*’ (Int. #20). Actions taken in such circumstances are described by subjects as “immediate” (Int. #’s 2, 10, 20, 22, 23), “unprompted” (Int. #13), and “unscripted” (Int. #11) or, more commonly, based on “intuition” (Int. #’s 3, 5, 6, 10, 12, 14, 17, 23). Given that all the subjects were physically capable, technically skilled, and had experienced events of somewhat similar intensity and seriousness, it seems likely that a determining factor in allowing subjects to act in an intuitive fashion was that of physical and mental preparedness.

Not every action is undertaken in a reflexive fashion. Many circumstances require deliberation before action. Verification of the appropriateness of a preferred course of action was inevitably described, once again, in terms of the emotional response of the individual to the action. Here is one example of a typical comment:

*Yeah, definitely intuition comes into it. It's nice having a gut-feeling. It's really handy using your emotions to make decisions when your life depends on it. Because your emotions are your best measurement of how safely and how well you are doing.... Internally, decisions feel good. You feel relief. You feel emotional reinforcement of good decisions.* (Int. #10)

While subjects regard intuitive responses to situational circumstances as being a reliable gauge of their hazardous nature, they also recognise that there are times when the voice of intuition needs to be “put to bed” (Int. #22) and a more conscious thinking process used. Two situations in particular were mentioned by subjects as requiring further assessment of a more investigative nature. The first was that of a situation that, at first sight, had an especially malevolent appearance. In such circumstances the initial “blast of information” (Int. #17) can cause an immediate negative response. The experienced individual will take stock of the situation, and evaluate whether their intuitive feelings are justified. He or she may also attempt to create a new way of doing things instead of following established responses:

*From there it is a matter of thinking, "Is that realistic? Am I just getting put off because of all this frothing white water in my face? Am I making a logical decision, or am I making a decision just on this emotional feeling? What else is possible to do here?"* (Int. #17)
The second situation that was mentioned as requiring further evaluation of judgement involves group decision-making. Subjects described how frank communication was needed to ensure that other party members were in agreement with the team goal. Problems of misinterpretation were possible if total reliance was left to assumptions and feelings about the intentions and behaviour of others. Guides were especially clear about the need to explain in explicit manner to their clients what was expected of them. Guides described how, while undertaking an ascent, they commonly requested that clients verbally report back to them on a regular basis regarding their state of physical and mental condition. Guides also were conscious of how their clients’ aspirations could influence their own judgement:

*My worst mistakes have been by allowing client pressure to come to bear on me. And this is where intuition doesn't really work – it's more a cold clinical look at your motives for doing something or for being where you are that is going to balance out your client's wishes and your knowledge of potential risk versus enjoyment or satisfaction.* (Int. #14)

Intuitive feelings, therefore, are a multi-purpose tool. They are used to monitor and assess the changing situation for hazards, and to reflect on one's plans and actions and assess them for viability. They also are used as an 'early-warning system' to notify if the hazards, either individually or in combination, have reached a level of significance. The experts surveyed by this study expressed considerable trust in their reliance on intuition and emotions. It must be assumed that this trust is based on positive experiences of “listening” (Int. #23) to their feelings. Despite this confidence, experts also recognised the fallibility of feelings and intuitions under certain circumstances, and learnt to recognise the times when a more conscious form of introspection was required. One advantage of a conscious thinking process was that it could be used to create new ways of solving problematical situations.

**Theme 4: Situational management**

“I'd have no idea how far we were going to get or what decision I was going to make until we actually arrived at the situation. I was just doing a step-by-step sort of decision process.” (Int. #23)

‘Situational management' refers to the ability of experts to attend to a constant stream of information, tasks, and decisions in a context of partially resolved and constantly changing situations. Throughout this process, expert mountaineers and kayakers are able to focus on issues of immediate relevance while maintaining an overall awareness of the larger context. As one climber evocatively explained with regard to route-finding, “You’ve got to keep the big picture clear, otherwise you end up just wandering all over the show” (Int. # 8). This integration of current and future as well as micro and macro factors is generally undertaken in a manner that can be characterised as “calmness in the face of chaos” (from Int. #22).
The theme of ‘situational management’ has close links with the previous theme of intuitive feelings. The reliance on intuition and emotions as a means of monitoring, assessing, and signalling hazardous events is a tool that the situational manager employs to keep abreast of the changing situation. Despite the subliminal way in which intuitive mental processing occurs, it is wrong to regard this process as a passive activity. Being aware involves ‘judging the situation’ (Int. #12) and ‘having your radar tuned on’ (Int. #7). Subjects refer to the mental stress of remaining attuned to the environment. It is an active process that requires ongoing ‘management’ to ensure that it is effective, and to ensure that decisions and actions are taken in accordance with findings. It is this notion of active control over the situation that gives rise to the metaphor of the expert being a ‘manager’, although the term is deliberately chosen to reflect the conception of manager as described by Henry Mintzberg (1975). Rather than regarding a manager as a systematic, analytical planner dealing with aggregated information and in control of a formal system of operation, Mintzberg’s field studies led him to conclude that managers rely on judgement and intuition to deal with an unrelenting workload characterised by brevity, variety and discontinuity. This is more in keeping with the style employed by the outdoor-adventure manager.

The role of manager of all incoming information, decisions, and actions is a responsible one, particularly given the potential for serious consequences in the event of poor selection of a course of action. What is notable is the alacrity with which experts take on this role given their incomplete knowledge of the overall situation. The interviews offer clues that help explain their willingness and confidence. For example, the ‘situational manager’ compensates for incomplete information about future events by remaining in a state of constant vigilance. This allows them to amass detailed knowledge about the current situation, providing a body of information that can inform judgements made in contexts of risk. One mountain guide described how, after sustained attention to cues and anomalies in the immediate situation, a climb took on a “rhythm” as if he were “watching a puzzle unfolding” (Int. #12). Once a pattern in the environment has been determined, isolated cues allow the situation to be understood and future events can be predicted. ‘Situational managers’ integrate past and current situations with those aspects of the future that are available to them. In this way they are able to put in perspective new pieces of information that come to hand, as well as remaining on track to satisfy overall goals.

You sort of seem to be making decisions the whole time you’re going up. You come up against problems, work them out, go on and do them. But there’s a bit of your mind that’s ticking over and constantly evaluating the other things that are part of the bigger picture. For me, I’m always doing that. And you need to, I think. Especially in the mountains. (Int. #4)

Decision making by experts is typified by an ironic balancing of the need to make clear-cut decisions with a willingness to change decisions in the light of new information. The following comment typifies this strategy:

“My theory of the mountains is that whatever the plan is you should be prepared to change it, instantly, every minute, depending on what is going on around you.” (Int. #14)

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It may seem contradictory for a decision maker to approve of changing one's mind. However, the more experienced kayakers and guides were aware of the distinction between ongoing adjustment of a decision and indecision. Implicit in their understanding of the distinction is a perception of the natural environment as dynamic and complex. The vagaries and dynamism of the natural environment mean that it is unusual to know with certainty what will happen next. To vacillate, however, may be to court disaster. Climbers and kayakers are aware that the conditions around them are constantly changing regardless of their own actions. Therefore, they need to be aware that the features around them are in flux even during times of inaction, with potential dangers accruing with each unused moment. Also, they have with them limited and scarce resources to enable them to survive in an inhospitable environment. Decisions must be made and actions taken to minimise the time spent under threat from hazards and to resolve situations before resources run out. Without complete knowledge of the "big picture", the experienced decision maker is aware that any decisions made now need to be re-assessed once new information comes to hand. This understanding is made clear in the following quote:

One of the main things that I have learnt is that [each] decision should be reversible at a moment's notice. And that's just part of being in the mountains, and good decision-making. So, any decision only stands on the basis of the information you have. It's like you're continually evaluating. It's a process that never stops. And you change that decision on the basis of new information that you weren't able to anticipate. You do have to be prepared to change, to adapt. You have to be very flexible with your decision-making, and just make new decisions all the time. It's a continual up-dating, if you like, of the whole process as it's occurring. (Int. #12)

The tasks of situational awareness and decision making can be mentally draining, especially where contexts are unfamiliar and when outcomes are uncertain. With experience, 'situational managers' learn to devise strategies that reduce stress. Here is a description by one kayaker of how this can be achieved on the sustained and technical water of the West Coast rivers:

It's almost like a mental fitness. What I notice with people who are good paddlers is that they'll break the drops down and apply stress and anxiety to just the small pieces of it as opposed to the whole thing. Whereas the newcomer paddling that thing, like from the very first move to the last move is major stress. Whereas people who know better, they'll go "Well, I can totally switch off, I can make that boof down to there, and once I'm set up, then I've got full-on concentration for that next ten metres. And then after that, you know, sure it's funky, but I'm all over it." And so that again takes less of you. (Int. #19)

In the above example, experience and competence are prerequisite conditions for the ability to limit one's anxiety levels to the minimum necessary to allow successful negotiation of hazardous situations. There also exist less tangible ways of managing stress. The same kayaker talked of the benefits of the "power
of positive thinking” as being a means of reducing stress levels. In his words, “…so much of the ability to do that stuff is psychological” (Int. #19). In combination with positive thinking is mental simulation of the successful performance of a difficult manoeuvre, such that “you can see it all happening before you even do it” (Int. #19).

One management strategy for minimising ‘downstream’ errors of decisions is that of delaying the initiation of critical decisions for as long as possible. This ensures that the individual or party is not committed to a course of action prematurely, and offers more time to scan the surrounding environment for further clues that can inform the final decision. It also ‘buys’ time enabling the relatively slow process of conscious deliberation in search of creative solutions to a problem to take place. The risk involved in utilising a delaying strategy is that a critical decision may not be made in time to avert disaster. It is most unlikely that such a strategy would alleviate anxiety levels. In fact, it may raise tension to extreme levels in the minds of those who are not familiar with situation, or do not have trust in their ability to rectify any consequent problems associated with over-running the safety limits of the previous decision. It would appear to be a strategy best reserved for highly experienced decision makers who are confident in their ability to recognise the moment of opportunity.

So it’s almost trying to push the envelope to a point where you’ve made the decision just slightly before you got too committed. You’re making that decision just before you’ve reached the line between danger and staying safe. And that was the trick, really. (Int. #23)

Ideally I like to let the process run as long as I can until something becomes such that I have to turn it around with a tight safety margin. (Int. #15)

Once a decision has been made, expert managers of the situation see no value in mulling over the virtues and its faults of its consequences. Although reflection is an integral part of the process of self-improvement, there was general consensus among the subjects that detailed introspection was postponed until the situation at hand was resolved. The following comment outlines how one kayaker saw the post-decision period:

You may look back and go “that was a good decision”. It's interesting though because that sort of reflection doesn't tend to happen a lot in kayaking until the end of the trip or day. Individual rapids tend to, you know, it's like this sort of Maxwell Smart situation, these slamming doors just kind of come down behind you on the river, and its “OK, onto the next one”. (Int. #19)

The role of the situational manager is, ultimately, to ensure that the overall goals of the trip are being achieved. For kayakers and climbers this is normally expressed in terms of achievement and safety. For guides and instructors, their point of reference is typically that of the satisfaction of their clients and students first, and then the attainment of a technical or physical objective. Well-laid plans are only the preliminary step in attainment of these goals. In fact, rigid

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adherence to plans may result in catastrophic failure to adapt to unexpected deviations in the situation.

You have a firm goal in the back of your mind that you’re aiming to achieve. And as long as those decisions progressively lead to the attainment of that goal, each decision is very transient … it’s almost being made to last only as long as it needs to last. And then you just let it naturally pass away. And just keep evolving it, and updating it and changing it. And it’s very ephemeral in nature, because it just does arise and pass away. Something else takes its place and you just carry on as long as you’re on track, basically. You’ve got a track in your mind and you’re just making sure you’re keeping on that track. (Int. #12)

Theme 5: Guidelines, not rules

“Rules are for the guidance of wise men, and the obedience of fools.”

Sir Douglas Bader

The previous themes emphasise the importance of a legacy of experience for the decision making process. Through long practice, a repertoire of memories is accumulated and made available for access at later times. These memories become manifest in the form of intuitive or emotional feelings, or through the more conscious processes of investigation and creative problem solving. Subjects also emphasise the way that their decisions and actions evolve in response to the ever-changing situation, as stated by this mountaineer:

“I don’t think you can make rules like that. You can say, “There are these guidelines”. But I don’t know if you can say “You should do this and you should do that”. You have got to take each situation on its own merit, and then make a decision depending on what is happening at the time. It is very complex.” (Int. #5)

Reliance on guidelines rather than rules is a by-product of the interaction of experience, feelings, and situational management in typical expert decision-making behaviour. This theme describes how expert mountaineers and kayakers prefer to rely on their own experience-based and situationally-reflexive judgement as the final arbiter of what they should do. Only in especially serious situations are rules regarded by experienced decision makers as having value.

The theme of using critical cues as guidelines for behaviour rather than as prescriptions is a significant one in that it highlights the importance of individual responsibility and accountability in such activities. Mountaineers and kayakers of expert level, according to this finding, do not rigorously follow procedures and rules in the pursuit of their activities unless circumstances are dire or unfamiliar. This is despite there being considerable instructional resources available to mountaineers and kayakers that describe how best to carry out their activity. The participants are aware of this information, and are capable of paraphrasing many of the more critical learning points without effort. The kayaking subjects were familiar with sayings such as “Don’t paddle what you can’t see”, “First priority is yourself, second priority is the team, third priority is the victim”, and “If it is not meant to be in a river, don’t paddle it”. They were well versed in paddling etiquette, communication signing systems, and crisis rescue protocol.
Skilled mountaineers memorise multiple methods for placement of snow, ice, and rock anchors, and for use of ropes for ascending and descending steep ground. Winter mountaineers learn to recognise signs of avalanche instability, and systems for rescue of buried victims of an avalanche. Trainee mountain guides are assessed on their ability to conform to safe practice in a variety of conditions. In short, there is no lack of prescriptive advice for mountaineers and kayakers.

Many of the subjects did state that there were rules that they did follow. Without exception, however, these rules were limited to situations of extreme seriousness, or else were later qualified by the subjects as being guidelines that needed to be adjusted according to the situation. Serious situations involving potential loss of life in contexts of time stress were particularly noted as examples of 'hard and fast' rules. These included instances where individuals were in danger of drowning, suffocating, or falling. In such circumstances, the subjects considered it imperative that resolution of the situation be effected according to a rehearsed script. Knowledge of this script was considered an integral component of competence.

It was generally agreed that some individuals were more capable than others of taking a leadership role during such times of urgency. An explanation for this was that while the rules of a rescue apply to the 'standard' crises, not all crises are similar. Therefore, the rules occasionally need to be interpreted and applied to the particular situation. People of greatest experience were considered best qualified for this role of interpreter. Another reason may be because the rules of action for urgent situations, on analysis, offer only minimalist advice on what to do. Their intent is primarily that of prevention of further deepening of the crisis. Beyond that, the rules require that the individual adopts rational methods of analysis to develop further courses of action. The irony of such a requirement is that rational methods of concurrent evaluation take time to accomplish. The expert who uses their judgement to 'see' a solution may skip out steps in the rule-based protocol.

The subjects did mention examples of rule-based situations not involving time stress. These examples were typically of rules for application in very serious situations. The majority of these rules referred to preparatory behaviour rather than to behaviour during the activities. Both mountaineers and kayakers expect other amateur party members to be self-sufficient in terms of their basic skill, knowledge, and equipment. Experienced kayakers were scornful of paddlers new to the West Coast rivers who were not equipped for a possible walk-out in the event of losing a kayak or paddle (Int's # 19, 20, 21). Air-bags, split-paddles, maps, map-reading skills, and footwear are regarded by experienced paddlers as basic equipment on helicopter-access kayak trips. Some situations are considered so critical as to warrant on-going systems of checking to ensure that everything is correctly functioning. One climber described how, on her ascent of Everest without bottled oxygen, she followed a strict routine to ensure that she did not fall prey to equipment failure or exhaustion in her oxygen-deprived state:

> I would get into that ritual of watching, looking after myself, and going “Crampons attached ok; make sure you don't trip up”, and all those little

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things that become rituals when you are really tired. Basically you go step, step, step, step, rest, and before you start the next session of steps you check your crampons. You don’t lift them up to check them, you look at them, you check that your bails are still on. And you check that your gloves are still on, you haven’t just taken them off, and you check your ice axe, have you got your goggles and face mask on.... And [on return from the summit] I got to my tent, and I had organised everything before I’d left. I had snow inside the tent, and a stove and really fantastic sleeping bag and I just did everything perfectly. And I melted some snow and drank, and melted and drank, not because I wanted to but because I had to. (Int. #6)

Rules, therefore, appear to be mainly utilised as aids to facilitate rapid, safe and reliable response in serious situations. They have particular application as pre-emptive planning aids, ensuring that all preparatory tasks and skills-training has been accomplished. Rules are learnt in association with pre-defined conditions, and then action is taken upon recognition of such a condition. Experts are familiar with rule-based responses. Despite their detailed knowledge of recommended rules of behaviour, experts generally use them as guidelines for decisions and actions rather than as prescriptive procedures. During activities, experts switch to a process of either supplementing or even supplanting rules with their own judgement. Sometimes this may be because a strict rules-based procedure requires too much evaluation of all cues and variables in the environment:

So, I’m using the thought process, the structured process that I have been taught as a guide, to think through what possible decisions I may have to make when I finally get on the mountain. But when I get on the mountain, with ski-guiding in particular, I don’t have the luxury of the time to make another really informed, structured decision. I tend to rely more on the intuition that has come from previous experience and from trying to think through all the possible alternatives before I get there. (Int. #14).

Discussion of the validity of rule-based behaviour inevitably produced sceptical responses from the subjects. Instead, they spoke of basing their decisions on “guidelines and principles” such that their behaviour remained “flexible” and able to respond to “different situations” (Int. #13). The few claims by subjects of examples where they had used rule-based behaviour often metamorphosed on further questioning into behaviour that was influenced by guidelines, not rules. Expert subjects appear confident in their own abilities to interpret commonly espoused decrees as starting points for determining what to do given the particular circumstances. The following scenario is a typical example of a commonly cited mountaineering ‘rule’ that, on reflection, came to be regarded as informing rather than directing behaviour:

There are certain accepted practices or rules. For example, “Don’t descend a gully in the afternoon”. But then again, people stomp all over the rules. So it’s very complicated in mountaineering, because you’ve got all these micro rules, and half of them cross over each other. It’s identifying the greatest risk at any moment that’s important. ‘Cos there’s

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lots of risks. You have to prioritise. You can’t just say “Don’t descend a gully late in the day because of rock-fall”. You might have to say “We’ve got to break that rule and descend now because there is a storm coming in”. Then you’ve missed out on the storm, and even though you or your partner might have a broken wrist from rock-fall you haven’t died of hypothermia huddled in a little alcove on top of some peak. So you’ve got to balance it up. And you don’t always make the right decisions. (Int. #8)

The above quote points out how experts go about making decisions when confronted with hazardous choices. Experts rely on their experience-based knowledge to select what appears to be the most appropriate option. Depending on the option chosen, different hazards and different goals will be activated. Experts use judgement to recognise that a particular proposed course of action is more aligned with certain goals of the adventure than other possible courses of action. This is because the danger involved in carrying out this course of action, though potentially extreme, is recognised as ‘balanced’ by advantages that outweigh the danger. Other courses of action either do not equate with the successful attainment of specific goals since the compensatory advantages are not so great. Implicit in this decision process is the understanding that one cannot avoid exposure to some degree of danger. The result is the use of a decision strategy that appears to have prioritised a list of options on the basis of danger as per concurrent evaluation. Closer examination of the process reveals the use of a recognitional strategy that can be justified in terms of prioritisation of hazards. The greater the experience and skill of the decision maker, the more likely that this intuitively recognised course of action is the best option.

Without extensive experience, there is limited ability to make an efficient and accurate series of decisions based on multiple hazards and goals that shift depending on the proposed course of action. Subjects were aware of the way that their own judgement had developed over time as they gained in experience. They described how they now were able to manage events differently to how they had formerly:

As a young raw instructor there is no way I had the skills to be able to make those sort of decisions in that way. I don’t think I would have had the experience, the mileage, to have that sort of intuition or gut feelings or even the skill level. (Int. #23)

For those who have not yet built up enough experience to have well-founded judgement, the use of rules to direct behaviour may be reassuring. From the perspective of skilled participants, rules are a limited and static way to deal with complex and dynamic situations. A classic example from the interviews of inappropriate rule-following was that described by a civilian instructor working alongside a relatively inexperienced Army abseil instructor. The civilian noticed that the Army instructor’s student was suspended from the abseil line by a non-load-bearing part of his harness. It was a situation that required an immediate response. For both instructors it was a novel situation. The Army instructor “froze” (Int. #20), and could not come up with a course of action. The civilian instructor described how his own reactions in designing a rope-rescue system to rectify the situation were immediate and “instinctive” (Int. #20), whereas the
Army instructor was stymied because of lack of knowledge and skill beyond set procedures that did not cover this unusual situation.

So this guy had learnt how to abseil people by the Army check-list, rule-book method, you do x, y, z, and you do these checks 1, 2, 3. Well, he obviously did his checks, but he didn’t see what he saw. The Army guy was working at his limit. He had zero personal climbing experience. He had only done a course, and popped out the other end and thought he could take people top-roping and abseiling, and basically nearly killed someone. (Int. #20)

Rules cannot take into account all the possibilities that may eventuate, and rules do not allow for invention of creative solutions to unusual problems. The assumption can be made that experts avoid strict adherence to rules unless absolutely necessary since they do not believe that this is the way to self-improvement and the perfect performance.

CHAPTER SUMMARY

The activities of expert mountaineers and kayakers can be summarised in terms of five characteristic themes. The overriding theme is that of striving to emulate a mental vision of what constitutes excellent mountaineering and kayaking practice. In order to make progress towards the goal of perfection, the participants demonstrate other typical forms of behaviour. These include the accumulation of extensive experience of a largely applied nature (‘long practice’), the use of intuitive and emotional feedback mechanisms (‘feelings’), the application of evolving decision-making practices that reflect environmental variability (‘situational management’), and reliance on a philosophy of experienced-based judgement to prioritise decisions rather than the use of rules.

Experts also employ specific strategies designed to support the process of making decisions. The largely intuitive and emotional monitoring and assessment processes are supplemented by more conscious forms of mental processing during times of unfamiliarity or whenever significant deviations from the ideal performance look probable. Following decision making and action, experts regularly re-assess their performance in order to pin-point where possibilities for future improvement may be made. This reassessment takes the form of personal reflection and, where possible, discussion and information-sharing with peers. Participants also utilise opportunities such as formal training courses, literature, and audio-visual technology to supplement their personal activity. See figure 5.1 below for a diagrammatic representation of the integrated nature of these dominant thematic depictions of mountaineering and kayaking behaviours.

The use of the ploys of long practice, feelings, and situational management, plus general adherence to a philosophy of judgement-based behaviour and a goal of continual self improvement have the effect of providing experts with outcomes that would otherwise not be so assured. Very importantly, one of
these outcomes is safety. By constantly refining and extending their technical skills, knowledge, and understanding, experts lessen the prospect of entering a situation for which they are unprepared. This in turn allows experts to continue to enjoy their activity – both for reasons of satisfaction at incremental gains in improvement, and satisfaction at succeeding in a risky endeavour.

This chapter has provided a description of what it is that expert mountaineers and kayakers do, and has also suggested functional outcomes of these behaviours. The next chapter examines links between theory and practice in outdoor-adventure decision making.
Figure 5-1 Dominant themes of practice for mountaineers and kayakers
CHAPTER SIX

RPD IN THE OUTDOORS

“The mountain has a soul which I can feel with a kind of sixth sense... I check everything that is happening with my third eye. I rely totally on my intuition.”
Tomaz Humar - extreme alpinist (Climber, 2000)

CHAPTER OUTLINE

Conventional decision making theory has been criticised for its inability to account for the way competent people make decisions in their everyday lives. NDM researchers argue that experts make decisions using mental strategies that are qualitatively different from those proposed by rational-analytical decision-making perspectives. NDM researchers regard classical approaches as being misapplied beyond specific situations where domain experience and/or knowledge are irrelevant, or where a definitively correct outcome is essential. NDM models propose alternative conceptions of the process of making up one's mind based on observation of expert performers who are able to apply high levels of skill and experience to familiar but dynamic environments.

Klein's (1989) recognition-primed decision-making model is the best known of all NDM models. RPD represents experienced decision makers as usually capable of determining a workable course of action as the first one considered. The decisions that are made are based on recognition of typicality and on intuitive understanding of the situation. These features are in turn based on experience and knowledge. Diagnostic and mental simulation strategies are used to clarify the decision process if the situation is unclear. Diagnosis and mental simulation operate on each proposed course of action in turn, without comparing options for action. RPD is regarded as especially appropriate in circumstances characterised by time pressure and ambiguity (Klein, 1989).

The aim of the chapter is to explore the relevance of the RPD model to decision making strategies of skilled and experienced mountaineers and kayakers. This is accomplished by comparing observations of the decision-making behaviour of mountaineering and kayaking practitioners with key defining features of the RPD model.

RPD AND OUTDOOR ADVENTURE

Re-introducing RPD

In chapter two a summary of the RPD model was presented. In brief, the RPD model describes a hypothetical set of specific decision strategies used by experienced decision makers to devise effective courses of action in situations characterised by incomplete information and pressures of time and/or consequence. Depending on the level of complexity of the situation, the RPD model outlines three progressive stages of mental deliberation. The initial stage is that of immediate awareness of what to do ("simple match") (Klein, 1993, p. 141). More complex situations may require further probing of the situation for
pertinent information ("diagnose the situation") (Klein, 1997c, p.285).
Complicated, unfamiliar, or serious situations may involve assessment of
imagined courses of action before implementing them ("evaluate a course of
action") (Klein, 1997c, p. 286). All three stages utilise a recognition process to
identify a proposed course of action.

The RPD model details four defining features of decision-making behaviour as
performed by experts. First, experts are ‘primed’ to recognise “prototypicality” in
a situation. Second, implicit in the process of judging a case as typical are the
strategies used by experienced decision makers to gain "situational
understanding" of plausible goals, critical cues, expectancies and typical actions
in order to establish what is going on. Third, experts tend to generate and
consider carefully one option at a time, rejecting each option in turn if necessary
until a satisfactory one is found. This is referred to as “singular evaluation”.
Fourth, mental simulation is used to diagnose the cause of the present situation
and to imagine and evaluate the deployment of a preferred course of action in
the current circumstances (Klein, 1989).

The familiarity and complexity of the situation influence the activation of the four
defining features. In the case of a “simple match” strategy there is no activation
of the element of mental simulation because of the high level of intuitive
understanding of the situation as well as the implicit awareness of an
appropriate response. What is happening ‘now’ and what needs to be done
‘next’ are immediately self-evident to the expert because they are recognised as
“typical”. If the situation requires greater investigation, then feature matching
and story building are employed in order to decide if the current situation is
congruent with past experience and with expected events. Once this is
achieved to the expert’s satisfaction, then the course of action becomes
obvious. Occasionally, the anticipated outcome of a course of action remains
problematic. If so, the decision maker mulls over the preferred plan and tries to
imagine how it can be adjusted and made to work in terms of the situation and
the overall goals. If it is rejected, then the next most likely option is considered
according to the principle of “singular evaluation”.

The RPD model’s four defining features of prototypicality, situational
understanding, singular evaluation, and mental simulation provide a structure
for the search for evidence of recognition-primed decision strategies. This
structure will be used to direct investigation of interviews and observations
involving expert mountaineers and kayakers in order to explore the basis of
their decision strategies. Each of the four defining features will head a section of
analysis.

Prototypicality
Klein (1998, p. 89) claims that a basic characteristic of recognitional decision
making is that experienced people can “size up a situation and judge it as
familiar or typical [usually] so quickly and automatically that [they] are not aware
of it”. Klein (1989, p. 51) refers to this characteristic as ‘prototypicality’. The
essential feature of prototypicality is the use of intuitive understanding based on
past experience to recognise critical situational features (‘cues’) and appropriate
responses (‘actions’). This may happen almost instantaneously. Alternatively, it may require an evaluative process in order to confirm what is going on and what should be done about it. Prototypicality relies on the ability to recognise critical features and reconstruct them as patterns that have meaning and relevance to the situation at hand.

Prototypical decision behaviour is most evident in the “simple match” decision strategy of RPD. The instant recognition of typical situations within a given situation, and the equally immediate identification of typical ways of responding, allow efficient and effective “simple match” decisions in stressful and challenging circumstances, whereas under the same conditions non-experts make mistakes (Calderwood, Klein, and Crandall, 1988; Klein, Wolf, Militello, and Zsambok, 1995). In situations of greater complexity, understanding of expected occurrences and outcomes is mediated by mental simulation according to the same principle of singular evaluation.

The use of decision making strategies based on recognition of typical features is a non-rational process that can be equated with an instinctual or even emotional response. Experienced decision makers trust themselves to ‘just’ know what to do without comparing options.

I tend to go with instinct a lot, so, what you feel is instinctively right is often the best way to work.... I went with what was happening, and what I felt was best for the clients on the mountain. (Inst. #9)

There are marked similarities between the making of “simple match” decisions in situations recognised as prototypical and descriptions of the state of flow (Csikszentmihalyi, 1975). Characteristics of flow include the clear exposition of goals and feedback, and the merging of action and awareness. Csikszentmihalyi and Csikszentmihalyi (1990, p. 150) describe a person who is experiencing flow as someone who...:

“...knows clearly what must be done, and gets quick feedback about how well he or she is doing...it is possible to foresee the results of alternative actions...However, there is no pause to evaluate the feedback, the person is too involved with the experience to reflect on it. Action and reaction have become so well-synchronized that the resulting behaviour is automatic.”

Competent mountaineers and kayakers who are performing in challenging circumstances are acknowledged as capable of operating in a state of “flow” (Csikszentmihalyi, 1975). Subjects of this study occasionally referred to deep levels of concentration and awareness when making decisions based on intuitive methods that closely resemble characteristics of flow. The following comment is an example of this:

Generally, on a route you tend to get in a very positive frame of mind. Once you’re there, you’re there. Especially once you’re committed, or I find the higher you get, you really do get focused on going up. You get to the point where you sort of seem to be making instant, obvious decisions

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as you’re climbing up. It seems to me you come up against situations, but most don’t seem to need thinking about, ‘cos you just go on and deal with them. They’re not really even decisions. But in the back of your mind you’ve got a bit of you’re mind that’s ticking over and constantly evaluating the other things that are part of the bigger picture. For me, I’m always doing that. And you need to, I think. Especially in the mountains. (Int. #4)

For this climber, the absorption in the activity has the effect of raising his intuitive level of awareness to the point where he is able to act without deciding to act. His further comments to the effect that he is constantly monitoring the “bigger picture” suggest that a bi-level process of attentiveness is in operation. On one level of cognitive awareness, the decision maker is deeply immersed in the activity such that she or he is in a state of flow, and is able to respond intuitively to circumstances using “simple match” (Klein, 1993) strategies of prototypical recognition and response reactions. On a secondary level, the decision maker is reflecting on the link between immediate, intuitive behaviour and the longer-term situation that includes likely up-coming events, past events, and over-arching goals.

The evidence above suggests that the ability to use “simple match” decision-making techniques is enhanced when experiencing a state of flow, with the flow experience dependent on the perceived level of challenge. One assumption that may be drawn from this is that, over time, a decision maker will vary in his or her ability to respond intuitively when confronted by difficulties because of fluctuations in their competence level that influence the level of challenge that they are experiencing. During times when their competence level is deficient they will find it difficult to achieve flow, with associated difficulty in making rapid, intuitive decisions. Evidence from kayakers suggests that one’s mental competence is equally as important as one’s physical competence for the smooth performance of an activity. The combination of mental relaxation and concentration that is required for intuitive decision making to occur as a result of flow was described by one kayaker as equally a function of one’s “mental fitness” (Int. #19) as it is a function of one’s physical abilities. Comments by kayakers point to mental fitness being a variable factor that is affected by experience and training:

The more I do, the more comfortable I get with longer runs. So at the beginning of the season, I only deal really well with a smaller amount of high stimulus. Whereas at the end of the season I can deal with a lot greater amount of stimulus before I hit the same level. It’s knowing that you’ve done it before, knowing that you can do it, knowing that you’re in tune, that you are now paddling fit, that it is all feeling good and coming together. It’s being current. Quite often it’s just a matter of staying

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1 Flow is critiqued by Dörner (1989/1996) for its power to seduce one into following irrelevant goals. Dörner argues that fascination with flow can lead to the performer becoming enmeshed in projects that are chosen for their ability to produce emotional satisfaction rather than for their importance. This study argues that experts are more capable of keeping a ‘weather eye’ on the big picture than less skilled and experienced individuals. In effect, this ability to maintain a roving awareness on goals that are important to the current context is one of the hallmarks of expertise.

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focused, not goofing off, staying with the here and now and not worrying
when it's going to finish.  (Int. #20)

The same heightened level of awareness and response is described by another
expert kayaker following a two months' stint of intensive paddling at an extreme
level of difficulty:

I'm just all smiles and I'm laughing. 'Cos people are going "Is this class
five?" And I go "I don't know what class five is any more", you know, it all
felt like class 2 'cos you're having such a good time. And those days are
the best days when that's happening. When you're out there in gnarly
class 5 water, and you're smiling, thinking this is just the easiest sport in
the whole world. And if you can hitch into that train of thought, then it's all
good, because so much of the ability to do that stuff is psychological.
You know, the best days are when you make those lines, and you know
absolutely 100% that you are going to go off that little rib, and you are
going to keep the deck clear of water, and you're going to boof this next
ting and land in that eddy. And then you go down there and it's just like
that -- you can see it all happening before you even do it.  (Int. #19)

What this kayaker is describing is an advanced state of familiarity with his
environment. No diagnosis of the situation or evaluation of responses appear to
be required in order to operate at the highest level of competence. The same
kayaker was struck by the phenomenon whereby physically capable kayakers
caved in under the mental stress of sustained paddling on difficult and serious
water. Invariably, these kayakers were "new to the [West] Coast, or new to hard
paddling every day" (Int. #19). He continues:

Physically and technically they were all there, yet they were just like "I
can't do it any more", and they'd get to this totally unseen and intangible
point, and they'd suddenly start walking rapids no harder than they had
been paddling up 'til then, but their brain has just gone... And it's almost
like a mental fitness.....And so it was really interesting just watching
people do that, switch off, they just started walking rapids not because
they were physically tired, but "No, no, I just can't be bothered thinking
anything". And they just ran out of food for their brain.  (Int. #19)

Another kayaker describes how her levels of mental awareness are worn down
when she paddles sustained sections of rapids that are of a level of difficulty
that are at the top end of her own level of competence:

I think that on the Perth, towards the end of that three km stretch, by
which it would have taken a couple of hours at that point, now you are
really feeling like you are working hard to focus on what you needed to
look for. Rather than just being overwhelmed by the look of the rapid, you
have to work really hard to break it down and make good decisions all
the time... You just might be so mentally exhausted that it is like "I don't
want to come close to my limit now. I feel too tired to push that hard."

Q'n: Can you remember that happening?

Answ'r: Definitely on the Knuckle Grinder It was like "I feel really happy
to have made good decisions up till now, and paddled what I feel is really
well up to now, and this can wait another day". So you do bring it into that
decision, and it is just recognising what is going on in yourself...The Cess Pool on the Arahura is [also] like that. It is pretty much the last rapid, and not as hard theoretically as some of the ones up higher. It looks a lot worse, but it does feel like you get to that point, "Oh no, it is too close to the end. It is too easy to walk." And I guess it is because I think to make really good decisions in paddling you can't look at it purely from a logical point of view. You have to bring into that how you are feeling and how mentally tired you are, rather than that being a set of "x" skills matched up with "y" technical difficulty. (Int. #17)

An interpretation of the above comments is that it seems likely that as the kayakers progressively become mentally weary they are unable to remain in the state of flow. This leads to consequent loss of ability to make instant decisions through intuitive means. An incorrect decision or a slowed reaction time will probably have serious consequences in class 5 and class 6 white water. Without the essential ability to respond reflexively to the dynamic requirements of rapids of such severity, the kayakers have to discontinue the activity until their minds are refreshed and they can once again attain the state of flow.

The above comments regarding the importance of mental fitness emphasise how optimal levels of challenge, psychological response, and intuitive awareness are interrelated. In the previous chapter the presence of intuitive and emotional feedback ('feelings') were highlighted as one characteristic of expert decision making. Feelings arising from observation of situational cues or from consideration of courses of action were proposed as being based on memories of similar events experienced in the past. There are mutual reinforcing factors at work here. Experts, by definition, know a lot about the domain that they are working within. This in turn allows them to take high-stakes decisions with relative confidence. Their expertise also grants them full awareness of the serious consequences that may arise as a result of missing key cues or opting for inappropriate courses of action. Consequently, decision-making processes are readily associated with strong emotions, as expressed in the following comment:

_I reckon good decisions feel good, and I think you get that emotional response 'cos your life's on the line. And you can feel really clear about something, yet you might have trouble justifying it._ (Int. #10)

Not all feelings are pleasurable. They may also be intuitive warnings similar to the "waving flags" (Int. #23) mentioned in the previous chapter. The sensation may not be verbalised in any meaningful way, and yet the meaning of the sensation is understood. Klein's explanation of similar sensations is that they are products of the recognition of typical patterns that indicate the dynamics of the situation (Klein, 1998, p. 31). Patterns are composite bundles of salient cues recognised as typical on the basis of what cues are present as well as because of the absence of disconfirming cues. The complexity of patterns and their context-specific nature makes it impossible to use them as rigid templates. Consequently, they are difficult to record or describe, and judgement is needed in order to interpret any arrangement of cues as forming a pattern of significance. However, various combinations of cues may form patterns that
have similar emotional meaning, allowing them to be categorised into a few basic feelings. Feelings, in turn, can be summarised in a succinct verbal message. This phenomenon is described in the following comment from a kayaker:

You look at the water and you know whether you have a really good feeling and whether you can make that move. Basically I have got a little voice in my head that says, "No, don't do it today". And sometimes it is something I have done before, but if it doesn't feel right today, the voice says "No", and it has usually kept me safe. (Int. #16)

The implication arising from these various comments is that emotional recognition of cues and responses forms part of the same intuitive recognitional response that Klein describes as "prototypical". Another suggestion of this section is that emotional responses are dependent on a careful matching of physical and psychological competence with danger to ensure that a satisfactory level of challenge is maintained. It is important to remember that the reliability of the intuitive understanding that is evoked by emotional response is dependent upon the relevance and degree of experience of the decision maker.

The importance of the connection between possessing a repertoire of experience and the capacity to make reliable intuitive decisions is not always apparent even to the decision maker. Klein (1998, p. 31) mentions the difficulty that decision makers often have in allowing themselves to trust their own intuition since it seems so "accidental". Klein describes how other decision makers interpret their ability to intuitively "know" what to do in situations where there are no obvious situational cues as demonstration of their ability to use a "sixth sense" (1998, pp. 32-39). In each case Klein uncovers previous experience that allowed the decision makers to intuitively recognise key cues or anomalies in the current situation. The last account in this section describes an intuitive response that saved a person's life. The point of the account is not to debate the authenticity of extra-sensory perception, but to highlight the significance of the interaction of expertise, challenge, and heightened emotional awareness in allowing people to make intuitive-based decisions efficiently and effectively in familiar but dynamic environments.

There was this big storm, and we had to down-climb the face of this mountain. This was from 22,500, to say 17,000 feet. We couldn't work out a way down, we had no rope, and it was complete white-out, with all these avalanches. So we dug this snow cave, and it collapsed in a big avalanche and JM got bowled and carried downhill but not buried. And you know how everything is really hard to find under debris, a completely smooth surface? Well, I am buried under there somewhere. And how could anyone run up this slope? It was deep bottomless stuff, yet JM powered up the slope. And he just went straight to one place – he has no idea why he went to one place – and dug. And found me straight away. (Int. #6)
Situational understanding

Klein (1989, p. 51) claims that familiarity with a context is associated with a greater likelihood of noticing disconfirming evidence. If the situation is judged not to be a good match with typical events, then more complex diagnostic and evaluative strategies are employed that involve story building, the checking of anomalous events, and mental simulation. All these RPD processes are underpinned by the notion of situational understanding (also known as “situational awareness” and “situation assessment”).

Situational understanding is the process by which information is used in order to establish what is going on (Klein, 1989, p. 52). The information comes in the form of plausible goals, critical cues, expected occurrences, and typical actions. Specific goals are evident (allowing priorities to be pre-set), important cues are readily distinguished (thereby limiting information overload), forthcoming events are expected (facilitating preparation and planning), and typical ways of responding are well-known (allowing easy recognition of a likely course of action) (Klein, 1998, p. 24). Klein points out that since recognitional decision making occurs in contexts of changing situations and shifting goals, then decision makers need to monitor the effects of their actions in order to update their situational understanding (1998, p. 53).

Chapter five included a description of the way that experts manage situations in the face of incomplete information and changing circumstances (described under the theme of ‘situational management’). In the midst of uncertainty and changing circumstances, experts are able to isolate the salient pieces of information that allow the “puzzle [to] unfold” (Int. #12), and the “big picture” to remain “clear” (Int. #8). What is apparent from accounts given by expert performers is that their seeking of information is an active and ongoing process. There are two meanings to this statement. First, the situation is almost constantly being scanned for relevant cues that will trigger an intuitive response. Second, awareness of what is going on in the situation is something that is shaped and formed, and that changes over time as new information becomes available. This observation supports Klein’s explanation of how experts use situational understanding to make decisions in dynamic environments.

Evidence for the active formulation of situational understanding from the perspective of mountain guides is presented below. One feature of mountain guiding is the unequal level of knowledge and skill that almost always exists between the guide and her or his client. The greater experience of the guide compared to the client, the training that he or she has undergone, and their familiarity with local features means that they are the experts in the team. The level of skill and awareness of the client remains an unanswered question in the guide’s mind until a variety of situations have been experienced. The ability of the client is a critical variable in any decision-making process undertaken by the mountain guide. Therefore, the mountain guide engages in intensive examination of the client’s abilities.

I'm always analysing my clients when I'm moving into terrain, whether I've been with them for three months, or whether I've been with them for a day, it's something that goes on in my head all the time. (Int. #9)

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You rely on a combination of things. Including the client's skill level. With another client with everything else exactly the same you might choose to use a different technique because your assessment of their capabilities comes into it. (Int. #10)

[Talking about maintaining client satisfaction] ....Primarily, what's involved is communication. It's almost like a monitoring of the client's emotional state as much as you can to see that they are going to have a successful trip. And what a client often goes into the hills with, in terms of physical objectives to have a successful trip, they down-grade or up-grade or change, based on their experience of the moment. They might just decide that they're happy just being in there, even if it's attempting lesser objectives than they had initially planned. Or perhaps, in order to have a successful trip, they need to climb harder objectives. So it's very much related to keeping in touch with the client's feelings. So there's a lot of on-going communication there, and looking for feedback on that. So a very difficult process when you've got a very quiet person who doesn't express their emotions.

Q'n: So it sounds like it requires active participation on your part?
Answ'r: Yep. Very active. Asking a lot of open-ended questions, leading questions, and just quite frank discussion about how they're feeling, and how things are going. It has to be a dynamic process, because often what happens is a client's perceived perception of what they want to do or need to do in order to have a happy time turns out to be different from the actuality of when they're in the mountains, and adapting that to weather conditions and snow conditions and whatever. A very dynamic thing. (Int. #12)

[Talking about good mountain guiding practice] .... all of these things are going back to a lot of what I've been talking about in terms of guiding is about observing things, and each time you get a different client then you must observe the client. (Int. #15)

I'm always looking at the client and asking myself how good they are on their feet, and whether I can hold them if they slip, how can I mentally take them over this kind of thing. It's the kind of thing that perhaps an amateur climber would never even think of, but as guides we’re really aware of it. (Int. #15).

The task of being aware of one's surroundings, while active, is not necessarily a conscious one. Comments from mountain guides give the impression that it is an underlying intuitive sensory power, similar to a radar system constantly sweeping the event horizon. The cues to which the mountain guide is attuned can form patterns that are not readily interpretable as explicit knowledge, but instead give rise to feelings in a similar way to those experienced during the state of flow:

[Being aware] is a question of maturity, it's a question of observation, sometimes its almost a question of, it's fair to say, 'feel'. And you get that
as a guide, if you’re roped to someone you feel through the rope if you like how they move, especially short-roping. And it’s being sensitive to small indicators, body language, tone of voice, observations about people. (Int. #15)

The judging by the mountain guide of the client’s ability must be integrated with the other situational factors:

*What you’re judging is the combination of the client’s sure-footedness and comfort level and your ability to watch and monitor that, plus your ability to respond should they trip or slip. So you’re juggling that. You’re also looking at the terrain ahead trying to pick the line that gives you the best option, like the lowest angled slopes, the best footing, the best positioning of the client. And you’re keeping an eye out for the weather. With another client with everything else exactly the same you might choose to use a different technique because your assessment of their capabilities comes into it. So, there is judgement involved.* (Int. #10)

The seeking of information about the climbing ability of clients generally begins far earlier than the first steps on the hill. The following account describes how the guide’s mental picture of her or his client’s competence can begin to form the instant they meet, and then continue to develop:

*Q’n: With the clients who were less capable than they had described themselves, how did you come to realise that?*

*Answr: In many ways it happened when we met in the airport [laughs]. We hadn’t gone long before the other guide and I realised that we had a couple of, to put it bluntly, bullshit artists. And once we started the walk-in it really did become apparent even on very moderate ground that what they said they had done and their boastfulness didn’t amount to anything at all….Certain little things like watching the client’s reaction to first seeing a climb will tell you a lot about whether they’re overawed or really nervous or confident.* (Int. #15)

Once the climb is underway, the guide must continue to upgrade his or her awareness of the client’s physical and mental condition. One guide described how he deliberately established a communication system with a relatively unskilled client in order to make it easier to monitor the stress levels and physical competence of his client:

*I also try to pick up on how [the client] is internalising things, how he’s feeling emotionally, how his confidence is. And so one of the successes of that climb was my helping [the client] to be totally open about how he was feeling. And that was something I tried to build on. I think the words I actually used to him were, “This whole climb today is going to be about trust. And what I want you to do is to be totally open with me, and feel relaxed about telling me how you are going and how you’re feeling, about whether you’re worried, any concerns you have or whatever”. And we just kept checking in like that. A lot of the decision to keep climbing was based on that communication.* (Int. #23)
Many other examples of mountain guides seeking to extract information verbally from their clients were witnessed during the researcher’s periods of observation. In New Zealand, and unlike Europe, the mountain guiding tradition strongly endorses the establishment of a rapport between guide and client. Reasons for this development probably include the far more intimate nature of the living arrangements in New Zealand mountain huts compared to the segregated arrangements in the European Alps. Also, the distinctive features associated with the New Zealand alpine environment may help to shape this tradition. Isolation, loose rock, heavily glaciated terrain, changeable weather, and long approaches are risk factors that local mountain guides may strive to manage by, among other strategies, maintaining a high level of awareness of their client’s fitness, stress levels, and technique. Gauging the on-going wellbeing of their clients requires of guides that they inform them of the general plans and objectives of the undertaking.

It is at this point that the mountain guide needs to remember the purpose of the process of situation assessment in which she or he is engaged. Situation assessment is performed within a context, and for mountain guides the context is that of leadership. As a leader, it is imperative that the guide realise the difference between seeking opinions from clients regarding a proposed course of action, and allowing the clients to dictate what shall be done next. This distinction is strongly expressed in the following comment:

As a general rule I always share the plan with the client so they have some idea how the day is going to unfold. However, I will never present it in a way that has room for their input, in terms of safety. It’s very important that the guide stays the decision-maker. You are being paid for the responsibility of decision-making and you should not try and divest yourself of it, in a more discussion-orientated sort of way. (Int. #14)

Another observation from the field that relates to situational understanding is the role of story telling in supplementing and even creating awareness of significant situational factors. As mentioned in the previous chapter, mountaineers and kayakers often engage in discussion or reading about the exploits of others. The role that these stories play in informing participants about key hazards and behavioural responses is likely to be considerable. Stories (or ‘narratives’ as they are often referred to in academic literature) are more memorable than lists of hazards or procedures. Stories provide drama and context to make the key points more interesting and salient, and the listener is able to identify with the actors in a way that is not possible with bald directives. The point of story telling is often a message or ‘moral’ concerning what to do or not to do, but the contextualised nature of the story precludes simple reformulation as a rule. The best of stories become legends.

In this way, stories pervade the consciousness of participants’ imaginations, and shape the way that they think and feel about what they may do and where
they may do it\(^2\). This has the effect of creating a set of expected occurrences (e.g., environmental phenomena, behaviours, and emotional responses) even though the individuals listening to the stories may not have personally experienced the actual events. Much of the information that made up the participant interviews that informed this study came in the form of stories. Interviews often began with the subjects being asked to recount a recent mountaineering or kayaking experience. From this beginning, the subjects continued to describe story after story, often in great detail. Questions from the interviewer concerning concepts were regularly answered as a story. The specific context and the definite end-point of the subjects’ stories give them a metaphorical power that makes them useful as identification and prediction devices in ‘real’ situations. In effect, stories communicate group understanding about situations to individuals who haven’t been there themselves. This vicarious experience supplements or even creates one’s understanding of what to expect about a situation, as well as what to notice as missing or anomalous in some way.

**Singular evaluation**

Singular evaluation is based on Simon’s (1957) satisficing strategy (Klein, 1998, p. 20). A situation is judged initially as prototypical, with consequent understanding of a likely course of action. The attributes of the likely course of action are evaluated independently from attributes of other possible courses of action. Comparison of courses of action, also known as concurrent evaluation, is deemed by Klein to be seldom used by experienced decision makers. This is not because experts do not want to compare options; rather, it is because they do not need to (p. 17). The singular evaluation process may determine that the effectiveness of the likely course of action is not immediately self-evident. If necessary, the proposed action is imagined being carried out with special attention paid to problems that might ensue, in accordance with the process of “mental evaluation” (Klein, 1989, p. 51). If it is found lacking, then that course of action is discarded and the next most likely course of action is independently considered according to the principle of singular evaluation.

In this study, subjects were not directly asked if they used singular or concurrent evaluation strategies. Instead, subjects were asked open-ended questions about general issues. This was done in order to avoid the possibility of retrospective revision of the subjects’ behaviour though rationalisation and justification. As a result, there are very few comments that directly state use of one strategy or the other. However, interpretation of subjects’ interviews and behaviour does demonstrate that mountaineers and kayakers prefer to use domain knowledge to evaluate preferred courses of action in a serial fashion rather than choose between several alternative options.

Participant interviews contained many examples of a "step-by-step" (Int. #23) decision making process reminiscent of Simon’s (1955) satisficing strategy and

\(^2\) The role that mountaineering and kayaking stories play in linking behaviour with environmental hazards has many parallels in social science; e.g., the role of religion (including song-lines) for Australian Aborigines in linking economy and ecology.
Klein's (1989) singular evaluation strategy. The implication is that because of the high degree of uncertainty and dynamism in the outdoor environment, it is not possible to make optimal decisions. A more effective strategy is one that monitors and acts on the current situation, as long as this is in keeping with the "big picture". In this way, decisions are allowed to evolve. This concept was mentioned in the previous chapter under the heading "situational management", with the suggestion being that outdoor adventure experts are the outdoor equivalents of industry managers who operate in circumstances characterised by brevity, variety and discontinuity. The following two comments supporting this notion are characteristic of many others:

Q'n: What do you mean when you say that you "choose an option"?
Answer: I don't know. I guess you make a certain decision, and if that does blow up in your face hopefully you're going to have room to fix that with another decision.
Q'n: How far ahead?
Answer: Well, only as far as that first decision takes you, because it is pretty hard to make any more scenarios than that. (Int. #5)

You set short goals. And you make a decision as you achieve each goal. And so the first thing, you get the kids out of the bus and you walk along the valley floor, and think "They all seem to be going ok". So the next goal is to get them up to the saddle, and the forecast isn't good but the front hasn't arrived yet. So you get them up to the saddle, and they're all going well and the weather hasn't changed. And you set these little goals, and each time you achieve a goal you're able to modify the decision in some way. Whether it is to turn back, do something entirely different, go and do an alternative peak, or to carry on. So, because the environment is such a variable, the weather, the fitness of the client, the snow and ice conditions, you don't always know how good the freeze is going to be, I don't think you can make a one-off decision. So it's a case of making a whole series of decisions and breaking the main goal down into lots of little goals. And at any point you may just abandon the whole trip. You may get to just about the final decision goal, just below the summit, but for some reason you pull out. So you couldn't quite make the big goal. But you've got that far by making decisions on the run. (Int. #23)

The strategy of making a series of independent and situationally-limited decisions that are capable of evolution as more information comes on-stream has strong similarities with descriptions of singular evaluation. Both strategies trade accuracy for speed. This is because there is recognition that not all the information is available to the decision maker, but, nonetheless, decisions must be taken. It is also recognition of how the act of behaving on the basis of decisions that have been taken alters both the set of information available to the decision maker, as well as the goals that direct decisions. The acceptance of the recursive nature of decision making and behaviour provides a rationale for allowing sub-optimal decisions to be made.
Some situations are not so straightforward to allow immediate recognition of a typical response. The next example is a description by a kayaker that describes deliberation over how to react during a serious and time-pressured situation. Two potential courses of action are considered. The first option considered was mentally evaluated, found wanting, and discarded. Next, another decision was independently considered and accepted. This conforms to Klein’s hypothesis that expert decision makers evaluate options in a serial fashion rather than in a concurrent way:

Q’n: Can you think of a critical situation that you have been involved in recently?
Answr: I’ve observed Peter getting stuck in a hole. Which he got himself out of. Immaculately.
Q’n: And what were you doing while Peter was stuck?
Answr: I was about 5 feet away from him trying to decide whether to give him the end of my boat if that was physically possible.
Q’n: And when you say you were trying to decide, what were you thinking?
Answr: Whether I’d get sucked into the hole as well. In the end I got out and got a throw bag by which time he’d got himself out, but I was in position to throw a rope to the next person who got stuck in the hole.
Q’n: So you were sitting there, just a couple of metres away from Peter who was re-circulating in a rapid, ....
Answr: Right. Doing multiple enders and cartwheels . . .
Q’n: Uuhh. And you had options...
Answr: Two. One, to give him the end of the boat, but I could have got pulled in which would have made things worse. And giving him the end of the boat wasn’t that easy ‘cos he kept shooting backwards and forwards 10 metres across the hole. It wasn’t like he was stuck sideways and braced at any point. He was very dynamic; he was all over the show. He would have rolled 15 times, at least. So I decided not to. The other option that I considered next was to make a ferry, get out on a rock, get the throw-bag. By the time I’d done that Peter had got himself out. But if the next person got stuck I was in a good spot. (Int. #21)

Note that each option is evaluated for effectiveness in turn. The first option (the attempt to offer Peter the nose of the subject’s kayak) was mentally simulated, but the chances of success were low and so this was rejected. It was then that the subject evaluated the next option (to get out of his kayak and organise a throw-bag rescue). The rugged nature of the gorge in which the situation was occurring meant that this was a more time-consuming option to fulfil than the one previously considered, which may have been why it was not ‘recognised’ as the first option. What is also of interest is that this kayaker is using a deliberative strategy rather than immediately adopting the first option as a good course of action for him to follow (which it would have been in water of lesser severity). This evaluation presumably takes place because of the prospect of serious personal injury in the event of the selected course of action proving to be ineffective in this particular situation. It may be surmised that the ability to discriminate between recognising proposed courses of action as immediately viable versus requiring further diagnosis is a function of expertise.

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Adventure is characterised by uncertainty of outcome (Mitchell, 1983). One aim of adventurous activities is the strategic use of one's skill and experience to reduce uncertainty. In the domain of kayaking and mountaineering it is common for situations to involve a high degree of uncertainty of outcome regardless of the proposed course of action selected. For mountaineering in particular, the variety and number of hazards means that this may be the case regardless of the ability of the performers. For kayakers, the dangers are (relatively) more discrete and predictable (although still considerable), and therefore more tightly linked to personal ability. The nature of the mountain environment is such that there are often hazards that no amount of skill or experience can reduce to a level that will guarantee a certain outcome. Ice cliff avalanches are one such hazard. Furthermore, it is common for multiple hazards to be in evidence at any one time. This is not to say that the particular course of action that is chosen does not matter. The actions that are taken generally mean that certain hazards become more or less relevant. For example, wise mountaineers who choose to pass under ice cliffs will consider moving swiftly rather than slowly to minimise the time period for which they are exposed to danger. However, to do so may increase the chance of tripping and falling, or perhaps it may limit the ability to take precautions against hidden crevasses. At such times, experts are wary of relying on rules to define actions. Instead, close attention to the situational circumstances provides the key to making decisions that may contravene rules set in place for the use of less experienced performers.

In the following quote, a mountain guide reflects on comparisons between guiding techniques that give rise to quite different dangers. The comment refers to the use of slow and secure fixed-belay techniques versus fast but insecure short-rope techniques for one small but critical section of a guided ascent of Aoraki/Mt Cook:

"[Fixed] pitching the Shelf protects against a fall, but there are other priorities you have to consider, such as getting to the Summit Rocks before the sun gets on them and you get rock-fall, or people get ahead of you and you get debris kicked onto you, or even being exposed to ice-cliff avalanches from the Mini-Gunbarrels. So I think that you are still in a compromised situation. You may short-rope the Shelf, but no matter how good the client, when you're roped to someone else you always have an element of risk. And you just have to minimise that risk by observation of the client, your positioning relative to them, your use of the rope. If you were to pitch all of it I think you would heighten the risk elsewhere, so the total risk of the whole trip would most likely be greater. I think it is something you have to think about in guiding, there is so much risk, there is always going to be some, you can't eliminate it all, and if you eliminate it in one spot you perhaps get it back in another. (Int. #15)"

As described in the previous chapter (under the section 'Guidelines, Not Rules'), participants who are confronted with a dilemma that has no reasonably certain outcome will resort to a decision strategy that resembles prioritisation of options as per concurrent evaluation. The use of a strategy that resemble prioritisation as a means of determining a course of action raises the question of
whether this type of evaluative strategy is the same as that of concurrent evaluation. If so, then this would mean that there is a significant category of decisions made by mountaineers that do not conform to recognitional decision-making processes. The term ‘to prioritise’ generally means “to list or rate in order of importance” (Merriam-Webster Dictionary, 2000). The act of rating is the basis of the rational choice decision-making strategy. Rational choice decision making involves a 5-step process as follows:

1. Identify the set of options. [e.g., A or B.]
2. Identify the ways of evaluating these options. [e.g., likelihood and consequences of injury.]
3. Weight each evaluation dimension.
4. Do the rating.
5. Pick the option with the highest score. (Soelberg, 1987)

As has been mentioned earlier (refer chapter two), rational analysis is the conventional method for describing how people should go about making decisions. In the outdoor adventure domain, Priest and Gass (1997) recommend that outdoor-adventure leaders use rational choice methods when making decisions. Priest and Gass advocate the establishment of an extensive set of options, followed by a rigorous process of analysis involving the weighting of evaluation dimensions using either quantitative or qualitative methods. The subsequent rating of options, followed by the selection of the optimal result, is intended to allow the outdoor leader to “effectively choose the option that appears to have the strongest chance of success” (Priest & Gass, 1997, p. 280).

According to the evidence gathered during this study, it is uncommon for mountaineers to engage in a conscious process of rating decision options according to the rational choice strategy unless they are able to make a simple “either – or” choice in circumstances where goals and cues are stable. What, then do mountaineers do when they are confronted with a situation that offers options? The following comment gives some clues:

You’re running things over in your head all the time. You’re mulling over option A, B, C, and you’re sort of juggling them around. Like, you know that this will call for one of these possibilities. So you’re sort of making a conscious decision in a lot of ways. So there’s that level of consciousness. But you’re also relying on your intuitive response to the situation as well. Like certain things that have come into your decision making you can’t exactly quantify, and they’re definitely intuitive-type feelings, whatever you’re picking up there. And that’s what the decision is really based around. Yeah, definitely intuition comes into it. (Int. #10)

What the climber is describing is explicit (i.e., conscious) awareness of the option set, but implicit (i.e., intuitive) understanding of which option is the appropriate one for the occasion. Weighting and rating does not enter into the decision-making process. The base of experience of the expert allows them to recognise the likely alternatives for action. Because of the seriousness of the occasion, or perhaps because of changes in the current situation compared to previous occasions, the various options for action are brought to conscious
awareness. However, the identification of the eventual course of action occurs in an intuitive fashion, based on a singular evaluation process.

In the case of situations where no option offers a reasonable level of certainty of outcome, then the expert decision maker may possibly consider the most likely option not in terms of its best qualities, but according to its worst qualities. That is, the proposed course of action is assessed for things that can go wrong. This strategy is prevalent in the following account of a mountaineer who, on the second day of a planned one-day climb, realises that the way ahead is blocked by an impassable seventy-metre rock wall:

So you look at the options. To simplify it you can go straight up, you can go down and around and up on one side, or you can go down and around on the other side. So the obvious thing, the first thing you want to do is to go up the wall. And I, with difficulty, made the decision that I couldn’t even see how I could protect it, and I didn’t think I could climb it, and I might end up halfway up a wall on lead with no protection, with no second rope to abseil... so I was imagining what would happen if I fell, and then thinking “What would you do?” I mean, even if you only stuff your ankle, well, you’re in a stupid position to stuff your ankle. There are good places you can stuff your ankle, and there’s very dumb places. And besides, if you fell you don’t fall straight back onto the ridge again. You fall into these massive gullies, and then you’ve got one person tied to a rope and you know... it just goes on, so you kind of think “Well, in that environment you have to be a little bit more cautious”. Because it’s all loose as well – that’s another thing. (Int. #6)

A similar mental strategy of imagining the worst is described below:

What is going on in my mind? Well, usually I use turmoil. “Which icicle is going to collapse, which crevasse is going to eat me up?” And then in some ways I never feel any relief until I actually get to the Shelf and then the concern there is that you have to short-roped someone across some very icy terrain with a death drop. It’s very tricky guiding there. So normally it has been in my mind always when I arrive at the Shelf “What are the conditions going to be like?” And so my next spot of relief is the Summit Rocks. And as long as there are very few people in them, or if I am in the lead which is where I try to be, that’s almost a period of relaxation, all you have to do is climb. And usually I find if I have got there I stand a very good chance of getting up. And then obviously your next concern becomes that quite often it is really windy above there. You can pitch the summit rocks no problem, but if you go on the ridge and you are exposed you are going to be blown away. And then the next one is how much has the client left in terms of their cramponing ability for the ridge. So I think you leave with a huge turmoil and then I try and shut them down as we go up and get past certain ones, “Hey, there is just one or two left”. And then again you have got to think on the way down, as they reassert themselves. (Int. #15)
The same mountain guide (#15) also used the term "healthy paranoia" to characterises the state of mind that he felt was necessary to ensure sound professional practice. If it is true that problematic options are assessed according to their 'worst-case scenarios', then this strategy relies on having ready access to a mental repertoire of hazards and outcomes. Certainly the subjects are aware of the significance of risk evaluation for making critical decisions:

I think the broader your experience, the more you’ve done something, the more you are a "car mechanic", the faster you can come to grips with what the problem will be without going through a check list. And usually be correct about it. (Int. #14)

"Once you know about consequences and outcomes, then you have a way of managing things that’s different." (Int. #22)

The only instances from the data of direct comparison of options were situations where two obvious options of equal uncertainty were clearly presented to the decision maker, with little opportunity for either to be altered by other events. A classic example that was witnessed on two occasions was the problem of whether to cross a crevasse from either the left-hand side or the right-hand side. In each case the mountaineer was at first too far away to determine what was going to be the eventual line of ascent. When asked how they would make the decision, a reconstruction of their answer was "I will wait until I can compare one side with the other". Further examples were given by kayakers who described choosing a line down a rapid, or choosing to run or not to run a rapid, on the basis of weighted evaluations such as consequences for loss of life. Even in such cases, participants appeared to supplement rational choices with experience-based judgement. In the following account a mountain guide describes how a "whim" caused him to alter what had been a preferred choice made according to concurrent evaluative methods:

**Qn:** How did you get to choose where you went?

**Ans:** In the end I chose to go left on the basis that there were some old tracks, really faint but leading that way. So on the basis that the most recent people had gone that way I decided to follow them and then see if that went, and if that didn’t go I’d go to the right, because when I surveyed the scene from a distance it looked the most likely way to me. So I sort of really made the decision on a whim of following the tracks with the rationale that, you know, someone had obviously got through that way, or if they hadn’t they backed off at that point. With the option then to still head out right. That wouldn’t be closed to me. (Int. #12)

The decision on whether to run something or not to run is not based on what the rapid has been classified as by general consensus. For me, it looks runnable or not runnable. It doesn’t necessarily ... there were several class 5’s we did run. But there were other things that just, I didn’t
see myself in there doing it. I saw, ok, well the way I’m paddling I’ll get
slopped over here instead of making that cut. And you don’t want to be
there. And it was based on a fair amount of river running experience of
hydraulics…a lot of our decisions as to what we were running and not
running on an individual basis was based on, like, we had some
experience to draw judgements and make some decisions on…So
anytime I felt that I was on that threshold of potential for disaster to
happen, then a little inner voice was on my shoulder. I was aware of that.
And then the third dimension of that was another little voice, where you
don’t have experience to work off, has a name called “fear” or “doubt”.
(Int. #22)

The conclusion reached in this study is that mountaineers and kayakers use
judgement rather than rational analysis as the basis for making decisions. It is
proposed that the occasional use of terms such as "prioritising" (Int. #18) and
"choosing" (Int. #3) by subjects to describe their decision-making is a
justificatory reaction that occurs during post-event reflection. Experts are on a
journey of self-improvement (because of incentives of increased safety and
enjoyment), and therefore are keen to analyse why they took certain decisions
at critical occasions. Intuition is not a solid basis for an answer. If, however, the
actions taken were effective, then, on reflection, it will be possible to provide
more 'acceptable' reasons for why they were taken. The higher the stakes, and
the better the outcome, then the more 'rational' will the decision seem when
looking back on it. In this way judgement and intuition will be disguised for the
reflective decision maker as the prioritising of options according to a hierarchy
of vital factors. In an ironic twist, this reflective process may be responsible for
creating embedded awareness of critical cues that later can be used to
intuitively recognise patterns within the situation.

Mental simulation

The last defining feature of Klein’s model is mental simulation. This is the
process of mentally transforming a situation within a specific context by
imagining how it may pass through several transition stages (Klein, 1989,
1998). Klein emphasises that this imaginative process is not static, but forms a
"sequence of snapshots [used] to play out and to observe what occurs" (1998,
p. 45). There exists a dynamic interplay between mental situation and
situational understanding since insights gained by the imaginative process may
affect one’s recognition and interpretation of goals, cues, expectancies and
typical actions (Klein, 1989, p. 62).

A decision maker’s capacity for mental simulation is facilitated by having a
repertoire of relevant experiences to draw upon. Fantasy alone is not a rich
enough source of information compared to expertise that comes from
experiencing the variety of real-world events (Klein, p. 147). Decision makers
who are able to rely on "ease of long practice" (McDonald, 2000) will enhance
their situational understanding and be more able to recognise typical cues and
responses that aid their mental simulations. An appreciation by mountaineers
and kayakers of the benefits of long experience was documented in the previous chapter, and is reiterated in the following comment:

The more things you do, the more experience you gain, and [therefore] the more you are able to make informed decisions and judgements about how you’re going to approach the next situation. And the more experience you get, the more inventive you can be as well. So, you might do something you’ve never done before because you can see that it’s going to work in this situation. (Int. # 11)

Klein describes mental simulation as having two main functions within RPD. These functions are “to explain the past” and “to project the future” (Klein, 1998, p. 58). The term “to explain the past” is, in the eyes of the author, a misnomer, since it can apply equally to present situations and not only to historical ones. Explanations about past or current events provide a rationale or justification for what is going on in a specific situation. The RPD model describes the use of story building (Klein, 1998, p. 187) in order to diagnose and provide explanations for what may be going on in a situation. Mental projections into the future may have multiple functions. They may predict what is going to happen. Alternatively, they may prepare one for what is going to happen. Finally, they may be used to assess a potential course of action for flaws. Mental modelling of a likely course of action is the strategy used for predictive purposes, and if assessment is required then the mental model can be subjected to evaluation (Klein, 1998, pp. 45-74).

An example of mental simulation incorporating the features of feature matching and prediction is given by a kayaker in the following description of an incident that occurred when undertaking the first descent of a river on the West Coast. His party had descended part way down a river when they entered a gorge formed by sheer 60 metre high walls. Mid-way through the gorge, the river dropped over a ‘horizon line’, indicating a waterfall. Despite vigorous attempts over the next 1½ hours, they were not able to gain a view of the landing at the foot of the drop. Neither was it possible to reverse back out of the gorge. Their options were either to run the waterfall “blind”, or wait for a (possible) rescue. The decision to paddle over the drop was aided by mentally modelling the water dynamics at the foot of the waterfall based on a diagnosis of critical situational cues that led to the conclusion that it was a viable option:

A classic one was when we ran an unscoutable, invisible 18 footer on the Upper Hokitika back in October where the closest we could get to it was 10 metres away from it. And that was like the boys lowering me in my lifejacket on the end of a rope in the current to try and get to the edge of it. And we still couldn’t see the whole drop. You could see the top, and you could see the pool by climbing up the cliff in the gorge, you could see the pool down below and it was blue water. You could see on the right side that there was a huge stuff [i.e., undercut] rock and you just knew that it [i.e., the current] went in there and got pulverised under this rock. So you knew that was out. But the left side looked like the volume of water going over there was good. So all I had to make a decision on was 18 years of going “OK, this amount of water going over a drop at that angle churning out that amount of aerated water at the bottom moving at

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that speed with that amount of lumpy-ness in it will be something like that”. And then go “Well, we’re not going to get out of this gorge any other way, so I’m going. If I don’t turn up, it’s been good knowing you”. So then I run the drop, and it’s a big drop, and it’s a technical landing, but it’s sweet, it’s no big deal. Well, it’s exciting because it’s an 18 footer, and it’s a landing into a slot this wide [1½ metres] so you have to go off at the right angle….So what would you do? (Int. #19)

This is a dramatic example of the use of feature matching and predictive mental modelling to inform decision making. Not all instances of mental simulation are based around such risky decisions. Most of the time they are put to far more mundane purposes. West Coast kayakers regularly use feature matching and story-building to estimate the levels of flow of rivers in their upper reaches before committing themselves to flying in by helicopter. Mountaineers do similar simulations to imagine what snow conditions will be like on upper portions of the mountain. Close attention is paid to meteorological conditions, as well as other factors such as the angles and aspects of the relevant slopes, seasonal influences, the nature of equipment used for transport (e.g., skis, snowshoes, on-foot), plus the abilities of the party members to use the equipment in an efficient manner. In combination with these “what if???” (Klein, 1998, p. 26) strategies, mountaineers and kayakers also use mental modelling to evaluate proposed plans for managing those situations.

During the fieldwork process, a mountain guide was observed while waiting out a storm in Mt Cook Village before attempting a guided ascent of Aoraki/Mt Cook. After viewing the latest weather situation map and checking the temperature at the Village, the guide described how he was mentally picturing the climbing conditions 1800 metres above, and his party’s progress at various critical junctures in the prospective climb. His mental assessment of conditions for travel was not favourable. He described his thinking regarding the snow conditions as follows:

...When you know you’ve got 40cm new [snow] up the Linda [Glacier] that’s arrived in the last 36 hours, it’s either going to be impossibly deep, or else there will have been some rain on it and it’s surface is frozen. It [i.e., the surface conditions for travel] depends on how much rain, and how frozen the surface is. (Int. #9)

As it turned out, the snow conditions were poor and the ascent was unsuccessful. Not enough rain had fallen to saturate the new snow, forming a breakable frozen crust on top of thigh-deep loose snow. What this example demonstrates is how an expert is able to devise a story that is a faithful representation of reality.

Mental rehearsal is a strategy commonly used by athletes. It is unsurprising to find that kayakers also use mental rehearsal to prepare themselves for a difficult section of paddling. A complex section of white-water will require a series of linked paddle strokes, dynamic body positioning, and precise angling and railing of the kayak in order to maintain boat position to within centimetres of the ideal ‘line’ through the rapid. A form of training often used by kayakers to improve their paddling skills is that of kayak slalom. As part of the fieldwork the
researcher attended a kayak slalom competition. Subject #20 was observed to walk once down the riverbank alongside the slalom course. Afterwards, subject #20 made the comment that he had every manoeuvre memorised. This prompted the following conversation (recorded in the interview at a later date):

Q'n: So if there’s a 25-gate race, are you capable of retaining knowledge of those 25 gates after one or two looks?

Answ'r: I can walk down a course once and know every particular manoeuvre that I have to do. Absolutely. But only until the end of the race and a day or two later. Unless there was a significant gate and then I might remember it for a few years or ten years later. I have a picture in my head that I can see. I'm in that picture as well in terms of there’s the river and gates, if we're talking about slalom. I have a picture of where the boat should be at a particular time on the river. So I can already see where it should be. There’s the river with the gates above it, with water features at every gate, and features between each gate. And then there’s a picture of my boat and me running the ideal line into and out of and between each gate. And I can see what type of stroke it should be and where it should be in relation to the boat, the gate and the river feature.

Q'n: So if we now take a section of water on a river on the West Coast, no gates, it’s just a river trip, what sort of mental picture do you now get?

Answ'r: Just the same. Absolutely. I wander down the bank looking for a line, in the same way that I would look for a line, well, the ideal line between two gates. Pretty much I see a line in the same way that I see one in a slalom, definitely. So I guess one of the ways you do this is to break the rapid up into small chunks. So I'm looking for a break-out, an eddy. The classic upstream gate in the slalom is the classic eddy turn. So I'm looking for those, to rest, re-establish myself, ... not to overwork, not to chew off too much, not to get too much stimulus. But yeah, so it's a pretty quick wander down, there is a line or there isn't a line, or there's a line that I'm willing to do or not willing to do. (Int. #20)

The kayaker's account of how he is able to 'read' the current of a river involved two processes: first, rapid memorisation of complex sequences of manoeuvres, and second, the mental visualisation of these manoeuvres at a later time. These advanced situation assessment skills are similar to those described by NDM researchers as characteristic of domain experts (see Lipshitz, 1993; Cannon-Bowers & Bell, 1997; Endsley, 1997). Subject #20 is a former world-class slalom paddler. In his own opinion (see below) his current ability to use advanced situation-assessment skills is a product of many years of experience in kayak slalom. He describes his ability to visualise and imagine typical cues and typical responses as something that sets him apart from kayakers of lesser experience:

There are things that I see in the water that other people can't even see. They can't even see that it may put their boat in a different position or that they may use a wave or boil in a different way that would give a completely different result...So I guess I can from slalom, and just from miles of river running, knowing that that type of feature will do this to me. And depending on where I want to go in relation to that next feature, therefore which way shall I have my boat/paddle/knee/sitting position/edge pointing? And how powerful is that feature? So for me, I
look at it and I have a very clear picture of what it's about, and what I expect it's going to do. (Int. #20)

Mental simulation in RPD builds on an earlier conceptualisation of mental evaluation known as 'progressive deepening'. This term originated from de Groot's (1946) studies of chess grand masters, and refers to the way that these experts think their way through options one at a time checking for strength and weaknesses. Klein's (1998) description of mental simulation builds on de Groot's concept of progressive deepening. Klein (1998, p. 60) regards mental simulation as capable of being used for locating weaknesses in an option, finding ways to repair these weaknesses, discovering opportunities and previously ignored dynamics in a situation, and inventing new solutions to old problems.

For the kayaker or mountaineer who is confronted with a serious situation, experimentation with new ideas can be fraught with risk. Generally it is the 'tried and true' solutions that are favoured. However, if these typical solutions are deemed not appropriate, then the individual is forced to explore new ways of behaving. In the following account a mountain guide describes how, as a relatively inexperienced guide, he was able to use mental simulation to devise a new solution to a novel situation:

There was an instance coming off Mt Cook, and the summit rocks were completely covered in sastrugi. And by the time we were coming down the whole Shelf was being bombarded by sastrugi just flying down. And shocking snow conditions, whereas in the morning we had crampons on. There was just this horrible boot-top deep pug that balled your crampons up, but with ice underneath so you had to have your crampons on. And my client was shagged; by that point he'd delivered himself to me, and started stumbling and couldn't really concentrate. And so we'd got to that position on the Shelf, and I was stuck for ideas. I couldn't short-robe him because he was going to fall for sure, and I wasn't confident with the footing conditions whether I was going to hold him. I couldn't really pitch it because what do you do, he's going to take a pendulum fall, or we're both going to get slugged by sastrugi 'cos we're taking so long. And it was at that point, it seemed like a brain-wave to me at the time, but I thought of getting him to front-point using his tools, and claw his way across while I would short-robe him. I could picture it in my mind, and the chances of him falling seemed limited, but I could see that we could keep moving. And that worked well, and it was just a matter of playing Russian roulette with the sastrugi. We moved across there really fast, and we didn't get hammered. So, I had never done that before ... But that's the thing, you get more inventive. (Int. #11)

This mountain guide's parting comment regarding the ability to develop one's powers of invention needs investigation. How is decision making developed? Many of the previous quotes (e.g., waterfall paddler Int. #19; slalom kayaker, Int. #20) implied that experience was the necessary ingredient in being able to

3 ‘Sastrugi’ are wind-sculpted protuberances that project outwards from an ice covered surface.
make reasonable decisions. However, experience alone is no guarantee of learning. Experience provides no more than opportunities for learning. A reflective process involving analysis and memorisation is needed to gain understanding of situations, and to convert that understanding into judgement that guides behaviour on future occasions. Reflection is a version of mental simulation, with the focus being the location of weaknesses in prior decision making and on finding ways to repair or improve those weaknesses. The reflective process is one that appears to be carried out as a matter of course by those aspiring for perfection. The kayaker involved in the waterfall incident provides the concluding comment to this section with a description of what is for him a typical process of reflection following an unexpected event or outcome:

I’ll take time to try and understand the factors that led to me failing to understand or put things the way they needed to be to achieve what I wanted. You might hit a wave and then all of a sudden your nose is going left and your whole plan was to head right. And even while you’re out there I know sometimes I’ve been conscious of myself going “I should have read that differently”. And then you are onto the job of fixing the mistake. You’ve just taken in what that hydraulic looks like, and it gets stored away in the memory banks for retrieval at some other time. “Oh, that’s like that other time when I thought that it was going to kick right but it kicked left.” So that happens there and then while you’re on the run. If it is a more complex [section of water], then it’s sort of like a post-mortem where you [complete the rest of the rapid], and if it all worked out, then go back to the one area that caused a problem. And it’s not like you get out of your boat and go and have a look at it, although I have done that just to make sure of how you’re making the next judgement. But generally you’ll go “I thought this was what was going to happen, but the outcome was different to that, and these are the reasons why”. And I may not understand all the time, but I’ll try and go “Ok”, and again store information so that it’s usable for a different time, because then when you get somewhere else you’ll go “That’s like this other thing”. And that’s how, especially when running bigger drops and waterfalls where, because you’re falling through the air you don’t have any control any more, and so you’re having to make a judgement on the landing. And because you can’t practice landings, they’re all for real, you can only go “That water bubbling out is like the time when there was a rock in there, or was like something or other else”. (Int. #19)

SUMMARY OF THE EVIDENCE FOR RECOGNITIONAL DECISION MAKING BY MOUNTAINEERS AND KAYAKERS

Investigation of the interviews and actions of expert mountaineers and kayakers strongly suggests that recognitional decision-making strategies as proposed by the RPD model are the prevailing mechanism for making decisions. In this study, evidence for the existence of the three stages of the RPD process ("simple match", "diagnose the situation", and "evaluate a course of action") was supported by words and deeds of mountain and kayaking performers. Investigation of these features was structured according to the cognitive tasks
of prototypicality, situational understanding, singular evaluation, and mental simulation that the RPD model regards as defining features of recognitional decision making (Klein, 1989). Specific findings were as follows.

This study concluded that experienced subjects regularly recognise situations as typical, and also regularly recognise subsequent typical courses of action that are appropriate to the situational requirements. Intuitive recognition can be so immediate as to dispel belief by the performer that they have made a decision. The decision maker simply acts in a fashion that feels normal and obvious. It is proposed that expertise is a critical factor in allowing decision makers to discriminate between proposed courses of action that are immediately viable and those that require further diagnosis. Expertise provides decision makers with the ability to recognise subtle inconsistencies in the situation and to detect the existence of concealed but serious consequences.

The evidence suggests that the ability to make simple-match decisions is enhanced through experiencing a state of flow, with the flow experience dependent on the perceived level of challenge. Remaining in the state of flow requires both physical and mental fitness. If one’s physical and mental fitness level cannot withstand the strain of performance, then one’s overall level of competence is reduced. The consequent mis-match between levels of ability and challenge mean that the performer can no longer remain in a state of flow, and intuition-based recognitional decision making is stymied.

One further implication of the link between intuition and the flow experience is that emotions, or ‘feelings’, are an indicator of one’s comfort level with the match between challenge and competence. Good feelings suggest that the match is perceived to be well balanced. Feelings of unease are an indication that the match is perceived as unbalanced. Fear means that the level of challenge has already exceeded one’s perceived competence level. With experience comes the ability to intuitively recognise the degree of balance that exists between challenge and competence in a situation. Experts have learnt to rely on their emotional reaction to a situation. They monitor their feelings, and respond accordingly, even though they cannot always provide a rational explanation for their actions.

Situational understanding is performed by experts in an ongoing way. The process of assessing the situation is an active process, involving the seeking out of typical cues and anomalies rather than passively waiting for an indication that something is not right. Despite being active, assessment of the situation and understanding of the findings appears to happen in an intuitive, unconscious fashion, like a form of background mental radar. Individuals with experience monitor and recognise critical variables to do with environmental features, equipment, and human-based qualities. If there is lack of correspondence between the requirements of these three features, then feelings of un-ease arise.

One ploy used by mountain guides to increase their understanding of the developing situation is that of instigating and maintaining communication between their clients and themselves. This allows them to better understand
how the other person is responding to the situation. Mountain guides and kayakers recall and transfer pertinent knowledge about specific or archetypal places and behaviours by telling and re-telling stories. The use of narratives provides a means of pooling information in an informal way that then can be assimilated and reshaped through further dialogue. In this way wisdom and learning are transformed through a process of group appraisal involving multiple perspectives. Seminal case-examples are retained as legends.

The singular evaluation of decision options is the most distinctive feature that separates decision making according to either RPD or rational choice strategies. The evidence examined here supports the concept of singular evaluation in all but especially serious situations, or in situations where a direct comparison of options exists in a context of unchanging circumstances. As part of the singular evaluation process, decision makers use a satisficing strategy based on short-term, evolving decisions designed to deal with the current problem. The use of evolving decisions is in accordance with RPD claims that experienced decision makers are able to come up with workable courses of action as the first ones considered. The success of this strategy is dependent on the decision maker having a base of experience that allows them to align the short-term decisions and short-term goals with the 'big picture'.

The uncertainty inherent in mountaineering and kayaking adventures provides experts with the rationale for making decisions according to guidelines rather than rule-based precepts. Decisions based on guidelines require the use of judgement to discriminate between relevant and irrelevant information and courses of action. In serious situations the emotional arousal caused by the stress of a potential mis-match between challenge and competence causes the decision maker to raise to conscious awareness the critical factors and options for action. Despite the process of decision making in such circumstances being conscious and deliberative, the selection of a course of action still seems to occur according to the process of singular evaluation. The act of judgement appears to be a mix of conscious deliberation of situational factors, plus intuitive, implicit awareness and understanding of what constitutes the most appropriate course of action.

Following the making of a decision under such circumstances, it is common for the decision maker to mentally reflect on the situation and attempt to rationalise or justify their "choice" of action in accordance with the benefits of hindsight. This leads to the confusing situation where the decision maker will retrospectively describe decisions as having been made according to the rational-choice method when this may not have been the case.

Assessing the veracity of a situation or of a course of action that is not immediately apparent can be facilitated by the use of mental modelling. Mental simulations that are based on experience will be more reliable than those based on fantasy. Creating a repertoire of useful experience involves more than the act of 'being there'. Experts actively reflect on past events in order to increase their understanding of what factors were significant. Not only are they later able to mentally 'play back' significant facts, they can integrate memories to create new solutions for unfamiliar problem situations.

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CHAPTER SEVEN

ACQUIRING EXPERTISE IN DECISION MAKING

"The overall impression....is of an ideology that distrusts intuition and that underrates the view of leadership as an art." Pete McDonald (2000, p. 10)

CHAPTER OUTLINE

This chapter explores contradictory perceptions about the acquisition of decision making skills. The perceptions arise from two distinct ideological stances regarding the best way to conduct and learn outdoor-adventure decision-making skills. The decision-making perspectives of rational choice and NDM are proposed as forming the theoretical bases of the two ideological stances. The way that the two competing ideologies co-exist in outdoor leadership education is discussed.

TWO PARALLEL IDEOLOGIES

‘Traditional’ and ‘training’ ideologies

The previous two chapters have highlighted the way that experts use cognitive strategies that rely on experience to help them make up their minds about what is going on and what to do about it. The experience-based cognitive strategies that are used to fill in missing pieces of information can be summarised as ‘judgement’ (Priest & Gass, 1997, p. 264). In this study, judgement was shown to be used by expert decision makers to assess situations and to generate plausible responses without recourse to analytical, non-judgemental calculations. The extensive use of experience-based judgement by subjects supports the NDM description of decision making in general, and the RPD model (Klein, 1989, 1998) in particular. The general consensus by subjects was that “long practice” (McDonald, 1998) in real-world situations characterised by personal responsibility for consequences was the critical factor in producing experience-based judgement and good decision making skills. This view is succinctly expressed in the following comment:

If you run a course and remove from it all risk then it's not giving the pupils a true picture of what situations they can get themselves into. Also, without the risk I don't think the attraction is there to do the sports. I think it is a necessary part of it. How you teach that risk I just don't know... well I do know, the only way you can learn it is through putting yourself repetitively in a situation where you are learning from mistakes...that is how people learn. (Int. #14)

Curiously, observations from fieldwork revealed that a parallel, competing philosophy of acquisition of judgement and decision-making skills was dispensed by many of the mountain guides and kayak instructors to novice performers.

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Instead of advising novices to undergo a lengthy period of peer-based activity, mountain and kayak instructors regularly provided formal instruction programmes within which novices could ‘fast-track’ the acquisition of skills by practising deconstructed and simulated real-world tasks in relatively risk-free settings. Instructional strategies observed to be used by instructors included the breaking up of knowledge into discrete chunks of information that were then presented to their students in relatively context-free applications. The information offered was a combination of conceptual knowledge and practical skills. The various chunks of information were delivered to students according to the principles of chronological sequence and progressive difficulty. Systems for assessing when to use knowledge and skills came in the form of rule-based schedules. Students were advised to override emotional reactions with rational reasoning and comparative evaluation of alternatives. In effect, instructors were advising their students to ‘do as I say, and not as I do’.

The conclusion reached is that there are dual ideological positions regarding how outdoor adventurer participants should practice and learn the skills of an outdoor adventure activity. The ideologies are referred to in this study as the ‘traditional’ ideology, and the ‘training’ ideology. The ‘traditional’ ideology is the archetypal belief structure of the expert outdoor adventurer. The ‘training’ ideology stems from the belief structures that are prevalent in situations where outdoor-adventure skills are taught to naïve performers. The skills of decision making are included in the set of skills for which there are dual conceptions of practice and acquisition. The apparent implications of the existence of two competing ideologies is that their combined presence confounds the development of a pathway for learning to use effective skills of decision making in outdoor adventure contexts.

The rhetoric of judgement versus the rhetoric of procedure

Each ideology attracts its own rhetoric regarding how practice and learning should be carried out. The ‘traditional’ ideology proposes that practice should be based on experience-based judgement, and that learning should be based on acquisition of experience. The ‘training’ ideology proposes that practice should be based on procedures (also referred to as ‘rules’), and that learning should be based on an understanding of what, when, and how the procedures should be applied.

Despite the contradictory rhetoric, the two ideologies exist side-by-side in outdoor adventure. The reason for this co-existence is that the expression of either rhetoric is generally confined to particular circumstances. The ‘traditional’ rhetoric is reserved for occasions where the audience is exclusively made up of proficient performers, such as when experts converse together or else individually overview her or his own performance. The ‘training’ rhetoric is used in contexts of mixed levels of proficiency, and particularly where experts are delivering instruction to novices. It is only during occasions when these circumstances coincide that the contradictory nature of each ideology becomes apparent.
A classic example of a situation where the competing ideologies exist in parallel in outdoor adventure is in the field known as ‘risk management’. Risk management refers to planned actions that seek to control hazardous situations to predetermined levels that are based on notions of acceptable outcomes. A major shift in perspective towards risk management by administrators of outdoor education programmes in New Zealand occurred in the early part of the 1990’s. Introduction of new legislation in the form of the Health and Safety in Employment Act, 1992, and the Employment Contracts Act, 1992, plus changes to the Accident Compensation Act, 1992, prompted the application of more transparent and rigorous systems of risk management to the education of others in outdoor adventure skills. Simultaneous with this policy change was Davidson’s (1992) reformating of the original New Zealand risk matrix into a Risk Analysis Management System (RAMS). In 1993, the NZMSC and the NZOIA mandated RAMS as the conceptual underpinning of a risk-management qualification jointly run by both organisations.

Today, RAMS instruments are regularly used in polytechnics and outdoor pursuits centres by both instructors and students to assess the hazards involved in outdoor activities. Their use is recognised as evidence of one component of a risk-management plan (McDonald, 1998). The principle that underpins the use of risk-management tools such as RAMS is that they are generic decision aids that can be used by individuals of any level of expertise to assess risk levels and to plan courses of action. Risk-management courses exist on the NZQA framework, disembodied from specialist activity, and offered to beginner students as a foundation subject in outdoor adventure. Polytechnic outdoor-adventure programmes typically include a course on the theory of risk management that exists in isolation from the learning of other practical skills.

The widespread use of formal risk management tools in outdoor-adventure education is contradicted by the scepticism with which experts view them. To the researcher’s knowledge there are no individual mountain guides or kayak instructors who use formal risk-management tools to assess or inform their own practice. Such tools are only used by large-scale educational organisations, and their use is restricted to the context of teaching inexperienced students or trainee instructors or to satisfy institutional risk-management requirements. The expert practitioners of this study were scathing of the worth of risk-management courses and of risk assessment forms to individuals who already possessed expertise. A typical response from the expert subjects in this study to the question “What do you think about risk-management forms?” appears below:

You can have the most wonderful things written down, but when you are under pressure if that is not the way you operate because it is not part of your experiential background then it is not worth a damn. I think they are box-ticking tools. (Int. #16)

Another subject showed his scepticism of formal risk management processes by using them as the butt of sarcastic comments, and by lauding the value of long
practice. The comments are repeated below. What is of interest is that the subject referred to the topic of formal risk management without prompting. The fact that the subject was making a joke of this issue points to his awareness of the existence of the two ideologies.

Q'n: How do you know all these things? How do you know, ...you talked before when you made a decision you were feeling ok about it, and yet you were making those decision on the run as it were, and now you're describing these guidelines that you like to work to, as well as gut feelings and intuition?

Answr: I guess its just mileage, it's just experience really. I was very lucky early on in my career to go on a Risk Management course [laughs] and I filled in a RAMS form before I left the Village (more laughter).

Q'n: I'd better catch the laughter here...

Answr: I don't know that I can define it apart from um, I guess it's just experience, well my experience really of just building on working in the outdoors. It doesn't necessarily have to be lots of different activities or disciplines, but that all kind of helps, I guess. (Int. #23)

Another derogatory comment about the value of risk-management training provides insight into why experts considered 'fast-track' methods of learning to be problematical.

I have a very cynical view of RAMS forms. I find that they are a process for people who do not have much background or judgement in that area. And the more background and judgement that you have in that area, the more you are already doing those processes yourself. If you are not doing them, quite frankly, you shouldn't be going out there. (Int.#15)

What this subject is pointing out is that there is a potential danger in giving people procedural skills that are not supported by judgement skills. Learners who are trained in the use of RAMS may believe that correct use of this tool is all that is required in order to make good decisions. This, clearly, was not the view of the subject who instead argued for the supplanting of procedural skills with judgement.

These comments reveal extensions to the rhetoric associated with each ideology. The 'traditional' ideological rhetoric states that the level of expertise of the decision maker is the key variable that influences the quality of decisions that are made. Experienced, skilled individuals are able to use their experience-based judgement to make good decisions. The 'training' ideological rhetoric states that the decision process is the key variable that influences the quality of decisions that are made. Indeed, judgement is a source of potential errors that should be substituted with rigorous analytical procedures. The 'training' rhetoric holds that regardless of experience and skill level, individuals who conform to the correct decision process are able to make good decisions.
More than this, the ‘traditional’ ideology is associated with a rhetoric that proposes that judgement is a complex of skills and personal qualities that can only be developed over time through experience, and is not able to be learnt in a step-by-step fashion. Within this conception, judgement – and therefore decision making – cannot be taught but merely enhanced. The ‘training’ ideology is associated with a rhetoric that proposes that decision making should be based on adherence to procedures and reliance on judgement eliminated. Within this conception, relevant experience refers to familiarity with the application of procedures rather than to knowledge of past events. This form of experience is capable of being taught and learnt. Therefore, decision making is a teachable and learnable skill.

Each ideology is associated with a distinct philosophy of education in the skills of decision making. The ‘traditional’ ideology regards decision making as not capable of being taught through formal educational methods, since it does not make sense to develop experience-based judgement in this way. ‘Training’ ideology promotes the view that decision making can be taught, since the key element of decision making is regarded as procedural integrity and conformity. These are skills that lend themselves to being taught and learnt through structured training programmes. Despite the contradictory philosophical principles, both ideologies continue to co-exist in the complex real world of outdoor leadership education.

A rationale for contradictory behaviour

The conflicting actions and attitudes of expert outdoor adventurers present a schizophrenic view of outdoor adventure. It is as if instructors of mountaineering and kayaking do not believe that the beliefs and practices that make their own behaviour so effective have relevance to those of lesser ability.

It is proposed that the source of the contradictory ideologies held by expert decision makers is that of the different character of the two general types of behaviour and knowledge that each ideology represents. Experience-based behaviour and knowledge associated with the ‘traditional’ ideology is intuitive and reflexive. This type of theory and practice includes the strategies of decision making that NDM theorising attempts to describe and explain. The enigmatic and irrational nature of ‘traditional’ behaviour and knowledge is not easily articulated. In contrast, the ‘training’ ideology is identified with behaviour and knowledge that is ordered and rational. Actions based on procedures can be described in terms of how, why, and when they occur. Decision-making strategies that are aligned with the ‘training’ ideology conform to descriptions of decision making as described by rational-choice theory.

The ease of description and comprehension of behaviour that is based on knowledge of procedures compared to behaviour based on intuitive understanding has implications for methods of education in decision making. Objective, structured techniques of rational analysis lend themselves to being incorporated into structured lesson plans and training sessions. The ‘messier’, subjective area of
experience-based knowledge is comparatively difficult (some might say 'impossible') to present as a programme of structured learning. The attractiveness to instructors of the rational-analytical approach is accentuated by the institutionalised nature of education within which outdoor adventure often operates. Aside from the demands placed on educational curricula by the physical limitations of time and place, a further consideration is that of the influence of trends in educational policy. The current trend in outdoor-adventure education towards formalised, short-duration course programmes with measurable outcomes helps to create a perceived need for training in decision making that involves concrete processes. Consequently, decision-making models such as P&GDM and risk evaluation tools such as RAMS that depend on the correct use of process rather than on expert knowledge are able to take centre stage in outdoor-adventure curriculum development.

An incidental outcome of favouring the 'training' ideology over the 'traditional' ideology for the purposes of teaching is that a barrier of misunderstanding and misrepresentation about each perspective has built up that reinforces the conflicting stances of the two rhetorics. Expert practitioners typically represent the 'traditional' ideology as a practice-based, atheoretical approach. The same expert practitioners typically represent the 'training' ideology as being a non-practice-based, theoretical approach. Neither representation is correct. In fact, both ideologies stem from a mix of theory and practice.

The difficulty in recognising the theoretical basis of the 'traditional' approach lies in that it is formed largely by a combination of word-of-mouth tradition and cryptic self-reports by expert practitioners. The unsophisticated nature of these accounts serves to reinforce the myth that there is no theoretical underpinning behind the actions of experienced experts.

The over-emphasis of the theoretical aspect of the 'training' approach reflects a prevailing belief by practitioners in the irrelevance of critical educational approaches to practice. The origin of this piece of folklore stems from the understanding by experts that judgement cannot be taught. Instead, judgement can only be experienced and developed by a lengthy process that is subject to influence by variables such as situational factors and personal qualities. In contrast, procedural behaviour and knowledge can be divorced from the elements of context and personal subjectivity and treated as a technical activity independent of judgement-based practice.

**How experts think novices learn**

The difficulty of using judgement-based expert behaviour as a template for teaching others can have a further effect. Instructors may interpret the difficulty as a function of differential capabilities between novices and experts to understand concepts and to master skills rather than being solely due to the characteristics of the concepts and skills. Expert instructors in this study behaved as if either:
1/ novices were not yet capable of making decisions in an effective way through the use of experience-based judgement;
or
2/ novices preferred to use different strategies of decision making to those preferred by proficient performers.

The belief by instructors in the differences between expert and novice decision-making ability and/or strategies provides a further rationale for process-based 'training' principles to direct the teaching of decision-making skills to novices. Such a rationale has support from the NDM perspective in general, and from the Dreyfus and Dreyfus' (1986, 1996) model of skill acquisition in particular.

According to the conceptualisations of Dreyfus and Dreyfus (1986, 1996) performance in an activity is associated with an increase in cognitive understanding of the situation as a result of experience. The Dreyfus and Dreyfus skill acquisition model describes the transition from learner to expert as involving a series of qualitatively distinct stages in perceptual awareness. In a reversal of the standard hierarchy, novices are described as initially being reliant on the application of theoretical, rule-based concepts for directing decisions and actions, whereas expert performers are described as using practical-based experience as the basis of behaviour that has become a routine. During complex activity, experts supplement practical knowledge with the equivalent support of theoretical concepts mediated by intuition in order to engage in deliberative reflection. The process of learning involves integrating one's initial theoretically structured perspective with a practical one.

Field-based observations of instructional sessions taught by experts revealed alignment between a teaching process held in common by outdoor instructors and the conceptualisation by Dreyfus and Dreyfus (1986, 1996) of the early learning stages. The observations suggested that there is a shared belief amongst outdoor instructors to the effect that beginners cognitively appraise situations in a different way to experienced individuals. It is accepted that the instructional format as described above may also be influenced by considerations of safety owing to physical incompetence of students. However, the researcher observed many beginner-intermediate students who were physically capable, but lacked "situational awareness". The deficit in perceptual awareness of these students in relation to their high skill levels appeared to be the factor that gave their instructors the greatest concern when deciding how to manage an instructional session. This supports the argument that instructors believe students 'think' differently to the way that experienced people do.

Belief in the philosophy that differential levels of expertise are associated with distinctive cognitive processing mechanisms requires of instructors that they design methods of instruction that reflect the differences in learning style. Ways that this is achieved include dissecting tasks into discrete units of information, teaching these units of information in isolation from the larger context, teaching information according to rule-based prescriptions, and recommending the
suspension of emotional reactions to situations. The performance of activities by students in accordance with these strategies bears little in common with real-world performances undertaken by expert instructors during their own free time. This discrepancy suggests that expert instructors believe that beginners cannot be relied upon to recognise critical cues, make links between disparate pieces of information, or create workable plans in unfamiliar contexts. Consequently, in keeping with the Dreyfus and Dreyfus conceptualisation of skill acquisition, the instructors resort to methods of teaching decision-making that are designed to activate beginners’ disengaged, analytical thinking rather than their experience.

The following comment from an experienced kayaking instructor provides evidence of his belief in the differential ability of exerts and novices to apply decision-making skills. The comment also provides evidence of an evolution from one teaching strategy (informed by the ‘training’ ideology) towards another strategy (informed by the ‘traditional’ ideology). The instructor teaches on a two-year long outdoor-adventure programme. First-year students are required to study a classroom-based risk-management course. During this year they also begin to learn pursuits in very controlled situations. In the following year the increasingly competent students are taken to more adventurous settings. The instructor begins by stating his belief in the need to de-mystify the aura of scientific rigour that often accompanies formal risk-management tools...:

*But, the risk management form where the ultimate thing that could happen in the outdoors is that someone could die, there are so many varying ways that you die in the outdoors that you could run out of paper. So I think it is a wasted document in terms of you write it out and then no-one ever seems to use it. When I am on the river I call a spade a spade, it is common sense. I don’t use a check-list system, my brain doesn’t think like that. I don’t work in a linear way like that. The first thing is to pay attention to that fact that there is a problem here, or potentially a problem or a hazard, or something that could cause something to happen that we don’t want to happen.* (Int. #20)

The instructor bases his straightforward exposition of the risk management process on his ability as an expert to use experience to recognise the gravity of a situation...:

Q'n: So when you say that you “pay attention to a problem”, what allows you to know that there is a problem?

Answr: Well, experience has taught me what things cause problems in rivers. It’s obvious to me. I look at something and go “That’s in the way, so obviously that’s going to cause me a problem”. I mean, it’s not any more scientific than that. You don’t need a risk management form to tell you that, you know? So to me, it’s obvious.... (Int. #20)

The instructor then explains that other people without experience cannot understand the situation as accurately as he can. Novices simply are not aware of what it is that they need to be aware of....
...It may not be so obvious to other people. And that's because you haven't ever seen something like that before, or no-one's taken the time to explain to you that characteristic, or you haven't had the misfortune of finding that it's an undercut rock from your own learning... (Int. #20)

Making people knowledgeable about concepts and features is the job of the instructor – as described next...:

...So, part of this Polytech teaching is about fast-tracking that, so people don't necessarily have to experience everything in order to learn it. I guess there are two things going on really. One thing is to teach people theory. And the other thing is to actually apply theory. And it's all very well, people can figure out the theory of how things should work, or do work, but then getting them to actually make observations and then state what they see, to apply the theory to what they are talking about, is another complete level... (Int. #20)

The instructor has pointed out that theoretical understanding of relationships among features is useful, but not enough on its own for effective coping. What is required in order to apply theory successfully is understanding that comes from practice but that remains "indefinable by theory" (Dreyfus and Dreyfus, 1996, p.44)...:

...And that's what we are pushing in our second-year programme, to apply the theory that they learnt in the first year, to apply this fancy term "risk management". Because risk management has become a paper exercise, but it is actually a real exercise when you are out there. "Tell me what are you going to do on this rapid?" "How are you going to look after yourself and other people?" We want them to come up with options. And if you call that "risk management", then we are doing it. But I call that common sense. And we want them to take responsibility for doing that. Eventually. When they put in a rock anchor and are hanging off it, it's not me that's hanging off it, it's them that's hanging off it. (Int. #20)

The final statements above describe the difficult task that the instructor has in integrating the tools of formal risk management with instruction of the activity of kayaking. The concepts of risk management were initially presented to his students as a set of rule-based procedures delivered in isolation from the kayaking activity. Now that the instructor's students are attaining moderate levels of competence (according to the Dreyfus and Dreyfus (1986, 1996) model), they are ready to take the initiative in formulating their own rules for action. The instructor realises that formal risk management procedures are incapable of adequately coping with the dynamic complexity of real-world practice at this level of competency. The role of the instructor is to 'wean' students off their reliance on pre-established procedures, and to gradually shift them toward a reliance on their own increasing repertoire of experience-based knowledge.
Implications for theory and practice

The difficulty in articulating how judgement 'works' has been described above as contributing to its lack of theoretical credibility and lack of application as an educational tool. The concepts, theories and models of NDM provide a means for communicating knowledge and understanding about how decision makers can use judgement to make decisions. Greater awareness of NDM may lead to acceptance of the 'traditional' ideology of practice and education in outdoor adventure as a legitimate educational perspective in its own right, and one with practical application.

The strategy of instruction employed by the instructor in the preceding section is an example of how the dual 'traditional' and 'training' ideologies can be integrated in education over time. As experience-based judgement accrues, and/or as preferred learning styles mature, then it is possible to gradually shift emphasis away from principles and practices derived from a 'training' ideology towards those that are aligned with a 'traditional' ideology. Decision making is one of the skills that can be taught in this evolving way. Initial training of rational-choice methods can be phased out and reinterpreted into the language and behaviour of judgement as the learner gains in experience and in critical evaluation of theory and practice.

Other options for structuring training and development of decision-making skills also exist. Further investigation is needed of the types of education that can be applied in order to enhance expertise in decision making. Conventional advice derived from the rhetoric of 'training' is to concentrate on powerful techniques for selecting the best option from among an array of choices. There is no current training that complements recognitional strategies of decision making. No concession is made for the possibility that competent and even expert performers may benefit from advanced instruction in recognitional strategies. Nor is there any awareness of the possibility that beginners may be able to improve their decision-making ability through instruction in methods other than rational choice. The findings of this study strongly suggest that more emphasis should be placed on 'fast-tracking' a transition towards methods of decision making in keeping with the messy, complex, but ultimately highly rewarding approach of recognitional decision making.

The 'teachable' and readily assessable nature of rational-choice decision-making strategies makes them very seductive tools of education. They can be 'packaged' in written format and they can be used as lesson-plans to give predictable teaching sessions to large numbers of students. This may incline instructors to use rational-choice decision strategies long after it is in the best interests of their students. The irony of easily manipulated rational choice strategies is that while they may facilitate the process of teaching and assessment, their universal, non-specific application may inhibit student learning. The selection of teaching strategies that are simple and workable may become an end in itself, and may even be used to shape ideas about how it is that beginners learn.
An overlong focus on rational-choice decision making can easily go hand-in-hand with a reduction in the quality of experiential learning, thereby hampering the development of students’ abilities to make effective and efficient decisions in stressful situations. It must be remembered that it has not yet been determined how novice decision makers are naturally inclined to make decisions, nor how they may be best supported in their use of alternative decision strategies to make decisions. This study does support the thesis that individuals who are highly competent use recognitional decision processes and not rational-choice processes for making decisions. As a generalisation, it makes sense to say that as an individual’s technical knowledge in a domain develops from novice to expert there is a commensurate increase in their judgement and their ability to utilise recognitional strategies. Another assumption is that training and practice can facilitate this development in ability.

One strategy of training that dovetails with conceptions of long practice is that of an apprenticeship educational system. This is a scheme in which students have opportunities to work alongside experienced mentors who have responsibilities for giving guidance and critical feedback over an extended period of time. The highly experiential nature of apprenticeship schemes means that they offer scope for utilisation of peer learning practices. Information from this study suggests that individual expert performers learn in an on-going fashion from communication with their peers. Educational schemes that allow a cohort of partially-trained individuals to practise and discuss outcomes together as well as experience intensive student:mentor training are aligned with NDM perspectives of how expertise can be used to enhance cognitive performance.

CHAPTER SUMMARY

This chapter presents the argument that there are competing ideologies regarding how outdoor adventurer participants should practice and learn the skills of an outdoor adventure activity, including the skills of decision making. While each ideology regards experience as crucial to the making of effective decisions, rhetoric associated with each ideology presents contradictory views of what constitutes relevant experience. The ‘traditional’ ideology is customarily associated with expert practitioners. ‘Traditional’ ideology holds that experience refers to extensive exposure to varied theories and practices, allowing a body of judgement to be built up that can be drawn on by the decision maker when investigating future courses of action. The ‘training’ ideology is typically associated with formalised, structured programmes of education. Experience within this ideology refers to knowledge and practice regarding rational rules and procedures that can be used to calculate optimal courses of action.

The ‘traditional’ ideology has been constrained in application in educational contexts because of the inability to describe the processes that make up intuitive understanding. The difficulty of expressing such concepts has led to ‘traditional’ ideology becoming a victim of its own rhetoric. ‘Traditional’ rhetoric denies the
possibility of experience-based judgement being taught, since it is not believed possible to articulate the mechanisms of experience. NDM offers a means of describing these processes, thereby opening up the prospect of structured programmes of education that teach individuals strategies for enhancing decision-making skills based on judgement as used by experts.
CHAPTER EIGHT

REFLECTIONS

"To train people to make good decisions in the outdoors, you've got to take them into the outdoors, into real situations, and let them face challenges by themselves."
(Paul Petzoldt, founder of the National Outdoor Leadership School, USA)

INTRODUCTION

This thesis was driven by discrepancies in beliefs, behaviours, and prescriptive advice in the field of outdoor-adventure decision making. The researcher’s experience suggested that practitioners of long-standing relied on subjective, experiential knowledge to figure out a workable course of action in natural settings. This did not conform to methods of decision making recommended and taught by the burgeoning outdoor-adventure education sector. Education and training in outdoor decision making is characterised by the use of rigorous and objective procedures that are set within a context of constrained and carefully managed safety and educational parameters.

The specific aim of the thesis was to carry out an exploratory investigation into decision-making strategies by expert mountaineers and kayakers, and to compare these strategies with those described by the naturalistic decision making model of recognition-primed decision making (Klein, 1989, 1998). The study affirms that experts from mountain and kayak domains rely on intuitive understanding of a situation based on experience to determine a course of action in accordance with NDM descriptions. Evidence also revealed the use by expert decision makers of singular evaluation and mental simulation strategies as proposed by the RPD model. In contrast to the conventional outdoor-adventure education doctrine, concurrent evaluation of options was rarely employed to make decisions.

In the light of the above findings, this chapter reflects on implications for the three research areas of outdoor-adventure practice, outdoor-adventure theory, and outdoor-adventure education. Finally, future lines of inquiry are suggested.

A REFLECTION ON OUTDOOR-ADVENTURE PRACTICE

NDM-based studies suggest that individuals who have expertise in a domain have a ‘natural’ cognitive tendency to use recognitional decision strategies when deciding on a course of action. The combination of technical expertise with rich and varied experience allows decision makers to feel comfortable selecting courses of action without resorting to slower but more rigorous rational-choice decision-making strategies. While this may be the case, it in no way requires us to think that experienced-based recognitional strategies are always the best way to go about making decisions. Some situational circumstances unequivocally require a rigorous
analysis of options. It is not appropriate to make rapid, short-term decisions that
deal adequately with the current situational requirements if the situation demands a
single, optimal solution. Given that there is an inclination on the part of experienced
decision makers to prefer recognitional strategies over others, it is important to
evaluate under what circumstances these strategies may and my not be
appropriate. Key variables that require assessment include the type of activity
being undertaken, and the level of expertise of the participant. The following
discussion examines some of the ways that activity and expertise can influence the
quality of decisions made in practice.

Recognitional decision making operates through the mechanisms of quickly
recognising analogous situations, diagnosing what is going on, and generating
explanations for what can be done next. These are generally effective strategies
when the situation lends itself to drawing logical connections between causes and
outcomes, and when the situation allows repetitive enactment of the cause and
effect cycle. Certainly for most aspects of mountaineering and kayaking it is
possible to make reasonable inferences about future events based on previous
occurrences. In this way participants are able to use their experience to predict
courses of action. If excessive dynamism or infrequency characterises an activity,
then at some point it will not be possible to make reasonable forecasts based on
recognition of past events. Shanteau (1992) proposes the following circumstances
when this may be the case:

- The domain is so dynamic as to be unpredictable.
- It is required that human behaviour be predicted.
- There are not enough opportunities to obtain feedback.
- There are not enough opportunities for repetition of the task/event to build
typicality.
- There are not enough repetitive events to instil reliability in outcomes.

The presence of one or more of the above factors increases the likelihood of
fallibility in recognitional decision-making strategies. If decision makers are aware
of the circumstances that promote inaccuracy in their ‘natural’ method of decision
making, then presumably they can take extra care to diagnose and evaluate
situations rather than relying on recognition of typicality as per the “simple match”
strategy. Alternatively, the situation may be so exceptional as to require use of
rational choice methods in order to determine what to do. Either case suggests that
prior warning of such circumstances could benefit the quality of the decisions
made. Such a suggestion is in accordance with McLennan and Omede’s (1996)
concept of “prepriming” in which decision makers use mental simulations prior to
activity in order to prepare for possible eventualities.

The presence of highly irregular situational factors also has an influence on the
level of expertise that a participant is able to develop. Without clear linkage
between cause and effect, it is not possible to establish a repertoire of reliable
examples on which to base future actions. A further problem is the possibility that
the individual may construct a database made up of unreliable precedents.
Through a process of faulty logic the decision maker may inappropriately attribute previous results to the wrong variables. This may become complicated by the human tendency to resort to faith and rumour in times of extreme uncertainty. Klein (1998, p. 282) cautions against assuming that experience translates into expertise when situations are characterised by irregularity. What can masquerade as expert performance may only be the artful expression of routine activity that is not based on logic or outcome.

There is always the possibility that repetitive events become translated into rules. The evidence from this study suggests that the decision makers who are least inclined to construct and follow rules are those who are experienced and/or inclined to judge a situation according to its worst qualities. Experienced decision makers in this study tended to convert repetitive events into guidelines, but differentiated them from rules. Decision makers of lesser experience may not have the maturity of judgement to make this distinction. Experienced decision makers exhibited a tendency towards cynicism in their view of what may happen during an activity. This prevented them from regarding repetitive situations as routine. The mountaineer who used “turmoil” to guide his thought process ensured that he was not about to be surprised by an untoward event. This is reminiscent once again of the concept of pre-priming. It is uncertain whether lesser-experienced performers regard events with this same level of untrustworthiness. It is possible that performers who do not have knowledge of the existence of hazards would have more confidence in a course of action being carried out as planned. Limited variety of experience could in this way deceive performers into believing that future events will always follow the course of previous events, leading to rule-based behaviour.

A further area of concern for practising decision makers is the tendency for mental simulations to remain robust even in the face of disconfirming evidence. Klein (1998) describes how it is common to explain away evidence that conflicts with a pre-established mental construct of what is happening. It is tempting to regard contradictory new evidence as untrustworthy. Consequently, the maintenance of an existing mental simulation may be retained long after an unbiased perspective would have suggested it should be discarded. Cohen (1997) theorises that the threatened mental simulation remains believable until discrepancies cause its maintenance to become overly complicated. This reluctantly forces reassessment of the situation. It is only after an alternative mental simulation is constructed that the original simulation collapses. It is well to remember that mental simulations are merely a means of generating explanations, not proofs (Klein 1998, p. 68). Therefore, they will occasionally turn out wrong.

The likelihood of decision errors befalling even experts is something that was widely recognised by the subjects of this study. Attempts to prevent the occurrence of decision errors by experienced performers through training in rational-choice strategies are considered by the author to be unhelpful. First, it is unlikely that experienced decision makers will use such methods in real-world settings since at such times experts generally prefer to make decisions according to intuitive guidelines. Second, recognitional decision-making strategies apparently give
satisfactory results in most field conditions, whereas rational-choice strategies have limited applicability. A more appropriate way to enhance decision effectiveness is proposed as being the reinforcement of assessment and revision aspects of the recognitional process. Rather than providing training in multiple option generation and in methods of comparing multiple options, emphasis should be placed on ways that enhance understanding of the situation so that a practical and workable course of action is generated and then subjected to testing. For example, a key theme of expert behaviour that was observed in this study was that of reflecting on previous decisions in order to locate faults and strengths that could then be used to inform future decisions and actions. It is proposed here that this reflective process is a critical component in the chain of events that lead a performer to develop good situational understanding and judgement. By supplementing training in individual reflection with the promotion of external intra- and inter-group communication mechanisms, relevant information could be shared more widely and more rapidly among performers. In this way there could exist industry-wide reflective mechanisms.

In order for the dissemination of knowledge about incidents, accidents, and general information to be most beneficial, consideration should be given to the handling of specific information that is embarrassing and even controversial. People will naturally be reluctant to share knowledge of mistakes that they have made if there is fear of formal or informal retribution by others. The various activity-communities, organisations, and professional bodies need to discuss the advantages of no-fault reporting versus the contradictions that this poses for professionalisation of outdoor adventure. As a suggestion, questions that seek to find out what happened are recommended over questions that ask for information regarding who was at fault. Other issues to consider include mandatory versus voluntary reporting of incidents/accidents, levels of confidentiality, and repercussions of reporting if the incidents include disciplinary matters.

Investigation into the area of decision making by teams was deliberately disregarded in this thesis. This is a complex area, and warrants a separate study. Studies based on the NDM perspective have revealed the significance of what is variously referred to as "shared mental models" (Cannon-Bowers, Salas, & Converse, 1990) or as a "team mind" (Klein, 1998). Effective teams are hypothesised to be those in which team members share a common awareness of the situation. A key source of failure in many teamwork tasks is claimed to be ignorance or confusion surrounding the intent of the task (Klein, p. 222-232). Team training strategies that have been developed according to NDM precepts have focused on fostering shared mental models, heightening situation awareness, and providing guided practice in natural or simulated conditions (refer to Salas, Cannon-Bowers & Johnston, 1997, for a summary of NDM team training strategies).

NDM-based research offers the prospect of integration with sociological research in endeavours to investigate the formation of a 'group mind' by some or all group members. Aspects of this phenomenon have particular relevance to outdoor-
adventure activities. The implications of such research may prove to be especially beneficial to leaders of these activities. Group issues that warrant investigation using a combined approach include the development of emergent cliques arising out of unstructured group situations (Freeman, 1970), group polarisation (Myers & Lamm, 1976), groupthink (Janis, 1982), Ollie-ism (Shephard, 1991), and more general issues of interpersonal conflict and inefficiency resulting from traditional working practices modelled on independent performance. Training in effective teamwork that is established on NDM concepts may benefit members of outdoor teams in ways that cannot be realised through traditional training methods.

A REFLECTION ON OUTDOOR-ADVENTURE THEORY

Efforts to translate knowledge that is imbedded in practice into verbal or written language can never entirely represent the original form of that knowledge. The experiential base of the knowledge is lost, and the complexity of action-in-context is transformed into a conceptual format that, for all its conceptual elegance, is nonetheless a simplified version of the original. When practitioners are reacquainted with their knowledge in this bastardised form, they are seldom comfortable. They recognise that something has been lost, and yet the formal, sophisticated nature of theoretical description implies that their 'basic' and 'raw' behaviour has been enriched in some way. This may explain why it is commonplace for skilled outdoor-adventure practitioners to view with suspicion most outdoor adventure theory that attempts to reduce practice to conceptual form.

It is hypothesised that a further issue complicating the relationship between theory and practice in outdoor adventure is that expert practitioners do not always know what it is that they do. Neither do they fully comprehend that the beliefs and folklore that direct their actions constitute a theory of action that is just as relevant as theory that emanates from academic sources. This is because much expert knowledge exists in a form that makes it difficult to articulate. It is 'implicit' knowledge, gained over time through practice in a variety of situations, and used to direct action in intuitive fashion. Because of this, experts are largely unaware that they are operating according to a certain set of assumptions (Dörner, 1996, p. 41). It is partly these assumptions that theoreticians attempt to capture in conceptual form. The distrust by practitioners of formal theories and concepts belies the fact that practitioners also believe, behave, and communicate in accordance with assumptions of their own. Rather than being theories, models and diagrams, the assumptions of practitioners take on the unsophisticated guise of heuristics, guidelines, and legendary stories.

In this study it was suggested that there are two parallel ideologies that inform understanding of how to think and act in outdoor-adventure contexts. The 'traditional' ideology that is based on experience-based judgement has been customarily associated with practice, since the ephemeral nature of experience and judgement was not easily described in either folklore or academic versions of theory. The 'training' ideology that is based on rational use of procedures has been
more closely aligned with theoretical application owing to the facility with which it may be applied to formal teaching settings.

A potential means of lessening the perceived divide between contradictory ideologies of decision making in outdoor adventure is the utilisation of NDM guidelines for research to structure investigations into practitioner behaviour. The increased use of NDM research approaches would shift the emphasis away from prescriptive advice and toward descriptive interpretation. In the context of decision making, immediate changes of emphasis could be made regarding the legitimacy of recognitional strategies in relation to more 'theoretically acceptable' rational-choice strategies. In particular, acknowledgement could be given to the ability of experienced decision makers to use their experienced-based intuition to devise a reasonable course of action as the first one considered without the necessity to devise large option sets and weight and rate alternatives.

The shift in appreciation of how decisions can be made has implications for the conventional way that we theorise about what constitutes a decision, and how a decision can be viewed as ‘right’ or ‘wrong’. Conventional conceptions of decision making presuppose that it is primarily concerned with choosing a course of action from among alternatives. Research focus rests on the predictive and explanatory power of the decision, with this problem-solving phase of the decision process emphasised over the initial problem-identification phase. The potential for human fallibility to compromise the decision outcome results in prescriptive advice that recommends the decomposing of complex problems into constituent parts, the use of procedures that augment limited human capabilities, and the correction of sub-optimal biases and heuristics (Kahneman, Slovic, & Tversky, 1982). In contrast, NDM perspectives emphasise the situational assessment phase of the decision process and the general workability of human decision capacities. Indeed, the RPD model entirely refutes the presence for comparative choice in favour of matching of an action with its situational context and assessment of an action by singular evaluation.

It is apparent that decisions that are framed as problems of choice are of a separate order to those decisions framed in terms of matching or assessment. Furthermore, if decisions are considered to always involve choosing between alternatives, then recognitional strategies will be theoretically sidelined or ignored. Given the existence of alternative ways for selecting courses of action, and given the evidence for the widespread use of matching and assessment strategies in circumstances that were formerly presumed to be the domain of rational choice strategies, the term “choice’ can no longer be considered an appropriate generic descriptor for decision making.

Lipshitz (1997b, p. 180) recommends establishing an alternative conception of what constitutes a decision. His proposal is to view decisions as “argument-driven actions”. The meaning behind this definition is that of actions being selected on the basis of reasons that “argue” for their implementation. Lipshitz (1997b, p. 181) claims that acceptance of the definition of decisions as argument-driven actions will
limit the “facile” application by decision analysts of inappropriate conceptions of consequential choice. The dangers of indiscriminate imposition of consequential choice analyses on all decision events include the false assumption that the decision process and the selected courses of action are wrong (because they do not conform to rational choice decision processes), the prescription of inappropriate courses of action (due to ignorance of contextual factors), and the failure to ask useful questions (Lipshitz, 1997b, p. 181).

Also relevant to this discussion of the theoretical nature of decisions is the question of how to assess a decision as right or wrong. Conventional decision-making theory considers deviations from the prescriptive procedures of rational-choice theory to be decision errors. NDM theorists regard such a formulation of decision quality to be inappropriate for decisions made in natural settings, as well as irrelevant to what it is that decision makers actually do (Lipshitz, 1997a, p. 158). Instead of prescriptive procedures, decision errors are assessed in terms of situation assessment, the generation of sequential options, the creation of mental models, and the reliance on evolving solutions to changing situations. The resulting NDM view of decision errors reflects a combination of interpretive and systems perspectives. Interpretation of decision quality depends on the contextual features of the situation and the perceptual framework of the decision maker, with the determination of root causes being contingent on the framing of the event and the degree of outcome knowledge available to the analyst. The systemic approach conceives of decision quality in terms of the match between the system (i.e., the situation) and the decision maker, such that bad outcomes are not produced by bad decisions but by the interaction of decisions and incompatible system states (Lipshitz, 1997a, pp. 159).

The above discussion highlights the very different ways of understanding what constitutes a decision and a decision error depending on the decision making perspective that is being employed. The implications for practice of this theorising include the importance of recognising that analysis of decision outcomes needs to be grounded in and directed at similar decision strategies. What may be regarded as incorrect from one perspective may be highly adaptive in another.

A REFLECTION ON OUTDOOR-ADVENTURE EDUCATION

Support for the hypothesis that decisions in natural settings are typically made in accordance with NDM theorising has significant implications for the way that education in outdoor adventure is structured and managed. A starting point for change would be promotion of recognitional strategies as dominant, viable, and legitimate methods for deciding what to do in outdoor settings. Beyond adoption of this perspective, education and training strategies could be focused on enhancing the means by which NDM cognitive thought processes are used to structure and evaluate domain knowledge. Efforts can be made to increase the reliability of recognitional strategies. More emphasis can go into designing resources that help users develop their assessment of situations and evaluation of proposed actions.
This can include training in the skills of mental simulation, pattern recognition, and mental organisation of experience-based knowledge.

Training can be given in discriminating between situations that are better served by either recognitional decision strategies or by rational-choice strategies. Where rational choice methods are deemed appropriate, educators have an opportunity to refine the application of quantitative weighting and rating evaluation methods to as minimal a level as possible. Also, qualitative ratings of dimensions can be promoted over quantitative ratings. Subtle changes of this nature will facilitate the convenience and accessibility of rational-choice applications in situations where rigour is preferred over rapid and evolving response. This will increase the likelihood of these strategies being used (although it may lessen their accuracy or specificity).

Indiscriminate promotion of rational-choice methods of problem solving may give inexperienced outdoor-adventure performers a false sense of confidence in their ability to handle real-world situations. It may lead naïve outdoor performers to believe that rational analytical strategies can always substitute for gaps in experience and knowledge. A related fallacy is that possession of procedural knowledge alone is adequate for dealing with outdoor-adventure situations. This study suggests that while procedural knowledge may be beneficial to learners, it is an insufficient foundation for real-world decision making where decisions give rise to consequences that matter. In a different sense, dissemination of non-critical information about decision making may reinforce the prevailing rhetoric that experts typically use rational choice strategies. This assumption is contradicted by NDM research (including this study).

As suggested in chapter six, there are factors that influence the continuing promotion and use by outdoor-adventure educators of rational-choice decision strategies even when it is realised that students struggle to apply them appropriately and expert practitioners decry them. The advantages of rational-choice strategies for instructors include the ability to establish predetermined procedures for action, to more readily articulate concepts, to present the concepts in written form, to use structured lesson plans, to operate according to relatively high student:tutor ratios, to utilise convenient settings (including indoor settings), to more easily manage dangers, to confidently reproduce outcomes, to compare outcomes and demonstrate optimal behaviour, and to ensure uniformity of teaching and assessment across a variety of instructors and locations.

This is in contrast to the application of ‘messier’ and more complex recognitional strategies that integrate decision making into the larger task of goal accomplishment in specific situations. The context-specific, evolving, and largely procedure-free nature of decisions founded on experience-based judgement makes for difficult operationalisation in educational settings, with consequent resistance to apply such strategies. As a result of these influential and inertial forces, the direction taken by the outdoor-adventure curriculum has become
gradually more divorced from 'real-world' practice, particularly as carried out by experts.

One critical aspect of current education that is challenged by both expert practice and by NDM findings is the emphasis placed on teaching a foundation of generic theoretical risk management skills that can be (hypothetically) overlaid onto any other situation. It is possible that rational-analytic and general-knowledge training methods do have value, although for whom and under what circumstances remains to be determined. What is strongly suggested by NDM is that the training of decision makers in domain-specific problem-solving skills is successful, whereas training that is removed from the context is of limited use (Cannon-Bowers & Bell, 1997, p. 107). With this in mind, a problem that needs to be addressed and managed by programme designers is that training that is imbedded in the natural setting may require more knowledge, focus, and organisation on the part of the trainer than does the teaching of general knowledge. A further management consideration is that it will also probably be more expensive.

These concerns issues aside, managers of outdoor-adventure education do have training strategies available for them to consider. Simulation training can accelerate learning by replicating key characteristics of situations. Simulations may have particular applicability to leadership training. Boyes' (1999) use of computer simulations of real-world case studies is one possible approach. Another approach is the use of visual and sound recording technology to capture real-life events as they occur, and then replay them later in controlled environments. Simulations allow time to be artificially 'collapsed' through methods such as the repetitive re-enactment of critical events, and the elimination of routine and time consuming features.

There is a quandary to be dealt with in the use of simulations of real events. No matter how well constructed, simulations can never entirely represent the real-world setting. Questions must always be asked of the ability of simulated situations to adequately prepare the learner for the real world. Simulation design, as well as management of the simulated setting, are variables that can influence the relevance of the training enterprise. While simulations may allow efficiencies in time compared to real-world training, cognitive processes critical to NDM such as pattern matching and cue recognition require time before they can be used effectively. Practice and repetition alone do not make good performance; critical reflection of the significance of events, and time to absorb learning are also critical factors. Another issue to be confronted regarding the use of simulations is that the advantages of being able to manipulate the type and intensity of information as well as the level of danger can inhibit the instructor and/or learner from confronting the natural setting. It is also possible that they can become ends in themselves. An example of the latter is that of students not progressing beyond the use of indoor training facilities such as climbing walls and kayak polo bats that were originally designed to promote the development of skills for use in the outdoor environment.
Provision of feedback on performance is another source of training that is supported by NDM theorising (Means, Salas, Crandall, & Jacobs, 1993). This has particular application regarding improved recognition of cues and cue patterns in the environment. Apprenticeships were mentioned in chapter seven as being a potential tool for enhancement of the proficiency of learners in a domain. The aim of an apprenticeship period in decision making is to deepen, clarify, integrate, and synthesise knowledge and cognitive processing skills already possessed by the trainee (Zsambok, 1997b). The researcher considers that there is significant anomaly in the NZOIA award since no provision is made for an apprenticeship scheme for inexperienced instructors.

A further potential strategy for enhancing the quality of decisions is that of training students to organise memories of their decisive learning experiences in ways that allow long-term retention and ready access. Mnemonic systems and story-telling are two methods that may have application here. Memory retention and accessibility strategies can be supplemented with pre-priming mechanisms that seek to prepare the decision maker for a situation. Pre-priming can be accomplished in various ways. NDM theorising suggests that, for outdoor adventure, practically-based preparation will be of greatest use. Nonetheless, there is scope for valuable research in this area, especially considering the available media resources at hand (e.g., video, magazines, books, www), as well as theoretical models and decision aids that can be taught in varying relationship to practice (e.g., RAMS forms).

A REFLECTION ON OUTDOOR-ADVENTURE RESEARCH

The application of NDM-based research methods and philosophy to the study of outdoor-adventure decision making gives a new perspective to what has been until recently a uni-dimensional research area. That this has been so is unsurprising. Very few other domains have embraced research in alternative conceptions of decision making. The few domains that do, such as US Army warfare training and clinical nursing, have relatively long traditions of research, large numbers of researchers, and an impelling need for integration of theory and practice.

The outdoor-adventure domain has only recently been considered a ‘legitimate’ field of study, and as yet very few academics have undertaken repeated research in this field. With most publications taking the form of papers submitted to journals, only a small number of books are available for general public reading. Those that do take on the status of texts (e.g., Ewert, 1989a; Graham, 1997; Priest & Gass, 1997; Miles and Priest, 1999), tend toward confirmation of accepted educational principles.

What is apparent is that the domain of outdoor adventure offers unique opportunities for investigation of the interrelationship between theory and practice. Within any research endeavour, theory and practice form a dialectical process. Theoretical developments can at times overemphasise an aspect of practice to
create an unbalanced account. In the current outdoor-adventure domain there are signs of tensions developing between practitioners and commentators. NDM offers scope for a theoretical re-evaluation of the roles of judgement and rational choice in the practice of decision making. As well, the orientation of NDM towards what is going on in a situation, as opposed to what should be going on, may inspire more collaboration between the academic community and outdoor-adventure practitioners.

FUTURE LINES OF INQUIRY
This study points to the following lines of inquiry as worthy of particular focus.

1. This study indicates that experts regularly use recognitional decision strategies in natural outdoor adventure settings. Further information about the following issues is needed:
   - The preferred decision strategy of naïve decision makers requires investigation. Whether naïve decision makers use different strategies to experts, and if so then how, is a critical question that is inadequately addressed by current NDM and RPD theorising. At present, ‘text-books’ in outdoor adventure recommend the use of rational-choice methods for the instruction of decision making to novice performers in an attempt to subordinate the role of judgement. The validity of this educational directive needs to be examined. Ways of matching training to preferred decision strategy need to be investigated, as do ways of boosting the reliability of judgement-based strategies when used by inexperienced people.
   - The influence of an individual’s level of expertise in decision making on the selection of a preferred decision strategy requires investigation. If research suggests that experts and novices do use different decision strategies, then further studies need to be directed at determining the stage(s) in the development of expertise that are associated with preference for a particular strategy.
   - The influence of an individual’s level of expertise in decision making on his or her ability to effectively use different decision strategies requires exploration. Information about decision-strategy effectiveness relative to level of expertise would promote confidence in particular educational strategies being used at different stages in the development of decision makers.

2. Similarly, this study indicates that domain-specific training in outdoor-adventure problem solving is valuable. It suggests that generic training in problem solving has limited value. Specific information is needed on the following issues:
   - The value of training in generic problem-solving skills for individuals of varying levels of expertise in a domain of knowledge requires investigation.

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The assumption that novices and experts are equally capable of understanding and applying general knowledge to an unfamiliar domain is unproven and, at face value, illogical. At present, some formal outdoor-adventure programmes provide general risk-management training without reference to specific domain knowledge. Other programmes provide both, but the link between theory and practice can be disjointed. Outdoor-adventure clubs offer a mixture of unstructured peer learning experiences, and formal programmes of instruction. Analysis of the levels of domain-based and generic information from these different sources, and comparisons of relative effectiveness, is needed.

- Ways of transforming generic risk-management training into domain-specific risk-management training should be investigated.

3. NDM theorising suggests that there are qualitative differences between the way that experts and novices use cognitive processing mechanisms to make decisions. Experts are better at figuring out what is going on in novel situations, and at devising innovative courses of action. This raises the possibility of devising means for distinguishing between experts and those of lesser ability who are merely efficient rule-based performers. The development of indicative measures for recognitional decision making could be used as markers of proficiency during outdoor-adventure qualification assessments.

4. Increasing demand is being placed on outdoor adventurers, and outdoor-adventure leaders in particular, to adopt technological devices as decision aids. Weather monitoring devices, satellite-navigation devices, and communication devices are classic examples. The augmentation, amplification and replacement of expertise with technological aids require investigation. NDM-based research suggests that the characteristics and capabilities of technologically-enhanced decision aids may misrepresent real-world expert decision-making behaviour. Investigations should be made into the appropriate usage of technological decision aids relative to the experience levels of performers. The increasing use of technological decision aids also has implications for outdoor adventure curriculum development, qualification and certification awards, and designation and scope of job descriptions for ‘qualified’ outdoor personnel.

5. Further research should be conducted in the related area of the influence of innovative design of outdoor-adventure equipment on decision making. The rapid development in design and construction of technical ‘tools of the trade’ increases the boundaries capable of being negotiated by adventurers. Although offering increased potential to perform in extreme conditions, such designs are often limited to specific use and settings. This impacts on the decisions that need to be made by outdoor performers. There are also consequences regarding the re-defining of what is meant by the term ‘expert’. Increasingly, this is no longer used to designate an all-round performer, but instead refers to a
specialist. Information about these matters will inform notions of how best to structure outdoor adventure training in skills-development and leadership.

6. This study supports the notion of apprenticeship-based training, although does not specify what form this should take. Investigation should be made of alternative trainee:mentor models that are aligned with NDM notions of cognitive decision processing. Also, inquiries should be made into the appropriateness of different forms that apprenticeship models currently take. Specific factors to investigate include the levels of expertise that are required of mentors, and the types of knowledge that are most significant in specific domains.

7. This study suggests that experts mentally review events with the objective of determining an optimal solution to a (previously experienced) problem. The RPD model in its current form does not offer a description of this process. This finding points to the need to study the subtle distinction between the reflective process regularly undertaken by experts after problem solving and the rational analysis process that is typically described as occurring as part of problem solving. Apart from the straightforward distinction of chronology of events, reflection and rational analysis do appear to have similarities. This suggests scope for investigating how reflection is undertaken in order to attempt to consciously replicate aspects of the reflective process during preliminary examination of a problem situation when rigorous procedures are required. The RPD model needs to be re-examined in order to find a way of incorporating this tendency for critical reflection into its structure.

8. Investigation into the distinction between conceptual and descriptive purposes of decision theory is needed in order to clarify the use of theoretical tools in the exploration of decision making. NDM researchers argue that classical decision-making theory does not accurately represent the decision-making behaviour of individuals, especially in real-world settings. NDM is claimed to be based on what decision makers really do, and therefore provides a more accurate description of decision-making behaviour (Beach & Lipshitz, 1993).

The critique presented by NDM supporters is based on an understanding of the function of decision theory that is a source of long-standing debate amongst economists. The debate centres on whether the purpose of the study of economics is that of prediction of economic decision-making behaviour, or instead, the enhancement of understanding of economic decision-making behaviour. The debate extends to examination of the need for economic theories and models to act as realistic representations (i.e., 'descriptions') of human decision-making behaviour.

McCloskey (1985) argues that economic theories are metaphors used to illuminate human decision-making behaviour without necessarily providing a
reconstruction of reality. That is, classical decision theories are abstractions from reality that may be used to provide conceptual enlightenment, but do not describe what really goes on. Therefore, attempts to use classical decision theory for purposes of description are misguided.

The debate amongst economists has implications for other branches of decision studies. The view that classical decision theory should be restricted to conceptual understanding clears the way for NDM (or some other perspective) to attempt to fill the void in the area of descriptive understanding of decision-making behaviour. It also presents the prospect of an integration of classical and NDM/descriptive perspectives, since they are now understood to be fulfilling different tasks. Further implications exist in the field of experiential learning theory. Conceptually-based classical decision theories and practice-based NDM theories can provide different perspectives on the mechanisms of the cycle of action and reflection.

9. NDM emphasises the relationship between domain knowledge and expert decision making. This study proposes the existence of two co-existing frameworks for the development of leadership skills – a traditional, experience-based learning pathway, and a more recent training-based learning pathway. According to the NDM perspective, a trainee who remains too closely associated with only one of the pathways may not gain the requisite domain knowledge in the other to make them a ‘well-rounded’, effective leader capable of intuitive-based decision making in a wide range of leadership tasks. The researcher’s background as assessor for NZOIA alpine instructor and NZMGA mountain guide qualifications has allowed close observation of candidates during the assessment process. On the basis of these observations, it is proposed that most candidates who fail to perform well during mountain leadership assessment courses can be categorised as either of the following two types:

- candidates who have not had enough experience in taking responsibility for themselves and others in non-instruction course situations;
- candidates who have not had enough experience in taking responsibility for others in formal instruction course situations.

It is proposed that this hypothesis is worthy of investigation. A survey of candidates who present for assessment on outdoor-adventure leadership qualifications could be conducted to determine their experiential background. This could then be compared against their performance on the assessment course. The results may provide valuable insight into the reasons for success and failure on these courses.

10. A final recommendation for future inquiry is the investigation of ways of adapting NDM concepts so that they may be more easily used in decision-making research in outdoor-adventure contexts. A limitation on the widespread
adoption of NDM research is the need to use ethnographic methods for collection of data. This requires gaining knowledge about a domain in order to ask the right questions and to appreciate the significance of important observations. Another problem is the necessity of collecting data that is of an applied nature, and that occurs in experimentally-unmodified 'natural' surroundings. The time that it takes to satisfy both these requirements limits the ability of some researchers to engage in this form of research. Although there are no short-cuts to satisfaction of either requirement, ways of easing the burden on the researcher need to be investigated. One possibility lies in examining the suitability of simulations in particular activity domains. The problems associated with conducting research in simulated settings have been noted. Another means of facilitating the use of NDM research strategies may rest in co-operative arrangements between universities, polytechnics, professional organisations, NZMSC, and peer practitioners. Such initiatives need to be investigated.

CONCLUDING REMARKS

Evaluating how decisions are 'really' made in outdoor-adventure contexts requires a willingness to engage in studies that offer ill-defined resolution and that are mired in issues of context and subjectivity. Nonetheless, the rewards that can be gained by such commitment offer a greater range of applications in practice than do traditional prescriptive approaches based on clear-cut procedures and analysis.

Outdoor-adventure researchers now have a choice of research perspectives to use as a lens with which to view the world of outdoor-adventure decision making. The choice of lens will largely determine what is seen. The lens of NDM will bring into focus people who use their experience as a source of exemplars and creativity in order to figure out how to respond to dynamic situations. Expert performers will be observed making consistently workable decisions using recognitional strategies under stressful conditions. The lens of rational choice will provide a prescription for problem solving that is recommended for use in any situation by all decision makers in order to calculate an optimal choice of action. Despite the availability of a script for optimal decision making, under the lens of rational choice performers will be observed making repetitive decision errors in natural settings as a result of their persistent reliance on fallible, human-centred decision strategies.

Decision making does not occur in a vacuum. It is a behaviour that is motivated by historical circumstances, environmental factors, internal needs, and social imperatives. The lens of NDM recognises these contextual factors, and refutes the notion that what defines good decision making is the correct following of procedures. This study supports the NDM perspective, and hints at the complexity involved in investigating decision making from the perspective of the actors. This study also advocates the adoption of the NDM perspective for its power to make insights and use methods that will bridge the contradictions in practice and belief in the field of decision making.

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PERSONAL COMMUNICATION


APPENDIX ONE

- Letter of introduction
Hello,

My name is Marty Beare. I am currently engaged in post-graduate study at Lincoln University. I am doing research on mountaineers and kayakers, and invite you to be a participant in a project titled *Making up one's mind in the outdoors: Naturalistic decision making and the genesis of judgement*. The aim of this project is to identify processes of judgement and decision making in natural outdoor recreation settings.

If you agree to assist in this project, *your participation will remain both confidential and completely voluntary*. Your participation in the project will involve two taped interviews that are estimated to take half an hour each. As well, you will be asked to allow the researcher, Marty Beare, to accompany you for an extended period while mountain climbing/paddling a river. Questions may also be asked of you during this period.

All information that is gained from interviews and observations will remain anonymous, and will eventually be destroyed. No one will be able to identify you or your information in any subsequent article or presentation. You may choose to withdraw your information from the project at any time without explanation. Your information will be coded with a Subject Identification Number and any future presentation of information will be in the form of "group results from New Zealand mountaineering/kayaking community".

Thank you,

Marty Beare.

(Marty has worked as an outdoor instructor, and is a NZMGA/UIAGM mountain guide and a NZOIA kayak 1 instructor. He will be pleased to discuss any concerns you have about participation in this project. The project has been reviewed and approved by Lincoln University Human Subjects Ethics Committee. Marty's supervisors in this research project are Pip Lynch and Kevin Moore from Lincoln University. If you wish contact them, please write or phone c/- Lincoln University (see number/address above).)
APPENDIX TWO

- Interview consent form
Consent Form

I, ____________________________, have read and understood the information sheet for the study, *Making up one's mind in the outdoors: Naturalistic decision making and the genesis of judgement*.

On this basis I agree to participate as a subject in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved. I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided.

Signed:

Signed:

(Marty Beare)