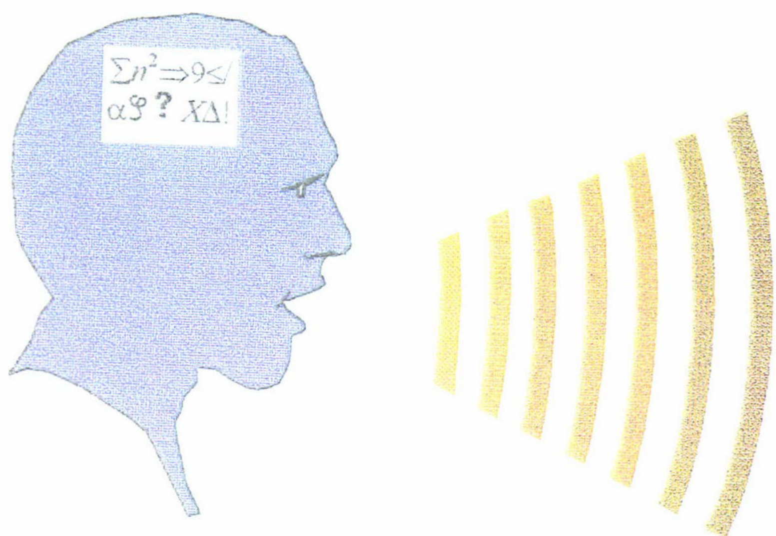
MAPPING COGNITIVE ARCHITECTURES: AN INFORMATION PROCESSING APPROACH



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Mapping Cognitive Architectures: An Information Processing Approach

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Abstract

This research attempts to answer the following question. How can the critical knowledge and mental processes used by people as they respond to their work demands and interact with their work environment, be identified and portrayed? This study uses an information processing model to focus on cognitively-based management competencies. The MAPA model, describes four crucial and interrelated stages in the recognition of what is thought to occur in human information processing. The resulting cognitive architectures reveal specific organisationally-valued knowledge, providing the basis for work-specific curriculum design. Organisational discrepancies of a cognitively-based nature are also identifiable.

A sample of New Zealand Army officers (N=103), comprising lieutenants, captains, and majors, completed questionnaires about their work-related cognitive processes. The MAPA model has facilitated greater understanding of respondents' combined work-related knowledge and knowledge structures.

The cognitive architectures identified by this research reveal that New Zealand Army officers have wide patterns of connectivity. This suggests that many theories are too simplistic in their descriptions of managerial and/or leadership behaviour. Prototype architectures devolved from the data illustrate a variety of cognitive activities appearing initially as people-oriented, such as listening, coaching, caring, and guiding, but which are instigated for the purpose of achieving the set task. This suggests that respondents perceive supportive Abilities to provide the most important method for achieving some tasks. This finding creates a theoretical paradox. Using commonly-held views on work orientations, it could be argued that some people have a task orientation while applying supportive behaviours in order to achieve that task. The stereotypical view of the task orientation is also disputed however, as the cognitive architectures resulting from this study indicate that concern with task completion is achieved predominantly through the use of what has been categorised as thinking functions, in that they represent problem solving and assessing Abilities. The findings suggest that army officers predominantly employ a deliberate information processing strategy of supportive behaviour in order to complete their goals.

In summary, this study explores a scientific approach for the recognition of cognitively-based competencies of managerial-level personnel. The results suggest that twelve Accomplishments describe the cognitively-based managerial-level competencies most valued by the New Zealand Army. In the process of identifying these value-added attributes, some organisational idiosyncrasies have been detected that, it is argued, may ultimately jeopardise the New Zealand Army's attempts to successfully implement its stated war-fighting and command operating doctrines.

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SECTION ONE

Chapter One. Rationale

Introduction

Over two decades ago Pfeffer (1977) complained that there were difficulties associated with the identification of the value leaders and managers add to an organisation. No appropriate solution to Pfeffer's complaint has as yet been identified. This has been attributed to numerous causes including problems with performance measurement and lack of objectivity in effectiveness ratings (Hogan, Curphy, & Hogan, 1994). Zaleznik (1983) attributes difficulties with the measurement of managerial effectiveness to the predominance of decision-making processes rather than ultimate events. Mintzberg (1994) agrees that managerial work is predominantly of a cognitive nature. Stubbart (1989) argues that managerial cognition must figure prominently in strategy-making, yet managers' thinking is seldom explicitly mentioned in the academic or business literature.

It is generally believed that people's "in-the-head"[1] (or cognitively-based) functions cannot be identified, yet such information could have immense potential for improving an organisation's performance. Detailed information of the knowledge and thought processes used by organisational members can identify training and learning needs and facilitate curriculum design (Hunt, 1997), as well as aiding in the construction of staff selection criteria. Furthermore, such information can identify potential discrepancies between what the organisation claims and wants to be doing, and what actually occurs.

Often a manager's major output is the product of his or her knowledge and analytical and decision-making abilities. Success for an organisation is often measured by and dependent upon a manager's problem-solving and decision-making ability. Knowledge and decision-making processes lack immediate transparency and occur in a multiplicity of contexts, which are also often of an ambiguous nature, therefore attempts at recognising these processes outside the laboratory have been relatively few and often indeterminate (Rose, 1992).

A popular analytical approach used to look into organisational effectiveness on a human performance level, is the needs analysis, described by Boydell (1971, p. 4) as *the identification of something lacking which can be rectified by systematic training.* As will be explained, the limitations and underpinning assumptions of extant needs analysis methods, particularly for higher managerial functions, bring their credibility and usefulness into question. Yet the entire training or learning intervention is often supposedly based upon the findings of such a problematic analytical method.

In response to Pfeffer's (1977) question concerning managerial value and its identification, this study will examine an information processing approach for identifying and describing, in a practical manner, the cognitively-based value added by organisational members at a managerial level.

This study will apply and examine two complementary information processing models which, if used together, have the potential to overcome many of the problems associated with needs analysis at a cognitively-based level. The first is Hunt's (1986) MAPA knowledge process hierarchy model, which is a scientifically rigorous, empirically-based variant of the needs analysis. MAPA is an acronym for Mission, Accomplishments, Performances, Abilities. These words describe four crucial and interrelated stages in the recognition of what is thought to occur in human information processing. The second model, PAVA, an acronym for Process Abilities Value Analysis, facilitates the construction of cognitive architectures from the data collected with the use of MAPA. Together these models are employed in an organisational context to identify the in-the-head functions of managerial-level decision makers. PAVA will identify the value people contribute to their organisation by analysing and mapping their work-related knowledge structures and cognitive process abilities.

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[1] Defined as the cognitive skills/activities/processes responsible for the more visible behaviours displayed by people in their work.

This study employs an interdisciplinary approach involving the fields of cognitive science, management, military studies, and human resources management. The discipline of cognitive psychology and its theoretical convictions provide the research vehicle for identifying, describing, and analysing cognitive processes and mental representations of work-related functions, contributing to the attainment of the organisational mission.

This study is presented in three sections. Section one discusses the rationale and suggested methods for understanding cognitive processes. Section two looks at the ambiguous nature of the work environments in which the study is set, and the variety of functions the research sample are expected to perform in the course of their work. Section three discusses the MAPA and PAVA research process, the results and findings, and the conclusions.

Background

Human achievement has stimulated a great deal of curiosity resulting in numerous disciplines of study attempting to describe and/or explain such achievement. Shreeve (1995), writing about the sudden and dramatic development of the human species within the last 40,000 years as compared with an evolutionary history spanning several millions of years, quotes from a conversation between himself and Berkeley paleoanthropologist Tim White:

> *After two or three hundred thousand years of nothing new, suddenly, in a tiny segment of time, after this huge gulf of nothing, you've got everything. There's one style over here and another one over there; there's trade, there's art, there's differentiation, all of this stuff just blowing up in your face. So you say to yourself, how come?* (p. 271)

The increasing complexity and accomplishment of the human species has been credited by many to the existence of a symbiotic relationship between competition (Dennett, 1996; Stewart & Cohen, 1997) and improved higher cognitive functions, particularly the development and use of language (Wills, 1993; Shreeve, 1995; Walker & Shipman, 1996; Calvin[2], 1996). In a similar vein it could be said that human endeavour is today continuing to be both driven and advanced by competition. Cohen (1989) claims that the memory requirements of someone living today contrasts vividly with the memory requirements of a rural villager living in the 1600s and yet approximately the same cognitive equipment would be utilised in both instances. The ever-increasing complexity of human life demands answers to the question, *how do we do it?*

This research focuses upon the application of higher cognitive functions for achieving competitive advantage in an organisational setting. This will be accomplished by studying decision-makers, their decisions, and the knowledge they require in order to work within and contribute to an organisation. Stubbart (1989, p. 326) complains that *even though managerial cognition must figure prominently in strategy-making, managers' thinking is seldom explicitly mentioned in the academic or business literature*. He claims that *in a sense, managerial cognition represents a vital 'missing link' in understanding the strategy process* (Ibid, p. 327). For this reason a study of the *missing link* underlying management performance is considered to be long overdue. The understanding gained from such research could potentially increase an organisation's competitive advantage and add greater value through its people. Knowledge and its application and expression can be viewed as a critical ingredient in the dynamic evolutionary process of survival and success occurring daily within the organisational milieu.

Mintzberg's writings (1989) echo similar sentiments to those of Stubbart. Mintzberg discovered that managers' programmes - scheduling time, processing information, and making decisions - remained locked deep inside their brains. He writes that researchers often describe managerial programmes with words such as *judgement* and *intuition*, but that they *seldom stop to realise that these are merely labels for describing our ignorance* (Mintzberg, 1989, p. 14). While it is generally thought that management is

[2] Calvin is more specific in attributing human intelligence to the development of language by inferring that it is the *syntactic* language capability which is responsible for the spectacular abilities of the human species (Calvin, 1996, p. 63).

becoming more scientific and professional in its decision making applications, Mintzberg derides this as folklore, arguing that a science involves the enacting of systematic, analytically determined procedures or programmes. He maintains that it is not even known what procedures managers use, thus making it farcical to believe that such procedures can be prescribed by scientific analysis. He argues therefore, that management may not be termed a profession since it is uncertain what managers need to learn to do their jobs. Hunt (1998, p. 3) describes two criteria for determining whether an occupational group can be termed a *profession*:

1. *Ways of acting or operating which relate to 'discipline-based' procedures rather than 'craft-based' practices,*
2. *A defined body of knowledge (or knowledge system) which is generally agreed to be requisite for the group to operate in a professional manner, and which is organised in such a way that the knowledge system becomes 'owned' by its users (the professional incumbents).*

Mintzberg (op.cit.) concludes that the first step in providing the manager with some help is to find out what his or her job really is. Such knowledge will provide a competitive advantage, not only for managers, but also for those who attempt to aid managers in their work, whether they are consultants or management teachers. The key to this knowledge may be found through an increased understanding of what managers do and more importantly, how they do it[3].

The Driving Force Of Competition

Competition is the driving force within society. Individuals compete with rivals for work. They then form into like-minded groups, competing for markets and/or resources. One strategy to improve a group's competitive ability relies upon education and training to increase knowledge and improve decision-making. With an increase in decentralisation and devolution of decision making in a world of increasing complexity, ambiguity, and pace of change, it becomes essential that each organisational member's contribution is optimised. Part of this optimisation process can be witnessed by the interest and enthusiasm with which both profit and not-for-profit organisations have embraced new management, leadership, and human resource management practices (Karpin Report, 1995).

One such practice is the competency movement which brought with it a demand for the identification of generic competencies in order to increase the efficiency and effectiveness of training. However, many of the so-called generic competencies such as critical thinking and problem solving are often context-bound, and it would therefore be erroneous to speak of these skills as inherently generic (Wallace & Hunt, 1996). Jessup (1991, cited in Wallace & Hunt, 1996) argues that *the concept of competencies should not be narrowly defined, but should instead be derived from an understanding of the individual learning process with respect to the application of knowledge, and the transfer of knowledge across situations* (p. 13).

Landa (cited in Reigeluth, 1983) explains the relationship between knowledge and learning, performance, and instruction. He claims that the application of knowledge to the solution of problems and to effective performance in general requires specific operations both on the objects of knowledge and on knowledge itself. Landa then raises questions concerning these operations, particularly about their nature, composition, and structure. He explains that, only on the basis of information about operations that underlie skills and abilities can we develop them in students consciously, purposefully, efficiently, and in a systematic way. Landa's views are supported by Gagné and Glaser (1987).

Kamoche (1996) claims that competencies have been characterised as sets of behaviour patterns. He explains that this perspective has led writers and firms to compile behavioural profiles of generic competencies and to relate these to performance. Kamoche points out that the behavioural profiling approach has been criticised both on methodological grounds and for being too general and unspecific, for example in the labelling of competencies. He writes that this criticism is pertinent in those cases where

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[3] For a detailed discussion see Henry Mintzberg , The Rise and Fall of Strategic Planning (1994).

firms have simply compiled a set of personal characteristics and job requirements, which they then label *competencies* and use in a mechanistic fashion as a yardstick for performance evaluation.

A growing number of writers argue that the generic approach is an inadequate and unsatisfactory solution in the continual attempt to minimise costs and increase performance effectiveness. This study will attempt to elaborate upon the hypothesis that use of knowledge is highly dependent upon context. Consequently it is posited that the identification and mapping of an individual's knowledge and its application in a set context may hold the keys to curriculum content, design, and subsequent teaching of critical work-related competencies.

It is proposed by the author that the results of this study will enhance an organisation's competitiveness, by identifying the cognitively-based value being added by organisational members. Farkas, De Backer, and Sheppard (1995, p. 1) define value addition as *the achievement of sustained, superlative levels of performance that would otherwise not be achieved if the organisation is left to its own devices.* It is suggested that value added by organisation members could be identified through the use of MAPA and PAVA, a complementary analytical model that maps those cognitively-based competencies adding value to the organisation. Dingle (1995) discusses a similar concept, which he has termed a *competence requirements/enhancement analysis* (p. 30). His approach more closely resembles a needs analysis focusing on behavioural competencies however, which, for reasons explained later, has been rejected by this author.

An Information Processing Approach

With the emphasis on knowledge being considered a crucial factor in the study of human performance and its improvement, it is proposed that the field of cognitive science be employed to study knowledge, its components, development, use, and representation. As an interdisciplinary field which includes psychology, linguistics, education, philosophy, anthropology, artificial intelligence, neuroscience, sociology, and economics, it provides numerous tools, methods, theories, and approaches for studying knowledge and its uses (Gardner, 1985).

The behaviourist outlook, which concerns itself only with observable behaviour, still appears to dominate most approaches to the assessment of human performance in organisations. The use of needs analysis is one example of such behaviourist approaches. While there is some value in the observation of people's performance and behaviour, the study of human performance should consist of more than simply observing an interaction between stimuli and its subsequent response. Pinker (1997) maintains that psychology during the reign of the behaviourists was *dull, dull, dull* (p. 84). He complains that during this period the *psychology curriculum comprised physiological psychology, which meant reflexes and perception, which meant beeps, and learning, which meant rats, and memory, which meant nonsense syllables, and intelligence, which meant IQ, and personality, which meant personality tests. Since then psychology has brought the questions of history's deepest thinkers into the laboratory and has made thousands of discoveries, on every aspect of the mind, that could not have been dreamed of a few decades ago* (Ibid). Since behaviour is to a large extent controlled by the thinking process, Meichenbaum (1977) argues that the most logical and effective way of trying to understand behaviour is by understanding the thinking which lies behind it.

Behaviourists from Watson through to Skinner dominated the field of psychology in America for several decades of the twentieth century, but work by such cognitive pioneers as Piaget, and linguists such as Chomsky, drew attention to the limitations of the behaviourist approach (Gross, 1996). Matlin (1994, p. 6) explains that *the late 1950s saw the rapid growth of research into human memory and its organisation.* Psychologists were becoming increasingly aware that complex human behaviour could not be easily described or understood in behavioural terms alone. Weaknesses in the behaviourist approach are discussed in chapter three.

Matlin (1994, p. 7) claims that the introduction of what is known as the information-processing approach of cognition evolved from computer science and communication science. The term 'information processing' was popularised in the late fifties to describe the pioneering work of Herbert Simon and his research associates in developing computer simulations of cognitive processes used by subjects in solving problems. According to Matlin (1994, p. 7) this approach introduced two important components into the study of mental processes:

1. *A mental process can be understood by comparing it with the operations of a computer.*
2. *A mental process can be interpreted as a flow of information through a series of stages.*

The identification, recognition, and isolation of these stages aids the understanding of knowledge structures and their composition. Such understanding provides researchers with the *how* information as opposed to simply knowing *what* has occurred in the cognitive process. Possession of such knowledge helps to researchers to visualise how people represent their information/knowledge. Wickens and Flach (1988, p. 149) argue that *the information processing paradigm has contributed both knowledge and tools relevant for understanding human performance.* They confirm that such a study of human performance provides an excellent opportunity to better understand general issues related to human cognition, particularly in complex environments. They lament however the lack of ecologically valid research in the field, due to an overabundance of information concerning a few esoteric laboratory tasks. This study responds to Wickens and Flach's challenge by applying information processing theory to the real-world complexity of work life. Attempting ecological validity may risk some blurring of boundaries and definitions however, due to the intractability of the subject matter. It is argued that an eclectic scientific approach is therefore warranted

A typical model in information processing may attempt to detect and map information flows from the initial reception of data on the senses, to information identification processes and comparisons with existing/stored data, seeking of further information for collaboration, clarification, confirmation, and finally through to the resulting decision making process.

Mandler (1985) explains that information processing models detect and trace flows of information while also observing the interplay between the information, the organism, and the environment. Christ (1991) echoes this point by stating that intelligent and deliberate cognition requires the activation of perception, memory, attention, motivation, and learning, none of which he claims can or should be studied in isolation. For this reason a considerable effort is made to describe the context and environment in which the research sample operate, or are expected to operate. Information processing literature is examined, a sample of people are questioned concerning work perceptions, and the philosophical as well as the operational work environments are studied.

An underlying thread woven through this study identifies the organisation from a biological perspective, due to its likeness to a living entity. The collective members comprising the organisation are sometimes referred to as the superorganism. Each member contributes to the larger organism and identifies with the collective cognitive architecture. The superorganism collectively perceives and perpetuates standards and norms of accepted behaviour, and it finds some things unpalatable, therefore resisting them. An information processing approach is used to 'see' into the mind of this living superorganism, and to map the knowledge process hierarchies of those cognitively-based managerial-level competencies it most values in order to succeed.

Information-processing models have made it possible to 'unbundle' competencies valued by the organisation. Such an unbundling process examines each value factor from a top-down or conceptually-driven processing approach and identifies constituent parts as well as their hierarchical structure. The specific cognitive processes in which information is selected, combined, weighted, and altered are referred to as information processing strategies (Ungson, Braunstein, & Hall, 1981).

One discipline within the field of cognitive science which studies and applies information processing models, theories, and strategies is known as cognitive psychology - described by Kalat (1995) as the study of the relationship between what is said and the meaning behind it. The study of human thought through the application of cognitive psychology has an intuitive appeal when viewed in the context of language ability being attributed as a major factor in the development of human intelligence and success as a species.

Wilber (1996) describes the relationship between cognitive psychology and knowledge concerning the mind and how it works in a unique manner. He claims that in its most objective manner, the study of the brain would require a scalpel and the ability to look - an empiric-analytic investigation. To understand the *mind* requires a different approach necessitating introspective abilities, communication, and interpretation. He states that *you can look at a brain, but you must talk to a mind* (p. 268). Cognitive psychology, by way of information processing theory, provides the epistemological grounds through which this research is undertaken.

Cognitive psychology attempts to unravel the mystery behind knowledge and knowledge structures by providing empirical evidence for understanding mental functions and mental representations. The results of such empirical research helps to provide blueprints or architectures of the way people's internal representations are used to describe their external world.

An Example

In 1995 the New Zealand Army undertook a review of its individual training system with the dual aims of decentralising training and taking training out of the classroom and on to the job. Expert panels were used to formulate trade/skill groups and career progression models and this was integrated with the Army output requirements. Such an approach identifies organisational needs but fails to account for the in-the-head computational structures subserving intelligent action. According to Lezak (1995) the translation of an intention or plan into productive, self-serving activity requires the actor to initiate, maintain, switch, and stop sequences of complex behaviour in an orderly and integrated manner. Unfortunately, the cognitive processes underlying such purposive actions are rarely identified.

Such an omission stems from what is transparent and what is not. Under the competency category PLANNING the expert panel included such competencies as *Conduct Combat Mission Analysis* and *Conduct Strategic Analysis*. The output is transparent but the cognitive processes involved are not. Humans perform feats of complex reasoning sometimes involving logic and/or non-rational processes. For example, when undertaking a combat mission analysis, the officer will consider such variables as enemy strength, position, morale, and intent relative to his/her own objectives. Information processing theory attempts to isolate cognitive functions involved in this analytical process while also identifying their interactivity. It identifies the information capacity, length of storage and subsequent processing, and how it is represented. Information processing theory categorises the information into relational hierarchies, from the higher, more indistinct conceptual-level intention, to successively more distinctive and well-defined cognitive functions.

Complex cognitive functions are not limited to the achievement of complex competencies. Dreyfus (1972) believes that even human common sense, something often ignored when discussing human performance, cannot be captured and portrayed in any set of declarative propositions or rules. Due to a lack of transparency and such beliefs as espoused by Dreyfus, the in-the-head functions are commonly ignored. Because cognitive processes are not transparent the realm within which cognitive behaviour falls is often not included in the training, education, and learning paradigms utilised in organisations.

The Research Goal

The explicit goal for this research is to attempt to identify and map the cognitive structures, processing abilities, and information processing strategies utilised by a cross-section of officers employed in command positions within the New Zealand Army. This research is designed to extend knowledge by adding to existing theories of mind. This will be achieved through the examination and testing of an information processing model. In order to take the study of information processing out of the laboratory, this model attempts to maintain an element of biological plausibility as it maps human information flows. The goal for this research is defined through the following concomitant objectives:

1. Recognising, describing and interpreting the cognitively-based competencies of a select sample of people.
2. Identifying and describing respondents' perceptions of their critical competencies in information processing terms.
3. Identifying and describing respondents' perceptions of their work competencies, to identify and map their cognitive architectures.
4. Developing prototypical cognitive architectures from the combined sample data.
5. Testing the efficacy and applicability of the MAPA model and its complementary analytical model PAVA.

This Is Not Just *Another* Piece Of Leadership Research

Rejai and Phillips (1996) introduce their research on military leaders by stating that the study of military leadership (they emphasise that this is relevant to all leadership) has not progressed much through the centuries. They explain that, *although a great deal has been written about the subject, from Sun Tzu (fourth century BC) to Machiavelli (1521) to Clausewitz (1832) to de Gaulle (1960) to Montgomery (1961) to Keegan (1978, 1988), military leadership has been treated in terms of such concepts as character, courage, competence, intelligence, persuasiveness, discipline, mastery of the subject, commitment to high ideals, optimism, self-confidence, selflessness, and luck, which have all made important contributions but no unified theory of leadership has yet emerged* (Rejai & Phillips, 1996, p. xv).

Argyris is quoted in Rauch and Behling (1984, p. 45) expressing the concern that:

1. *the number of leadership publications is increasing each year,*
2. *the additivity of the findings is limited, and*
3. *their implications for the central, everyday problems of leaders are minimal.*

Rauch and Behling (1984, p. 46) offer an alternative framework for studying leadership. They suggest that the leadership *functions* be studied. The authors explain that *leadership functions refers to the contributions that leadership acts, events, artefacts, and processes make to the achievement of the goals of the organisation in which they occur or, minimally, to its survival.* This could be viewed as essentially representing another behavioural approach to the study of leadership which could be regarded as useful but still largely focused upon what happens as opposed to explaining how it is done.

A Process Abilities Value Analysis (PAVA), applied in parallel with MAPA, can be used to analyse the functional contribution of organisation members. It is suggested that the use of these two models are an advancement on Rauch and Behling's suggestion, by further increasing knowledge concerning cognitive processes. This study is expected to identify critical work functions of officers of the New Zealand Army and analyse their knowledge structures and process abilities. It is suggested that this research will therefore provide an alternative to the growing pantheon of generic leadership literature by taking a perspective, which is at the time of writing still virgin territory. Identifying and mapping critical cognitively-based competencies and functions of Army leaders and analysing how these are fabricated and activated from a conceptual level through to a motorised deliverance state, will provide a new approach to the study of leadership. The model in use for this research is a type of cognitive process-tracing model, facilitating the identification of prototype information processing strategies.

The Limitations Of A Training Needs Analysis

Prior to the design and implementation of training or education, an organisation will ideally undertake a training needs analysis. Boydell (1971, p. 4) categorises training needs into three levels:

1. Organisational level - where training is most required in the organisation geographically speaking.

2. Occupational level - requirements in terms of skill, knowledge, and attitude to undertake the various duties related to a particular job or occupation.
3. Individual level - which individuals require training to eliminate deficiencies in skills, knowledge, and attitudes.

Boydell in a sense epitomises the main school of thought concerned with needs analysis: the identification of weaknesses and deficiencies. Training needs analysis is considered to be a critical step in training and development and ultimately the improvement of organisational performance, and yet it is fraught with problems. Such problems can be categorised as being both of a technical and attitudinal nature. An example of this was highlighted by McIntyre, a Lieutenant Colonel in the Australian Army heading a review of the Australian Army Training System (ATS) which concluded in its report:

> *In not one instance were instructional staff able to produce the training needs analysis on which their course(s) were based, and in most cases were unaware of the existence of such an analysis. This is not to imply that instructional staff were in any way unprofessional (indeed the opposite was the case) but rather that the ATS has broken down at this* first and most crucial phase *(the emphasis is mine) (McIntyre, 1995, Paper No. 2, p. 3).*

Mathews (1996) describing the New Zealand Army Training Development Course for Internal Trainers, identified a similar problem in her report. Mathews observed that there seemed to be two main areas in which current practices are identified as being weak: needs analysis and programme evaluation.

Dingle (1995) discusses the absence of training needs analysis as both McIntyre and Mathews point out in their reports, by complaining that different training needs analysis methods are described using the same common words in highly specific ways. He suggests that the resulting confusion may explain why training needs analysis is more frequently encountered in the pages of academic journals than applied in industry.

Dingle's point is emphasised in a survey of 1000 U.S. companies which revealed that only 27% systematically assessed their training needs (Saari, Johnson, McLaughlin, & Zimmerle, 1988).

Moore and Dutton (1978) begin a review and critique concerning training needs analysis by stating that while trainers and academicians recognise the great value inherent in the process of needs analysis, it suffers from three major deficiencies. The first deficiency cited by the authors concerns the lack of theory addressing the issue of diagnosing performance problems and ascertaining that they are caused by some lack of knowledge and that some variant of training represents the optimal solution set. The second failing is that organisational strategic planning considerations and training needs analysis decisions have rarely been integrated. Lastly the authors claim that the data collection process itself has been downplayed and therefore suffers from methodological weakness. With an increasingly greater awareness that training and education is a significant contributor to organisational effectiveness, such weaknesses in the first and possibly most crucial phase severely limit potential improvement and unnecessarily increase organisational costs.

As already explained, needs analysis is predominantly a behaviourist approach to problem identification within organisations. Such an approach, as will be explained in the following pages, is inadequate for describing requisite knowledge, its structures, and the flow of information for the performance of various critical tasks and functions.

Summary

This chapter has briefly described the need for a scientific process to facilitate the recognition of the value people add to their work organisation. It has been argued that this can best be achieved by developing an understanding of in-the-head processes. Two complementary information processing models, MAPA and PAVA, have been suggested as authoritative models to help achieve the stated research goal. Finally, problems and limitations associated with needs analysis have been introduced and this will be elaborated upon in the ensuing discussion.

Chapter Two. Problems Associated With The Identification Of Competencies

Introduction

Chapter two explains why cognitively-based competencies, which can be defined as skills, knowledge, abilities, and attitudes required to undertake a particular job, position, or function, are difficult to identify and define. These difficulties must be overcome before the cognitive makeup of competencies can be more fully understood.

Zikmund (1991) explains that there are generally three criteria for evaluating research measurements: *reliability*, *validity* and *sensitivity*. Reliability refers to the measuring instrument's ability to provide consistent results in repeated uses. Validity refers to the degree to which the instrument measures the concept the researcher wants to measure. Sensitivity refers to the instrument's ability to accurately measure variability in stimuli or responses. Patrick (1992) suggests that a further criteria be added in the context of researching training needs - *utility*. He claims that reliability and validity may prove consistency and accuracy but this still does not ensure that the results of an analysis has utility. Utility implies that the research results will benefit the organisation in some way. Having utility, it could be argued, may help to maintain the ecological validity of research.

As explained in chapter one, training needs analysis is often stated to be the foundation upon which the entire training structure is (theoretically) balanced. Errors or omissions in the needs analysis will have serious consequences for the outcomes of the training programme. Patrick (Ibid) claims that it is therefore surprising that the reliability and validity of analyses have received little sustained attention in comparison to the development of tests and measures in the area of psychometrics. This omission in scientific rigour is also contrary to Thorndike's view that the efficiency of any profession depends in large measure upon the degree to which it becomes scientific (Thorndike, 1906). Mayer (1992), Wittrock (1967,1989) and others have argued for a more scientific approach to instruction based on the inclusion of cognitive science and psychology as the guiding sciences of education and instruction. The contents of the following pages will posit and demonstrate one such approach. This study will be constructed upon an epistemological methodology based in cognitive psychology, of systematic data gathering, for the purposes of competency identification and analysis in order to identify and understand the value people add to their work organisation.

The following discussion identifies four potential problems confronting any procedure attempting to explain mental processes. If ignored these problems can adversely impact upon the resultant reliability, validity, and utility of the research (Pech, 1997). The subsequently identified competencies may have little credibility, and the cognitive processes deemed to be requisite for the job or function being assessed may fail to reflect reality. It is argued that an information processing approach, which according to Mayer (1992) views the individual as an active processor of information, can overcome the potential difficulties described in this chapter.

Springer and Deutch (1993) assert that the disciplines of psychology and physiology are working together to understand the thinking process and that although such interactions of the two disciplines have often led to premature simplistic conclusions in the past, things appear to be improving. Pinker (1997) disputes this assertion however, when he argues that *Psychology, the analysis of mental software, will have to burrow a considerable way into the mountain before meeting the neurobiologists tunneling through from the other side* (Ibid, p. 26). While the information processing approach to the study of mental processes draws predominantly from psychology, the views of psychology and to a lesser extent, physiology, have been included in this study in order to maintain an element of biological as well as psychological plausibility. Such an approach is intended to expedite the excavation process of Pinker's *mountain.*

The Problem With Implicit Knowledge

The first problem when attempting to understand cognition is that a great deal of knowledge is implicit (i.e. it is difficult to state). In 1977 Nisbett and Wilson observed that people may have little or no direct introspective access to higher order cognitive processes. Asking someone to verbalise their in-the-head processes, according to these authors is therefore limited in usefulness.

Paivio (1986) points out that for most people concrete materials are more memorable than abstract materials. Pressley and McCormick (1995) concur that humans are more adept at creating images for concrete verbal concepts than abstract ones. Therefore, it is easier to picture and remember a *book* than it is to picture and remember more abstract concepts such as *leadership* or *management*. Similarly, with much of our knowledge being implicit (Ibid, p. 81), we find it difficult to convey what we know. There is a great deal going on in our minds that is difficult to represent, and consequently difficult to articulate. This is largely due to a lack of awareness concerning our possession and organisation of such knowledge. Research by Hartley, Brecht, Pagerey, Weeks, Chapanis, & Hoecker (1977) has demonstrated by way of self-reporting that people accurately identified between 85% and 92% of the tasks involved in their jobs. This is sometimes mistakenly taken to mean that people can also accurately describe *how* they achieved those tasks. Identifying tasks involved in their work is not the same as identifying the cognitive processes required to undertake those tasks in their work.

According to Schachter (cited in Lezak, 1995, p. 33), implicit knowledge is not generally available to conscious awareness. Goldman-Rakic (1993) clarifies this in a discussion on working memory; explaining that the functions of working memory are to hold information in mind, to internalise information, and to use that information to guide behaviour without the aid of or in the absence of reliable external cues. The inference is that because a great deal of information is implicit; information processing speed is increased due to a reduced need to consciously reason, judge, generalise, order, organise, plan or solve. The subsequent result however, may be a bias towards responses to a researcher's questionnaires and interviews by stating more explicit knowledge stored in long-term memory. A large amount of detail that is abstract and implicit may simply be irretrievable and therefore irrevocably lost to the researcher. At the time of writing it is regarded that the sheer complexity and uncertainty of the mind/brain function only serves to compound such difficulties.

Related to difficulties with the articulation of implicit knowledge is the second problem when employing questionnaires and interviews for identifying competencies: this is the difficulty people have actually articulating their cognitive processes. This is a subtle variation on the first problem identified. Perkins (1981, pp. 44-47) demonstrates this by discussing the example of an insight puzzle. The purpose of this exercise is not so much finding the right solution as to measure students' abilities at recalling and explaining how they solved the problem. Before presenting the problem, it is explained to the students that they must attempt to find an appropriate solution. Immediately upon solving the problem the students must write down the steps involved in the problem-solving process - not omitting any steps, leaps of insight, or assumptions made. They must attempt to trace their thought processes exactly as they occurred. This must be done immediately after solving the problem or details will quickly be forgotten. Here is the problem:

> *A stranger approached a museum curator and offered him an ancient bronze coin. The coin had an authentic appearance and was marked with the date 544B.C. The curator had happily made acquisitions from suspicious sources before, but this time he promptly called the police and had the stranger arrested. Why?*

In the author's experience very few people have cogently managed to explain the mental or cognitive processes undertaken to solve this simple problem - at least to the extent that a child could look at the explanation and follow the steps to the same solution. Some people write an extensive step-by-step description of their problem-solving process although often omitting such assumptions as understanding the meaning of B.C. Other people quickly find the solution and just as quickly explain that they had a "sudden insight". Does this imply that the person with the sudden insight had better problem-solving abilities than the person with the lengthy explanation? It is probable that the sudden insight resulted from cognitive processes applying implicit knowledge which the student found difficult to explain, while the other student could follow the logic of the problem-solving process more easily although still missing certain steps and assumptions and crediting such omissions to *mental leaps*.

An interesting note to this experiment which has been undertaken with police, the army, and university students is that older, higher ranking people more frequently get the wrong answer i.e. that the coin cannot have been authentic because bronze had not been invented in 544 B.C. (which of course it had!). The correct answer is that the maker of the coin could not have known that Christ was going to be born in 544 years thus making it a fake.

Problem number two can cause genuine concerns for the researcher as the example has demonstrated. People being questioned cannot recollect details that may be critical to the research - no matter how hard they try.

A third problem for understanding cognition has been identified from the research of Anderson and Pichert (1978). These researchers and others have found that the schemata that are activated when attempting to remember can have a powerful impact on what is recalled. Schema theory in simple terms concerns the images and representations held about familiar and recurring events and which are stored in memory, that is, if someone mentions going for a meal at a restaurant, most people would automatically construct a visual image of their interpretation of the scene being discussed. Schemas are heuristics, or rules-of-thumb that are generally accurate but very personal in their basis and interpretation.

A great deal of research has gone into the influence such schemata have on the way people process new and recall old information (see Anderson & Pearson 1984, and Kardash, Royer, & Greene, 1988). An activated schema guides the reconstruction of a previously encountered event and can dramatically influence people's interpretation of old as well as new events. According to Rumelhart (1981) schemata are used to interpret new situations and observations and once a schema is triggered, if it contains precisely the right procedures it can control the solution (Gagné & Glaser, 1987). The following passage is an example that was used by Pichert and Anderson (1977), and Goetz, Schallert, Reynolds, and Radin, (1983) in their research. Research participants were asked to read the following excerpt from the perspective of a burglar planning to rob the house being described:

> *The two boys ran until they came to the driveway. "See I told you today was good for skipping school," said Mark. "Mom is never home on Thursday," he added. Tall hedges hid the house from the road so the pair strolled across the finely landscaped yard. "I never knew your place was so big," said Pete. "yeah but its nicer now than it used to be since Dad had the new stone siding put on and added the fireplace."*
>
> *There were front and back doors and a side door, which led to the garage which, was empty except for three parked 10-speed bikes. They went in the side door, Mark explaining that it was always open in case his younger sister got home earlier than their mother.*
>
> *Pete wanted to see the house so Mark started with the living room. It, like the rest of the downstairs, was newly painted. Mark turned on the stereo, the noise of which worried Pete. "Don't worry, the nearest house is a quarter of a mile away," Mark shouted. Pete felt more comfortable observing that no house could be seen in any direction beyond the huge yard.*

A different group of readers were asked to read the passage from the perspective of potential home buyers. In brief, participants from both groups were asked to recall what they had read. There was a marked variation between the two groups in what was recalled and this was further highlighted when both groups were asked to reread the passage from the others' perspective. The perspective being taken influenced the schema being constructed in each case, affecting the recall ability and items recalled. The implications for researchers studying competencies are two-fold:

1. People being interviewed about the competencies they think are needed to do their jobs will describe their thoughts based on a personal, cultural, and/or organisational schema which may not be pertinent to others doing the same job.
2. Recall based upon a personal schema will be limited in its uses depending on the perspective being taken.

The impact of the above will be explained and developed further in the discussion.

Taylor and O'Driscoll (1995) describe a fourth factor complicating the search for those elusive competencies. They point out that there has been little research undertaken to link training initiatives to organisationally-valued results. In other words, how can the researcher be certain that the competencies being identified are actually adding value to the organisation? This is particularly pertinent with the rapid changes being experienced in the goals and strategies of organisations. Taylor and O'Driscoll cite McGehee and Thayer (1961) who recommended that an organisational analysis be included with every needs analysis in order to ensure that there is a match between the organisation's goals, resource needs, and efficiency indices, and the organisational training needs. Goldstein and Buxton (1982) allege that since the publication of McGehee and Thayer's classic book, there is still very little information available on the procedures necessary to undertake an organisational analysis, particularly as related to instructional processes.

Summary

Four interconnected problems have been described, three of which are concerned with inability to recall and relate knowledge. The first two problems relate to an inability to articulate implicit knowledge. This has been explained due to a lack of cognitive awareness and an inability to articulate the correct problem-solving steps and assumptions that have been made. We therefore often credit solutions with leaps of intuition or sudden insights, rather than attempting to identify and describe the knowledge used and cognitive processes that actually took place. The third problem relates to our schematic, and therefore subjective, representations about activities and events. The fourth problem concerns the requirement of matching organisational and training goals. People being questioned about their perceptions of competencies required to do their jobs may have little knowledge of the greater organisational goals and where their particular function fits in with the overall plan. Such lack of organisational knowledge could result in expenditure of time and resources on the training of competencies which are only peripheral to the goals of the organisation i.e. they have little utility for the organisation.

The first three problems indicate a difficulty in the understanding and interpretation of metacognition, which Flavell (1985) describes as knowledge about, and awareness of one's thinking. Flanagan (1992, p. 154) sums up the consequences of the above three points in a debate concerning the value of phenomenological research[4] when he writes that:

1. There is no necessary connection between how things seem and how they are and,
2. we are often mistaken in our self-reporting, including in our reporting about how things seem.

The above observations could have some serious implications for qualitative research involving questionnaires and interviews, as these research instruments are largely dependent upon the subject's ability to articulate his or her perceptions and/or metacognitive processes. It is argued that attempts to identify competencies through empirical research involving questionnaires and interviews could result in serious omissions due to the subject's inability to articulate implicit and abstract knowledge. Furthermore, the subject may describe perceptions based upon personal schema which:

1. may not be interpreted correctly by the researcher,
2. being a decidedly top-down approach to information processing; activation of the higher-order idea occurs first thereby constraining thinking about the details (Pressley & McCormick, 1995); and

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[4] Often viewed as subjective and usually of a qualitative nature i.e. asking questions as opposed to gathering statistical data which is quantitative in nature.

3. may be grounded in the life experiences and understanding of the subject thus making such knowledge of less worth to other people due to a lack of transferability.

Point number 3 relates to organisational knowledge and the interpretation of what the organisation considers important. Respondents will reply to questionnaires from their perspectives of the organisation. Utility of results for the organisation may be questionable as a result.

The approach set out in the following chapters for the identification of value-added competencies and subsequent analysis of their composition is advanced to overcome the four research difficulties discussed above. It is argued that while the proposed methodology was originally designed as a tool for undertaking training needs analysis, in its adapted form, it is well-suited for undertaking a value needs analysis, the concept of which was first introduced in chapter one.

Chapter Three. The Importance Of Context, Structure, and Organisation

Introduction

The previous chapter discussed four difficulties associated with attempts at identifying internal representations of our interactions with the external world and how we function in that world. It was emphasised that simply observing behaviours and noting their existence fails to explain *how* such behaviours or outcomes come about. What processes did the mind undertake to perform the tasks identified as adding value to the organisation being studied?

The following discussion briefly reviews the part played by declarative and procedural knowledge in explaining the storage and use of knowledge, it then continues by establishing that expertise in any field requires well organised knowledge structures. The difficulty lies in how such multi-dimensional knowledge structures and their processing abilities are to be understood and subsequently represented in a recognisable format. Hunt's Knowledge-Process Hierarchy (1986) is examined as to its appropriateness, effectiveness, and accuracy as a model for the identification and analysis of human information processing (as opposed to attempts to understand cognition through biological, philosophical, or quantum mechanical methods). Applied differences between classical cognitivism and the parallel distributed processing (PDP) approach are briefly debated in an attempt to argue against the uniformity assumption which states that a formal research apparatus must conform with a single research approach and its underlying beliefs and assumptions.

Knowledge Structures And Processing Ability

As far back as 1929 Whitehead referred to the shortcomings of learning disconnected facts, which he claimed was useful if attempting to recall knowledge for a test but which could not be applied elsewhere (Whitehead, 1929). He called this *inert knowledge*. Knowledge that facilitates performance and is transferable across different situations and circumstances is well organised and connected. Gagné and Glaser (1987) refer to studies of expertise where the performance of novices and experts have been contrasted. They conclude that high levels of competence result from an interplay between *knowledge structure* and *processing abilities*. Skilled individuals possess rapid access to and efficient utilisation of an organised body of conceptual and procedural knowledge. The nature of this organisation determines the quality, completeness, and coherence of the internal representation, which in turn determines the efficiency of further thinking.

Experts possess a well organised, carefully learned knowledge structure (Belleza & Buck, 1988; Cohen, 1989) which provides them with many advantages over novices. Bloom (1956) identified such advantages in relation to the learning process when he wrote that knowledge, which is organised and related, is better learned and retained than knowledge which is specific and isolated. It is therefore critical that the structural representation of knowledge as well as its content are identified and described. Robert Van Gulick discussing consciousness states that:

> *The more we can articulate structure within the phenomenal realm, the greater the chances for physical explanation; without structure we have no place to attach our explanatory hooks. There is indeed a residue that continues to escape explanation, but the more we can explain relationally about the phenomenal realm, the more the leftover residue shrinks toward zero.*
>
> (cited in Flanagan, 1992, p. 59)

Such explanatory knowledge increasingly informs about the *how* of cognition, instead of simply observing via behavioural means *what* occurred as a result and then attributing such outcomes to an inexplicable process shrouded in deep mystery.

Organisations in pursuit of improved performance sometimes undertake a job analysis but such an analysis often only reveals what has occurred, failing to deliver details on *how* it was done. Schultz and Schultz (1994) state that *job analysis* is the most frequently used technique for determining training needs and objectives. They claim that it yields a detailed list of the characteristics needed to perform a job successfully and the sequence of operations required. Lockett-Kay (1992, p. 10), arguing in support of an information processing approach to needs and job analysis, explains that the most common procedures for determining and defining competencies for the purpose of developing content for training programmes, has been to focus on tasks required to carry out a specific job or function. She claims that this is done by:

1. describing the work or task
2. identifying each of its components, sorting them into sub-tasks and,
3. developing a description of mastery performance.

As she also points out, such a list-gathering approach to competency identification and evaluation ignores and fails to identify the *knowledge structures* and *processing abilities* (the in-the-head functions) developed over many years which in large part influences the difference between expert and novice. Both experts and novices may describe similar competencies when questioned about their jobs; however, it is the range and organisation of that knowledge and the speed with which it is accessed and processed that determines the level of competence (see Glaser & Chi, 1988). Furthermore, the ability to discuss and define a competency is not necessarily proof of a person's ability to apply it - Whitehead's inert knowledge. Knowledge which is useful for answering examinations but is often not practically applicable, is also called *declarative knowledge* (Anderson, 1983).

Although a great deal of knowledge may begin as declarative knowledge, the study of competencies requires deeper insights that are lodged in *procedural knowledge*, knowledge that is knowing *how* to do something. Pressley and McCormick (1995) describe procedural knowledge as knowledge used in conjunction with factual knowledge specified in schematic temporal, spatial imagery, and propositional codes. Such knowledge often refers to implicit memory and is therefore difficult to extract. Competencies are constructed from both declarative and procedural knowledge. Both the composition and organisation of this knowledge must be extracted from research subjects, as well as developing an understanding of their process abilities in order for the researcher to undertake an accurate competency analysis. As Clark (1989, p. 30) so succinctly puts it *[W]here real intelligence is concerned, it ain't what you know, it's the way you know it.*

From the late 1960s research began emphasising the importance of knowledge organisation as opposed to the previous behavioural orientation which focused on skills and knowledge required to perform a job or task. As a result the view of the learner changed from that of a recipient of knowledge to that of a constructor and processor of knowledge and information (for a detailed history of the joining of cognitive and instructional sciences read Mayer R. (1992); Ungson, Braunstein, and Hall (1981) also provide a lucid historical description of information processing systems research).

Mayer (op.cit., p. 408) states that the cognitive theory that had come to dominate psychology by the 1980s was one that viewed the learner as an active processor of information with the instructional emphasis being placed on helping learners become more effective processors of information. Eylon and Reif (1984) posed the question: how to communicate information about a complex multi-dimensional knowledge organisation. Verbal communication is linear and sequential and cannot accurately convey the information transmission processes occurring in the mind, thereby making it difficult to accurately map cognitive processes. The authors developed a knowledge organisation hierarchy to help identify the composition and structure of the information processing function.

The Knowledge-Process Hierarchy

Conceptually similar to Eylon and Reif's information processing model, Hunt (1986) developed a *knowledge-process hierarchy* to identify both declarative and procedural knowledge and to categorise such knowledge in information-processing terms, from initial higher-order conceptualisation down to the more specific constituent parts (see Figure 3.1).

It could be said that Hunt's knowledge-processing hierarchy has been extended beyond early information processing theory which viewed the mind as a sequential or serial processor of information - similar to the processing methodology undertaken by a Von Neumann-structured computer. The resultant data gathered and compiled by applying Hunt's model could be said more accurately to resemble the known physiology of the brain in that its interconnected levels of associations and multiple influencing elements mirror the dynamic properties and procedures of the neural network. Hunt's knowledge-process hierarchy has been termed MAPA, an acronym for Mission, Accomplishments, Performances, Abilities.

Rumelhart and McClelland (1986) describe such mental models in their ground breaking dual volumes on parallel distributed processing (PDP) (McClelland & Rumelhart, 1986, Rumelhart & McClelland, 1986). The PDP understanding of cognition relates the thought process to a number of neural activities occurring in parallel across various parts of the brain. It attempts to map these processes by applying complex mathematical algorithms and linear algebra, thus facilitating the fabrication of multi-dimensional models, to some degree replicating neural reality. Smolensky (cited in Rumelhart & McClelland, 1986) however distinguishes between the existence of the neural world, the conceptual world, and the mathematical world which he views as a descriptive bridge between the two worlds and consequently between the mind and the brain. He emphasises that the neural and conceptual bases for interest in PDP models are completely independent. This will be elaborated upon in chapter four when PDP models are examined in more detail.

Clark (1989) describes parallel distributed processing (or connectionism) as an attempt to provide slightly more biologically realistic models of mind. Complex cognitive functions cannot always be described in a linear fashion and can also not be described as existing in one localised portion of the brain. Similarly, to attempt to explain human performance by attributing single factors to success is unrealistic. Excluding exogenous variables, human performance is the result of numerous cognitive functions, interconnections and distributions of information and processes. This is best exemplified in our ability to deal with faulty or limited information while still managing to piece together enough detail to accurately come to the correct conclusion (Churchland & Churchland, 1990).

In a review of PDP, Palmer (1987, p. 928) calls it *a new paradigm for cognitive theory* emphasising that it is really a new language for constructing information processing models in a quasi-neural formalism as opposed to providing a totally new theory of cognition. Numerous authors (McClelland & Rumelhart, 1986; Parks, Long, Debra, Levine, & Crockett 1991; Matlin, 1994; Smith, E.R., 1996) express their views that PDP is a totally new framework revolutionising the study of cognition, and that cognitive scientists should abandon previous models of cognition based upon the serial computer as a model for understanding cognition. An expeditious literature search quickly indicates that a decade since the publication of McClelland and Rumelhart's two volumes describing PDP there is still little conclusive agreement in support of PDP as the dominant cognitive theory. Clark (1989) contends that supporters of the classical cognitive model and supporters of the PDP version have assumed aspects of a holy war in their attempts at denigrating each other's views.

In support of Clark's argument that the study of cognition is best served by a multitude of possible virtual computational architectures, this study attempts to integrate some of the underpinning propositions of PDP along with aspects of other cognitive theories[5] thought to be relevant to this study. This resists the uniformity assumption that states

[5] Perry (1994) warns that PhD candidates should not get involved in the cross fire of 'religious wars' of some disciplines (p. 8).

that only one approach is valid. The analogy used by Clark to explain such an integrated relationship between connectionist and conventional artificial intelligence (AI) is along the lines of the relationship between Newtonian theory and quantum theory. Clark speculates that the Von Neumann serial architecture may accurately account for *some* functions within the cognitive domain such as the process of serial reasoning in which the ordering of operations is vital. Seriality and sequential cognitive operations should therefore not be viewed as being psychologically irrelevant. McCauley (cited in Flanagan, 1992, p. 24), states that *differing theories often do not purport to describe phenomena at the same level of analysis, instead they have an interlevel relationship*.

For this reason it is again reiterated that this study is not an attempt to either *test* or *prove* the superiority of one cognitive theory over another. The application of cognitive theory is simply a means to an end, the end goal being the identification and mapping of the perceived cognitive structures, processing abilities, and information processing strategies used by a sample of officers employed in command positions within the New Zealand Army.

Furthermore it is emphasised that this study is based upon the premise that a significant percentage of deliberate and intentional cognitive processes *can* be understood and explained and that a significant proportion of human behaviour is planned, premeditated, and of a patterned and purposive nature. It is assumed that ad hoc behaviour (which could be more difficult to perceive and explain) represents a real but less significant proportion of total desirable behaviour at work. This perspective is in direct defiance of Bolger's assertion that *most of life is ad hoc* (Bolger cited in Hooker, 1993, p. 24) and Kosko's argument that we have only one decision rule: *I'll do it if it feels right* (Kosko, 1993, p. 17).

The MAPA Model

This research is based upon the premise that correct application of Hunt's MAPA knowledge-processing model will facilitate recognition of the strategies and processes used by respondents in order to conceptualise their work routines. It is also expected to identify how respondents execute such conceptualisations through the various cognitive functions and operations, thereby subsequently altering their state from a conceptual or *virtual* world to a corporeal and extant world. In brief, the utilisation of the MAPA model is expected to facilitate segmentation and mapping of respondents' perceptions from conceptualisation to operationalisation.

Various and often contradictory and conflicting attempts have been made to explain the processes of cognition, as demonstrated by neuroscientists, philosophers, psychologists, and cognitive scientists. The most recent entrants to the debate are neurobiologists applying quantum mechanical techniques (see New Scientist, May, 1996, pp. 20-27). Arguments put forward by those who represent the hard school of thought are largely ignored. This school of thought includes those (mainly philosophers) who consider consciousness as being private, subjective, unique, peculiar to the individual and therefore that it cannot be understood or explained by another[6].

Hunt's MAPA model as illustrated in Figure 3.1 is the basis for this study. Stubbart (1989) prefers to view cognitive representations based upon computer programs as a *metaphor* for minds. Pinker (1997, p. 114) claims that *connectionism is not an alternative to the computational theory of mind, but a variety of it.* It is argued however, that Hunt's model reflects an element of biological plausibility by mapping clusters and networks as perceived by respondents. This is consistent with current

[6] Gelernter (1994) while admitting that aspects of thought can be replicated through AI, strongly ridicules the basis of cognitive psychology, claiming that machines will always be machines and that such will never explain the workings of the mind. His argument rests largely on AI's exclusion of the human emotional element from machine software. He writes that emotion is central to being human. It is not intended to argue against the views of Gelernter and others, although there are very powerful arguments against the "ghost in the machine" principle utilised by many writers such as Gelernter (for instance see Calvin, 1996). Parallel distributed processing has been described by Rumelhart and McClelland (1986, p. 75) as being *neurally inspired* and as an attempt to replace the *computer metaphor* as a model of mind with the *brain metaphor* as a model of mind and it therefore advances considerably initial attempts at mapping cognitive functions of which Gelernter appears so scathing. Understanding emotional intelligence is without a doubt an essential and fundamental element in the study of the mind as reinforced by Goleman's (1995) book and as demonstrated by Bass (1990) whose research proved that key components of emotional maturity are associated with managerial effectiveness and advancement. The psycho-analytic perspective of psychology focuses on unconscious emotions and the humanistic

research of the brain, which has established that information is not held in any one location but is distributed in many locations and connected by intricate neural pathways (Hintzman, 1990; Hendry & King, 1994; Solso, 1995, Greenfield, 1997). Possible replication of a biologically plausible model ends there, however, as the biological and behavioural influences of hormones and emotions are excluded at this level of cognitive research. This study focuses solely on the executive functions of the brain, involving the verbalisations of memory and conscious thought, the advanced brain functions attributed to the cortical region, while admitting that the contribution of the limbic system - the emotional brain - is important but beyond the descriptive power of the MAPA model.

Parks et al (1991) claim that knowledge as represented by PDP models is implicit. They explain that knowledge is stored in the connections between units and is not stored in the units themselves. Therefore, they claim that PDP networks have no difficulty modelling non-verbal or intuitive processes. If this is correct, the real strength of MAPA is its power to reveal and map the connectivity between perceived computational units.

In contrast to the above statement however, perceived inability to articulate implicit knowledge and cognitive representations continues to stimulate debate over whether the data collected in the verbalisations of a study such as this are isomorphic with the actual cognitive processes[7].

The following chapter will look in greater detail at the difficulties associated with attempts to explain internal representations of the external world and how the MAPA model is utilised in pursuit of this controversial, often-debated and difficult task.

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perspective emphasises personal growth and interpersonal relationships - areas generally excluded in the study of cognitive psychology.

[7] Ungson et al (1981) provide a long list of authors who either question or support the scientific rigour of process-tracing approaches. Arguments opposing process-tracing approaches can be counteracted to some extent by placing less significance on the mathematical modelling approach utilised in the early process-tracing models and by including the successive stages in the decision-making process as per the MAPA model. It is also important to distinguish between impulsive and consciously deliberate actions as

FIGURE 3.1 **Knowledge-Process Hierarchy (MAPA - Mission, Accomplishments, Performances, Abilities)** from Hunt and Kinross, 1988)

Figure 3.1 describes the four hierarchies implicit in the MAPA model. The top of the pyramid-shaped hierarchy represents the higher conceptualised work purpose of respondents in the form of their perceived overall mission. Hunt (1997, p. 8) terms this as the *macro mission.* He explains that the *macro mission statement claims its validity from the degree to which all participants within the mission's purview can agree to its value and usefulness in providing direction and purpose* (Ibid). Often stated in abstract terms, the mission serves the dual functions of initiating the descriptive process for respondents, as well as providing a focal point from which all further considerations flow. Research by Harris, Hensley, and Schoen (1988) pointed out that schemas about a culture can influence initial understanding of a story about another culture. It could be extrapolated from this finding that the culture of an organisation will similarly influence the reconstruction of information received about another organisation. Therefore, it could be surmised that the mission of an organisation and a person's personal contribution toward that mission, together act in a similar manner to a cultural schema, providing the ability to reconstruct information that is consistent with the organisational schema. This schema provides the appropriate context for respondents when attempting

the planning stages of the latter are more carefully programmed and must therefore be more readily to reconstruct the contents and structure of their information processing flows related to their work.

The Accomplishments, according to Hunt (1997, p. 9) describe the *broad functional capabilities which contribute to personal expertise. They can be defined as a job-related knowledge base. The knowledge base is stored in and retrieved from long-term memory.* This level of the knowledge-process hierarchy could also be seen to describe the value being added by respondents through their work. A list gathering approach to the identification of job competencies may identify some of the visible, tangible Accomplishments, and perhaps some of their constituent parts. But, without a clearly defined order representing the organisation and structure identified as requisite for those people with high levels of competence or expertise, such lists fail to supply the most crucial information - the knowledge structure.

Research by Hunt and Kinross (1988); and Lockett-Kay (1992) suggests that the linking Performances are often generic across particular employment groups, only the order of importance and frequency of use varies. This is supported by Gross (1996, p. 648) when he explains that *the same basic processes are used to solve all types of problems, though in different combinations and sequences.* Hunt (1997, p. 9) describes the Performance as a *procedurally based group of intellectual skills which summarise 'knowing how' to do a major aspect of the job as identified by the [A]ccomplishment.* Hunt explains that *this entity is an application of the concept developed by Newell and Simon (1972) who propounded the notion of a cognitive entity as a production, which entered into more complex production systems. Such an entity comprised a rule of procedural knowledge composed of a condition and action (Gagné & Glaser, 1987). In this knowledge structures hierarchy model, [P]erformances provide the intellectual skill definitions related to individual [A]ccomplishments.*

After Accomplishments, Performances supply the next link in the knowledge-process hierarchy, and are in turn delineated by their process Abilities, again often generic

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accessible to phenomenological study than would be the in the case of the former.

across similar employment groups but more abundant in number. Hunt (1997, p. 10) describes Abilities as the *individual cognitive, affective (attitude), attribute (personality and motivation), or practical skills which can be taught or shaped through learning and education.*

The MAPA procedure guides, and in many ways directs respondents to articulate their perceptions of their higher-order Accomplishments. It's use facilitates the identification of increasingly detailed descriptions of capacities, processes, and their interconnections as they relate to conceptualisations of each higher-order Accomplishment. Rumelhart and McClelland (1986, p. 49) call this a *pattern of connectivity* - which constitutes what the system knows and determines how it will respond to any input associated with that particular higher order function. It specifies a processing system and the knowledge encoded therein. This can also be termed as a *competency unbundling process*. MAPA acts in a catalytic manner, in effect facilitating the exposure of the architecture of respondents' perceived representations of their cognitive processes in relation to prompts focused on particular work-related conceptualisations.

Esque and Gilbert (1995) describe a similarly constructed hierarchy for undertaking needs analysis, only they have omitted adding Abilities after identifying the mission, Accomplishments and Performances. These authors warn that there is often too much emphasis placed upon competencies per se. They claim that the *Accomplishments* (the emphasis is mine) are the most important part of the analysis as these identify the results the person produces, the value they add to the organisation. MAPA focuses respondents on the organisational mission. Respondents then describe how they personally contribute to the mission of the organisation, their added-value. The remaining steps describe how the value is added. Esque and Gilbert's model appears to lack the depth of detail required to fully describe *how* people add value to the organisation by failing to follow the information processing architectures down to their smallest components, the process Abilities. It is suggested that Esque and Gilbert's approach is therefore incomplete, as a substantial amount of context-specific detail and consequent processing is ignored. Particularly as these are the details upon which learning content can be based.

Choosing The Research Instrument

MAPA was identified as a practical and proven model to facilitate a means for articulating representations of human processing abilities. This was largely due to its relative ease of application for achieving an extremely complex task. MAPA's resistance to the uniformity assumption also strengthens its appeal by increasing both the number of options open to its application and the freedom with which the subsequent data analyses are undertaken and with which the results can be interpreted.

The results of previous applications of earlier iterations of MAPA (known under various different names and acronyms) were therefore carefully studied. The model in one of its earliest forms was used to identify critical competencies in vocational educators (Hunt, 1984).

Versions of the MAPA model have subsequently been used to identify competencies in top-level health executives (Health Executives Needs Assessment Questionnaire - HENAQ - Hunt and Kinross, 1988), airline pilots (Hunt, 1990), and health professionals in the forensic psychiatric service (Lockett-Kay, 1992). The model has been specifically adapted and customised in this study to identify competencies, knowledge structures, and processing abilities required for the function of command in the New Zealand Army.

Summary

The MAPA model described in this chapter is an advanced information processing model, facilitating the identification of respondents' knowledge contents and structures for the most critical roles/functions contributed in their employment. It has been suggested that respondent data can be analysed and utilised to identify and define a type of biologically plausible cognitive architecture. It has been suggested that the MAPA model serves as both an appropriate and convenient tool to reveal details of implicit knowledge, which, as the previous chapter explained, is extremely difficult to articulate. It has been stated in this chapter that a number of detractors argue against any attempts at understanding cognition from anything but a philosophical perspective. This chapter has attempted to explain that the cognitive architectures revealed through the MAPA process only reflect deliberate, purposive conceptualisations and that the emotional aspect of the cognitive process, while acknowledging its importance, has been excluded.

Chapter Four. An Information Processing Approach

Introduction

Previous chapters have introduced the concept and efficacy of an information processing (IP) approach for enquiring into the cognitive process. IP approaches have been described as the central approach for conceptualising and studying the mind (Gross, 1996, p. 72).

The MAPA model introduced in chapter three focuses on members of the organisation and how they contribute to the organisation's goals on a conceptual level. The model is designed to identify how value is added to the organisation by its employees and then to simplify respondents' perceptions of the complex task and knowledge structures required to undertake those value-added work processes. It is suggested that the results can be combined for analysis and the subsequent construction of prototype cognitive architectures.

Chapter four discusses the potential benefits of the application of MAPA, one of the greatest of which is believed to be its ability to facilitate diagnosis of higher-order knowledge structures and cognitively-based competencies.

The MAPA model is based solely on personal perceptual interpretation resulting in responses high in subjectivity. It is argued that as part of the research goal, it is necessary to identify and analyse the perceived verbalised process structures and abilities involved in perceptual, phenomenological interpretation. In brief this approach simplifies complex thinking processes, which are divided into sub-components. The relationships and strategies used between sub-components are also identified. The focus is strictly on cognitively-based competencies which add value to the organisation. All subsequent interventions including education and training and development can be related to the organisation's outputs thereby ensuring a high level of utility for the organisation (or a disclosure of Ungson et al's (1981) information processing strategies as mentioned in chapter one). The inclusion of a process abilities value analysis (PAVA) for the identification of education, training and development interventions established by utilising a model such as MAPA becomes immediately defensible in any audit or investigative arena[8], a situation not currently possible within the framework of the New Zealand Army training system and possibly the training systems of many other organisations.

Interrogating The Mind

Cognitive psychology has many detractors who are critical of attempts to study and represent cognitive processes (Dreyfus, 1972; Searle, 1980; Penrose, 1989; Flanagan, 1992[9]; Gelernter, 1994), although it should be stressed that much of the criticism directed at cognitive psychology is pointedly aimed at artificial intelligence (AI) research and its computer metaphor for mind. This particular research and the utilisation of the MAPA model in no way claims to be able to explain consciousness in a philosophical sense although its approach can be philosophically justified. It is focused on revealing the mind's information processing structure and abilities and the manner in which it represents internally its external work environment and work requirements[10].

Searle (1995, pp.150-151) relates the following points which underline some of the more philosophically-oriented arguments and difficulties which are seen to complicate the pursuit of improved understanding of the mind's architecture through the use of a model and approach such as is advocated by MAPA:

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[8] File Annex U to LF/SC 4500/1 dated Nov 95 states on page U-5:
a. All training should be able to be linked back to the organisational mission
b. Training, whatever the form it takes, is part of a process for converting inputs to outputs
c. Any measurement of training must take into account the link between objectives and outputs and inputs.
The writer continues by stating that "it is not apparent that Army can state with certainty that either sub-para (a.) or (c.) above are satisfied.
[9] Flanagan appears to ridicule cognitive psychologists because he claims that they attempt to describe the workings of the mind while paying little significant attention to consciousness. One particular group he terms *young connectionist upstarts* (1992, p. 5).
[10] In this sense the word *work* refers to the specific respondents' occupational functions within the Army.

- Human beings have a variety of interconnected ways of having access to and representing features of the world to themselves. These include perception, thought, language, beliefs, and desires as well as pictures, maps and diagrams.
- Some of the representations that people hold such as beliefs and statements, purport to be about and to represent how things are in reality. To the extent that they succeed or fail, they are said to be true or false, respectively.
- Systems of representation, such as vocabularies and conceptual schemes generally, are human creations, and to that extent arbitrary. It is possible to have any number of different systems of representations for representing the same reality.
- Actual human efforts to get true representations of reality are influenced by all sorts of factors - cultural, economic, psychological, and so on. Complete epistemic objectivity is difficult, sometimes impossible, because actual investigations are always from a point of view, motivated by all sorts of personal factors, and within a certain culture and historical context.
- Having knowledge consists of having true representations for which we can give certain sorts of justification or evidence. Knowledge is thus by definition objective in the epistemic sense, because the criteria for knowledge are not arbitrary, and they are impersonal.

PANEL 4.1 Searle (1995) On The Difficulty Of Understanding The Mind

Searle raises numerous and complex questions concerning what is real and how reality is best internally represented. Issues raised by Searle concerning internal representations in relation to their extraction and explanation will be referred to in the following discussion and in chapter six.

The post-structuralist (concerned with questioning logic, practices, strategy, and reasoning – much of which is subconscious) theorist Foucault detested the dehumanising objectification driving science's need for empirical and objective research criteria (Wilber, 1996, p. 269). He described views which may be extrapolated from in an attempt to agree with Searle's implied message that objectivity is difficult to achieve when attempting to represent complex cognitive activities. At the same time Foucault's views may also be used to disagree with Searle's argument that, as a consequence, such attempted representations therefore often fail to reflect reality.

Applying the beliefs espoused by Foucault (1969) that the systematicity of discursive practices only emerges in the very fact of its articulation, it could be implied that the key ingredient to the understanding of cognitive processes also lies in its articulation (whether verbally, in a written sense, or as musings within the mind). This is the same as saying that while a thought process exists prior to metacognitive attempts at self-analysis, its systematicity cannot be implied or understood until an attempt has been made at articulating it. It is the articulation process that implies both system and structure and this approach to understanding the mind should not be limited by any one particular academic discipline, or be hampered by a search for empirical, objective methods to satisfy the scientific search for information. Returning to Searle's argument, it can then be said that the ability to articulate thought in a structured and systematic manner, symbolises and improves currently limited capacity at describing internal representations.

Sokolov's (1975) research reported that adults utilise inner speech when undertaking tasks and that the amount of subvocalisation increases with the difficulty of the task. Vygotsky, who strongly influenced Sokolov, explained that what is contained simultaneously in thought unfolds sequentially in speech (Vygotsky, 1987 [translation]). Referring once again to Gagné and Glaser's (1987) studies of expertise and the importance of carefully learned knowledge structures discussed in the previous chapter, it may be hypothesised that a carefully designed questionnaire process would be able to extract existing knowledge structures from respondents as subvocalisation will have developed a predetermined disposition toward such a form of thought probing. It may also be hypothesised that the greater the amount of expertise a respondent has in a given field, the more detailed and readily accessible will be his/her written descriptions concerning that field of expertise. Searle's point that representations are arbitrary and Foucault's belief that such representations lack form and structure until they are articulated simply provide strength to the argument for the application of a vehicle providing a structured format to facilitate articulation of the cognitive architecture.

Some relevant implications of this discussion - particularly in relation to Searle's arguments - will emerge in chapter six when describing the research methodology.

Connectionism

Figure 4.1 provides a partial hypothetical architecture of a respondent's perception of the hierarchical structure of the Accomplishment *Personnel Management* as it may refer to a part of his particular job. Nodes represent the Accomplishments. *Associations* connect the nodes as few if any nodes exist in isolation from other nodes. To some extent this reflects workings within the actual neural network, as neurons grow dendritic connections in order to establish a pattern of connectivity. While the diagram depicts each *nodular network cluster* or *pattern of activation* as an isolated and self-integrated system, in reality the networks would integrate and overlay each other. Smith (1996, p. 897) claims that a single network module, whether a pattern transformer[11] or a content-addressable memory[12], can be only a component of a complete cognitive system. Proposed connectionist models for significant, realistic tasks such as intended to be identified by MAPA therefore generally involve interconnected modules and which may have either feed-forward or recurrent networks.

[11] Also known as a *feed-forward* network, most connectionist models fall into two broad categories. A pattern transforming (feed-forward) network has links from input units through to output units with all activity flowing one way. The second category is a *recurrent network* which has bidirectional connections involving feedback of activation allowing units to influence and constrain each other in finding the best overall pattern that fits the input (Smith, 1996, p. 897).

[12] Memory storage is *content addressable* i.e. we can apply attributes such as a person's size to activate associated content and form a pattern of cognitive representation.

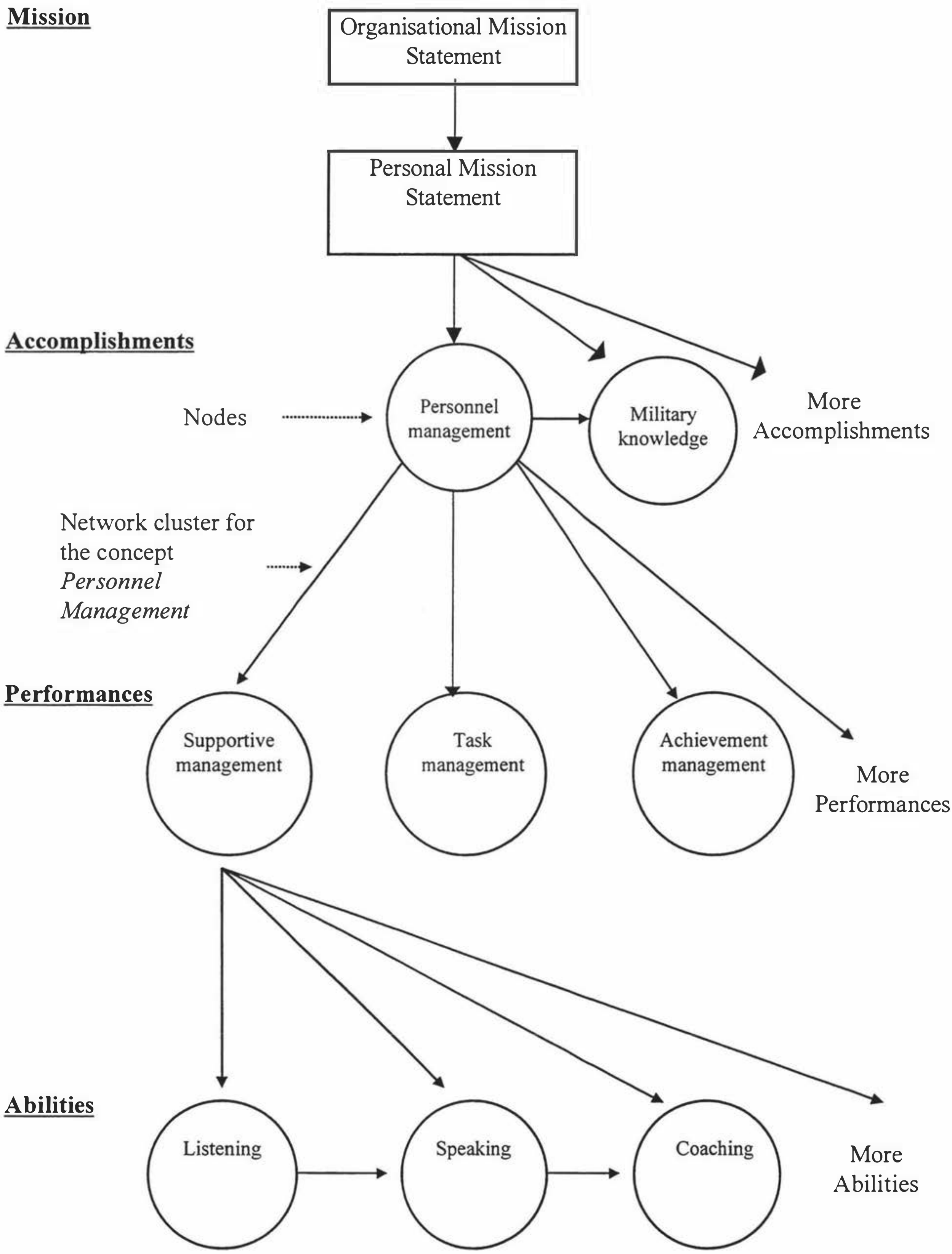

FIGURE 4.1 **A Hypothetical Reconstruction Of A Respondent's Perception Of The Accomplishment *Personnel Management*.**

Figure 4.1 shows no patterns of connectivity between Accomplishments. In reality however, there may be relationships between Accomplishments. Described in the language of the neural world if the influence is of a negative nature by inhibiting the respondent it is called an *inhibitory inferential relation.* If the influence is of a positive nature it is called an *excitatory inferential relation* (Smolensky in McClelland & Rumelhart, 1986, p. 393). Unfortunately the MAPA model in its current form, is unable to distinguish between inhibitory and excitatory inferential relations. Inferential relations can only be differentiated through discussions with respondents after completing the questionnaire. Such results therefore fall outside of the MAPA framework of competency analysis. MAPA in its current form is also unable to identify the associations between Accomplishment nodes. These limitations are not however expected to have any adverse effects on this research, although the addition of such capabilities should be considered in future iterations.

The application of nodes for describing an outcome is in direct conflict with the standard view of connectionism. Smith (1996) describes connectionist models as being mostly distributed representations with a pattern of activation across many units as opposed to attempts to capture an activity through a single unit. In contrast MAPA commences with a single output unit (the node) which is then represented by a pattern of activation and computation.

It may be perplexing at this stage to label the nodes as *output* units, although that in essence describes what they are. For example, respondents may view the Accomplishment Personnel Management as an output, as all related Performances and Abilities contribute to its architecture. From a procedural perspective however, the Accomplishment Personnel Management is regarded as the input from which contributing and connecting functions issue forth – a top-down approach. Further confusion arises as Personnel Management may only be regarded as an output at a conceptual level, while coaching, an integral but lower-order Ability, is a tangible and transparent activity thus hardly qualifying it for the label *input*. As an overall end state however, all Accomplishments are regarded as human outputs contributing to the collective mission of the entire organisation - the final output.

Smith (Ibid) applies the term *superposed* to describe the manner in which a representation is spread over an entire network which in turn is derived from previous experience - but which is also fluid and dynamic in that the network will alter with added experience or even simply through further accessing. McClelland, Rumelhart, and Hinton (McClelland & Rumelhart, 1986, p. 31) prefer to describe accessing of a representation as being *re-created* or *evoked* rather than being searched for (or accessed). They explain that the patterns themselves are not stored, rather, what are stored are the connection strengths between units that allow these patterns to be re-created. Smith adds that the re-creation will often be imperfect and subject to influence from the person's other knowledge (such as schemas and scripts), but that this characteristic is typical of actual human memory performance (op.cit., p. 896).

Facilitating Comprehensive Responses

Lezak (1995, p. 32) claims that remembering by *recognition* is easier than remembering by *recall*. Asking an officer to describe specific military knowledge required to competently complete his or her job involves an active and complex search process through recall. The question "which of the following describe the most critical military knowledge functions required to competently complete your job: military law, command structures, technical details, protocols..." and then asking them to rate their importance on a given list; places less stress on the memory retrieval process and consequently should facilitate greater respondent accuracy.

The recognition process should also enhance respondents' articulation of their thoughts by providing words and phrases which better express occurrences than could be achieved if respondents rely on their own descriptive ability. Hunt reported in her doctoral dissertation on learning strategies that the students she used for her research gave the most specific and complete information when asked about specific learning tasks (Hunt, 1995). She used this knowledge to construct a questionnaire requiring recognition rather than recall and identified a significant improvement in the quality of the responses.

A danger exists in the administration of questionnaires in that respondents may be deceived by their own heuristics of a given work-related schema. Questionnaires and their answers may be contaminated by *recency* and *frequency* factors, leading to inappropriate and inaccurate responses about critical competencies[13]. Searle (1995) argues that representations are always from a point of view. The impact of such respondent bias can be minimised by reducing the recency and frequency factors. By providing prepared lists, respondents may recognise descriptive terms which more accurately convey the reality of their situations, rather than relying upon a cognitive apparatus which has been described as *not inherently faulty but rather one that manifests certain inexplicable flaws*[14] (Nisbett & Ross, 1980, p. 14).

Limitations Of MAPA

Possibly the MAPA model's greatest limitation, is a consequence of its greatest strength. This strength is the model's ability to facilitate a respondent's *recognition* of terms describing cognitive processes, rather than having to rely on their ability to *recall* such processes. While providing respondents with the prompts to articulate their cognitive processes, the given lists also inhibit self-expression and individualism. This in effect defines a boundary around the data, potentially limiting its applicability and completeness. The comprehensiveness of the instrument is literally at the mercy of its designer. For this reason it is crucial that the research instrument is comprehensive in its coverage of respondent functions and process Abilities. The instrument must therefore be specifically tailored to the needs of the sample.

Cognitive processes involve a large amount of interneuronal traffic (Rose, 1992). Mapping such processes requires vast numbers of variables. To capture even a fraction of this traffic is expected to pose some difficulties with data storage and analysis. The

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[13] *Recency* is due to memory degradation resulting in recently experienced items being more easily recalled. As a result these recent items are more readily available thus also being judged to be more likely than they may actually be. People often judge *frequency* by assessing whether relevant examples can be easily retrieved from memory or whether this memory requires great effort. The impact these factors have upon decision-making are discussed in depth in Matlin (1994, chap.11).

high number of variables are necessary to explain possible cognitive process Abilities and their associations. The complexity of cortical activity and resultant processing patterns, according to Damasio and Damasio (1989), take many forms, including *parallel, convergent [integrative], divergent [spreading excitation], non-linear, recursive [feeding back on itself], and iterative* (p. 71). Such biological complexity, combined with analytical limitations of the research process, means that cognitive architectures portrayed through the administration of questionnaires and self-analysis can only indicate at best a rudimentary organisation and structure of cognition and thought. Such complexity creates a dilemma for the researcher. The greater the number of prompts (variables used to describe the cognitive process) included in the instrument, the greater the possibility that respondents will recognise terms for articulating their perceptions. However, a threshold must exist, beyond which the instrument and the data become unwieldy, both for the respondent completing the questionnaire, and for the researcher undertaking the analysis. Reducing the amount of data, and undertaking a subsequently simpler analysis, may be tempting to the researcher, but it also results in a more incomplete cognitive architecture. An incomplete architecture will impact on the ecological validity of the results by failing to provide the best possible representation of the respondent's cognitive processes.

A trade-off is required between the extremes of including every conceivable knowledge term in the instrument, in the hope that respondents will provide more comprehensive data, and including only the descriptive terms for what are thought to be the most commonly used, and most critical cognitive processes. The instrument for this research will illustrate the result of the above trade-offs. According to Baird and White (1982), respondents have difficulty articulating the cognitive processes they engage in and therefore feel burdened by the cognitive workload required to express their thinking processes. A questionnaire based upon the MAPA model is considered to be extremely complex and onerous, and can take respondents a considerable amount of time to complete. Such questionnaire complexity may result in respondent fatigue and

[14] Felsen (quoted in Samson, 1988, p. 7) is more critical of our cognitive limitations. He states that *our human computing power is modest, our information storage ability is slow and unreliable, and that we can effectively deal with only a small number of dimensions or variables.*

irritability. This is an ongoing consideration in any instrument design seeking insights into cognitive processes.

The sheer complexity of the research and data-analysis requires that the analyst be conversant with a range of research methods (or borrow the services of specialists), as well as having an intimate understanding of the work being researched. Although these limitations can complicate the research, it is argued that the information processing approach to needs analysis, employing a MAPA-type model, will significantly advance understanding of cognitively-based competencies.

Lastly, MAPA has no analytical procedure or established algorithm by which to process the data and create a cognitive architecture. A proposed solution to this limitation is discussed in part three of chapter eight.

Summary - Potential Benefits Of A MAPA Approach

Four potential problems associated with this research process were identified in chapter two. MAPA is designed to recognise and minimise the impact of these problems by potentially:

1. providing a structured response format drawing out implicit and abstract knowledge in a meaningful and structured manner, specifying a pattern of connectivity without consciously attempting to do so on the part of respondents,
2. focusing on the mission and goals of the organisation and thereby reducing the probability of respondent subjectivity by providing a similar generic schematic representational foundation for all respondents,
3. enabling respondents to articulate their knowledge structures and processing abilities (their unobservable cognitive functions) which enable them to execute competencies with a degree of mastery,
4. providing standardised descriptive terms easily interpreted and applied during the research process and which explain how officers *label* their cognitive functions related to their work,

5. focusing on the value-added aspect of the respondents' jobs thus ensuring that the research results have *utility* for the organisation,
6. providing the researcher with comprehensive descriptions of higher-order cognitive or intellectual performances and their lower-order abilities, their interconnections, knowledge clusters and relationships. MAPA is designed to illuminate respondents' conceptualisation of *command* and how such conceptual-level thinking is operationalised as per their perceptions,
7. identifying respondents' perceptions and understanding of what is important to the organisation and how they personally contribute to the overall mission of the organisation (which may or may not be compatible with the strategic plan and purpose of the organisation). Discrepancies between respondent perceptions and what the organisation finds desirable will immediately signal the need for an intervention, whether training oriented or of another type,
8. providing empirically-based and statistically analysed conceptualisations of value-added cognitively-based competencies, minimising the probability of subjective interpretation or personal judgement by the analyst and thereby reducing errors or bias,
9. identifying reasoning and problem-solving processes utilised by organisational members facilitating the identification of generic, organisation-specific, context-specific, and work-related representations of critical competencies as perceived by respondents,
10. identifying critical cognitively-based competencies and their hierarchical architecture for education and training purposes which can be linked back to the organisational mission, or to assumptions that can be made from that mission, thereby justifying expenditure of resources on subsequently appropriate interventions.

Smith (1996, p. 896) terms the recognition of common competencies as *prototype extraction*. Such prototypes will help to provide detailed models from which learning and training material can be developed.

Several approaches to needs analysis are able to actualise some of the above advantages, but only a complex information-processing framework such as MAPA has the potential to accomplish all ten points described above. The MAPA approach also takes account of the philosophical questions raised by Searle (1995) at the start of this chapter concerning attempts at capturing human internal representations of their external environment.

So far the discussion has explained several difficulties associated with this type of qualitative research and the advantages of an information processing approach for overcoming some of those difficulties. Little has been mentioned however, concerning the people who make up the sample for this research and the context, or environment in which they are expected to function. In examining the MAPA model it is considered critical that the reader gains an appreciation and understanding of the military environment and command structure in which army officers, who comprise the sample for this research, operate. Section two will explain the New Zealand Army doctrine and what it means to be in a command position.

SECTION TWO

Chapter Five. New Zealand Army Doctrine

Introduction

Section one introduced the merits of an information processing approach for recognising cognitively-based managerial competencies. It also argued in favour of a specific information processing model termed MAPA, which is an acronym for Mission, Accomplishments, Performances, Abilities. These four words describe four crucial and interrelated stages in the recognition of what occurs in human information processing.

It is appropriate and necessary at this stage to briefly describe the philosophical and operating environments of the New Zealand Army, in order that the reader gain an understanding of the people who comprise the research sample and the changing environments in which they are expected to work. Respondents are asked in the MAPA questionnaire to describe their perceptions of *command* as it relates to their own duties and functions. Knowledge of the New Zealand Army and the context in which officers operate will aid in understanding and interpreting the research results in an ecologically valid manner.

The following discussion will look at the New Zealand Army's interpretation and implementation of *Manoeuvre theory* and its contiguous philosophical command doctrine of *Directive Control*. Manoeuvre theory, in one form or another, has been adopted by New Zealand's major allies, the British, the American, and the Australian Defence Forces. It is briefly described to provide background for the more directly relevant topic of directive control, as the former cannot be implemented without the latter. Directive control can be viewed as providing the structure, while manoeuvre theory directs the overall strategy. The structure is specifically designed to support continuous learning by providing all members of the organisation with the opportunity to interpret, evaluate, and implement appropriate decisions at their own respective command levels.

It should be emphasised that this is not an attempt to study, support or discredit directive control and manoeuvre theory. The following discussion is provided to aid understanding of the environment in which officers of the New Zealand Army are and will be expected to operate[15].

The emphasis of this discussion is largely focused on *predicted* command requirements for the 21st Century. Command, control, and their interplay with communication and intelligence are in the throes of a potentially revolutionary transformation which, if ignored in the context of this thesis, would be akin to discussing aviation at the conclusion of World War II without including radar technology and its implications. Omitting to take heed of near future requirements in this study would reduce it to nothing more than an historical account of command, possibly of interest for those with a curious bent toward the subject, but in practical terms on the verge of exceeding its use-by date. The study of the intellectual processes and subsequent cognitive architectures determining the function and practice of command from an in-the-head perspective is entirely in congruence with developments in *digital* warfare, particularly in respect to the needed but as yet unmet convergence and synthesis between people and artificial intelligence. Until such an interface between people and artificial intelligence is developed, the true potential of digitized warfare will never be realised.

It could be argued that a decreasing defence budget and its attendant implications has resulted in a collective political mentality attempting to ignore potential impending changes to the military, particularly the increasing application of high technology in warfare. The military in New Zealand and in many other countries are caught in a mismatch between political expediency and what is potentially militarily feasible. New Zealand Army officers should not be *protected* from tomorrow's opponents by keeping them in the dark. Instead they should be encouraged to practice patterns of innovation

[15] For a detailed and critical review of directive control, manoeuvre theory, and the New Zealand Army see Pech (1996) in which it is argued that directive control and consequently manoeuvre theory will not function as expected due to the mechanistic, hierarchical structure of NZDF and its ponderous, bureaucratic decision-making style.

that will exploit new opportunities. The following discussion may go some way toward this objective.

The New Zealand Army: Its Operating Philosophy

As with most peace-time armies the New Zealand Army has been subjected to continual change over the last decade, due largely to changes in national strategy brought about by political, economic, and social reforms. The result is a requirement to do more with less. There is more ambiguity, technological complexity, and an increasing requirement to respond to everything with more speed and flexibility. This must be achieved with reducing budgets and reducing strength. In 1996 the New Zealand Army lost over 70 or one-eighth of its officer corps through attrition.

Directive control is the recently implemented management and operating philosophy of the New Zealand Army. Panel 5.1 describes the New Zealand Army doctrinal philosophy.

NZ P12 - the New Zealand Army Doctrine document written by the Chief of General Staff 1994 states:

1. An Army's doctrine - the basic principles which guide its actions - is a fundamental element of its professional military competence. Doctrine governs the way in which an Army will operate and therefore the way in which it will train.

2. Up to now, doctrine within the New Zealand Army has been based on that developed by allies and friends. The focus has been on attritional and positional warfare in a conventional environment.

3. The situation has now changed. DONZ 91 prescribes a new defence policy. Accordingly, in light of the strategy of self-reliance in partnership, the credible minimum force concept and the likely tasks confronting it, the Army is now configured as a light infantry oriented force.

4. As such our configuration is not identical to that of other armies - nor need it be - though interoperability will remain a fundamental consideration in maintaining and developing our operational capabilities.

5. Nor are our soldiers identical to those of other countries. Nations have their own characteristics, and combat experience leads all armies to develop their own style of operating which reflects the characteristics of their soldiers.

6. The New Zealand Army therefore needs a doctrine which is consonant with both its operational capabilities and the characteristics of its soldiers. That doctrine is described in this volume.

7. It is a doctrine of manoeuvre warfare. It focuses on flexibility and adaptability; its key elements are agility, surprise and innovation.

8. In addition, the command philosophy of directive control is to be adopted as the medium for applying the doctrine of manoeuvre warfare. Inherent in that philosophy are the qualities of initiative, resourcefulness and a can-do approach - a willingness to act without reference to superiors.

9. The doctrine of manoeuvre warfare applied under the command philosophy of directive control will govern our operational policies, plans, and practices; it will apply to all operational scenarios from higher levels and intensities of warfare, through low level operations short of war. As such it will be the basis for all training.

10. The concept of manoeuvre warfare and directive control, in 'guiding all our actions' as an Army, will also apply to our peacetime command, management and administrative functions. Being a member of a light infantry force is a state of mind as well as a state of training, of manpower, of equipment, and of materiel. In particular, the prescription of policies at the higher level accompanied by the delegation of authority for their implementation to the lowest practicable level will remain the basis for command across the Army.

11. Competence in operations, and in peace in preparing for operations, requires a thorough knowledge and understanding of our doctrine as an Army....

PANEL 5.1 The New Zealand Army Doctrinal Philosophy

Directive control is the devolution of authority and decision-making to its lowest possible levels. The origin of this concept has been traced by Simpkin (1985, p. 227) to an 1806 Prussian regulation. The German Army term for the concept is *Auftragstaktik*, defined as follows in the current German Army regulations:

> *A command and control procedure within which the subordinate is given extensive latitude, within the framework of the intention of the individual giving the order, in carrying out his mission. The missions are to include only those restraints which are indispensable for being able to interact with other, and it must be possible to accomplish them by making use of the subordinate's forces, resources, and the authority delegated to him. Mission-oriented command and control requires uniformity in the way of thinking, sound judgement and initiative, as well as responsible actions at all levels (Armor 90, 1981).*

As a result, being technically competent is no longer enough at almost any level of soldiering. To function with freedom of decision-making, and thereby being able to apply greater initiative, requires an understanding of the strategic, as well as tactical levels of command - the *why* as well as the *how*. Knowledge-based decision-making ability must be developed at the lowest levels, demanding competence and trust throughout all levels of the command structure. To develop the potential of the men and women who make up its strength, the New Zealand Army has attempted to widen its learning orientation from one which was essentially top-down and training oriented, to one which is complemented by an educational focus. The aim is to facilitate transfer of learning across a greater diversity of situations and to enhance both the speed and quality of decision-making.

To answer the how questions and address the pace of change and increasing ambiguity, the New Zealand Army is being educationally re-equipped[16]. The army has developed

[16] According to NZ P12 (Part One, Section Four) professional military education is viewed as a tool for fostering the ability to think and to exercise military judgement. Para. 20 states...The military profession

strategic alliances with several universities both in New Zealand and Australia, demanding continuing tertiary education of its officers. Courses are no longer limited to military history and warfare, but are chosen to develop and expand a wider and more diverse range of knowledge through qualifications starting from undergraduate diplomas through to doctoral degrees. They include subject areas as diverse as philosophy, business management, leadership studies, accounting, economics, strategic and global environments, communication, politics, and policy formulation.

The emphasis on education is also designed to increase the attractiveness of the army as a career move, a strategy designed to draw high calibre recruits. An unspoken but additional outcome ensures that personnel complete their military service with qualifications that are both recognised and transportable to the civilian sector.

Manoeuvre Theory

Early in the 1990s the New Zealand Army adopted a new doctrine termed Manoeuvre Warfare and its contiguous philosophical orientation of Directive Control. Lind (1985) describes manoeuvre warfare as a concept which best explains Hannibal's defeat of the Romans at Cannae in 216BC, German infiltration tactics in the offensive of 1918, the World War Two Blitzkrieg, and General Sharon's attack across the Suez Canal in 1973. In 1974 a retired Air Force Colonel John Boyd made a study of air-to-air combat during the Korean War. American aviators achieved a 10:1 kill ratio over their North Korean and Chinese opponents even though the American F-86 was considered by many to be inferior to the Russian MiG-15. According to Lind (1985), Boyd determined that the F-86 was superior in two respects: firstly, the F-86's bubble canopy gave its pilot good outward vision, while the MiG's faired canopy made it difficult to see out. Second, the F-86 had high-powered and highly effective hydraulic controls that the MiG lacked. The result was a much faster MiG but a more maneuverable F-86. The American pilots quickly adjusted their actions and with each alteration the MiG's response became more disorientated until

is a thinking profession. Leaders must have a thorough grounding in the theory and history of their profession, and must be able to effectively apply the lessons learnt in a wide range of possible scenarios.

the MiG pilot either panicked or inadvertently provided the F-86 pilot with a clear firing opportunity.

Lind (1985) claims that Boyd's study of ground combat identified a similar occurrence where one side had presented the other with a sudden, unexpected change or a series of such changes to which it could not adjust, resulting in defeat, usually at small cost to the victor. Boyd found that the loser had often been physically stronger than the winner, but the loser had suffered panic and/or paralysis similar to the North Korean and Chinese pilots. Wehrmacht victories by Rommel, Guderian and von Manstein in retrospect are credited by Lind and his adherents (cited in Hooker, 1993) with such tactics. British generals such as Slim and O'Connor and Soviet commanders such as Rokossovsky also applied the principles now termed Manoeuvre Warfare (Morris, 1993).

Lind (1985) explains the Boyd Theory of manoeuvre warfare: each party to a conflict begins by *observing*. He observes himself, his physical surroundings and his enemy. On the basis of his observation, he *orients*, that is to say, he makes a mental image or 'snapshot' of his situation. On the basis of this orientation, he makes a *decision*. He puts the decision into effect, that is, he *acts*. Then, because he assumes his action has changed the situation, he observes again, and starts the process anew. His actions follow this cycle, sometimes called the "Boyd Cycle" or "OODA Loop". The side that can consistently go through the Boyd Cycle faster than the other is said to gain tremendous advantage. The slower side responds inappropriately as it falls further behind the opponent's actions until finally it ceases to be effective.

Morris (1993) describes manoeuvre warfare as a method of seeking a decision in battle with the greatest economy of effort. The focus is on the enemy, not ground, and speed of action and reaction must be faster than that of the enemy. Manoeuvre warfare concentrates on the enemy's weaknesses, it creates multiple threats to throw the enemy off balance, and it constantly creates and shifts through new options more quickly than the enemy can respond. The battle is dictated by action as opposed to following carefully laid plans.

Manoeuvre theory implies a philosophical shift from the previously held doctrine of attritional and positional[17] warfare where strength was pitted against strength. The essence of the new doctrine is to generate havoc and confusion amongst the enemy to destroy their cohesion and will to fight. The ultimate aim of this doctrinal reorientation is to create a state of preparedness for future conflicts as opposed to training with the old mindsets and techniques developed during previous campaigns.

Contiguous to manoeuvre theory is the philosophy of Directive Control. Directive Control is the application of decentralised decision-making and provides the command structure without which manoeuvre theory would become untenable. Leaders are expected to know their commanders' intent two levels removed above them and the reasoning behind that intent. Where formerly a platoon leader would be told to *capture* Hill 21, he is now told to *engage the enemy* on Hill 21 and why he needs to achieve that objective. This is an apparently insignificant change in the wording but one which allows the platoon leader greater latitude in decision-making.

This philosophical shift in thinking is by no means limited to war. The peacetime military operate under the same principles. However, whether this change in thinking is implemented in theatres of war or during peacetime operations, its execution requires trust, knowledge, a high degree of communication, and informed decision-making from those with command responsibilities[18].

Environmental Push - Complexity

Harback and Keller (1995) describe the United States military environment as a vortex through which the U.S. Army must pass. They identify three factors driving the vortex

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[17] It should be noted that the terms *attritional* and *positional* are not official descriptive terms. Argument still rages as to the correct terminology and categorisation for warfare which is *not* regarded as being manoeuverist in nature.

[18] For a comprehensive review of the theory of manoeuvre warfare see Hooker (1993). Many nations appear to have embraced manoeuvre theory more as a solution to their shrinking defence budgets than for reasons of proven success of this approach to warfighting. As one antagonistic author in Hooker's book writes..."Maneuver warfare is bunk. No competent soldier, let alone the entire U.S. Military establishment, should embrace it." (Bolger in Hooker, 1993, p. 21).

(Ibid, pp. 32-33) which are also readily applicable to the New Zealand Army. Firstly they claim that in the future there will be greater *complexity* in terms of increasing occurrences of group dynamics within the organisation, joint and combined operations, and partnerships and task forces with other agencies, nations, economic entities, and non-governmental agencies. The complexity of such demands are compounded by a requirement for greater accountability, record keeping, and budgetary control fuelled by reducing funding.

Environmental Push - Speed

Harback and Keller (1995) identify *speed* as the second contributing factor involving new technologies and the need for reduced processing layers that had previously acted as "decision-making speed bumps". Unless well managed from the beginning the result will be information overload with critical decision nodes requiring ever-more complex solutions. A rapid reaction syndrome may result in less time to digest information from a proliferation of critical incidents. Instant global communications will report events in real time and be judged by the public on moral, ethical, professional, and technical grounds as and when they occur. The planning and problem solving functions will be more critical than at any time in history with regard to potential response (or lack of response) impact. Leaders will be required to absorb and sort information, make decisions and implement appropriate responses at speeds hitherto unknown.

Stressing the *speed* factor, western navies are at the time of writing, pondering the potential impact of the Russian Moskit supersonic sea-skimming anti-ship missile. The 3M80 missile is said to be capable of multi-mach speeds, would be extremely difficult to detect by radar as it skims over the sea and, even if hit by defensive weaponry, there would be a high probability that debris from the missile would continue to fly forward and impact the vessel, causing considerable damage (Zaloga, 1996, p. 156). Russian Akula class submarines are reported to be armed with Shkval underwater missiles, which; it is claimed, are capable of speeds of 200 knots (The Military Balance, 1995/96).

At the time of writing there are no deployed defensive systems capable of neutralising or countering these two offensive weapons. Additionally, no potential conflict between Russia and other countries is envisaged, however, the threat such weaponry poses is always a factor when planning defensive measures as most Russian technology, military as well as civilian, is for sale. The existence and potential deployment of such weaponry demands that decision-making *systems* be perfected and decision-making *speeds* be accelerated beyond current capacity and that decision-making *authority* be totally decentralised. Deferment of action while referring to the chain of command will not be an option should such worst-case scenarios involving high-tech weapons eventuate. Defensive measures therefore rely upon high technology countermeasures and rapid, well informed, and error-free human decision-making, moderated by systems of accountability to satisfy control requirements.

Environmental Push - Ambiguity

Harback and Keller (1995) identify *ambiguity* as the third contributing factor to the vortex in which the military operates. Recent United Nations' missions in Haiti, Mozambique, Somalia, the former Yugoslavia, Cambodia, Angola, and Iran/Iraq have been prime examples where New Zealand soldiers have had to act in the following capacities: military, policing, human rights monitoring and enforcement, information dissemination, organisation and conduct of elections, rehabilitation, repatriation, administration, and working with or overseeing regional or non-United Nations peace-keeping operations. All of this had to be undertaken while living under the stress of becoming potential hostages or worse. Teams have had to deal with situations where there were conflicting orders or no orders at all and few resources to support the requirements of their work. The New Zealand military has acquired a reputation for being well trained and well disciplined. They are highly respected in their ability to adapt to different cultures, are seen to be of a problem-solving bent, and have a reputation for having an ability to improvise because they are so highly flexible - a key consideration when the United Nations environs shift dramatically from the Gulf to Cambodia, Bosnia and Somalia (Thakur cited in Templeton, 1995). Of necessity soldiers need to understand the big picture, they must have access to a variety of decision-making tools and they require insights covering every conceivable faculty from political through to medical and they must understand the potential consequences of inappropriate action or behaviour.

Ambiguity also influences the military and particularly the function of command in other ways. Professor Thomas Czerwinski (1996) discusses the impact of uncertainty. In the absence of uncertainty the act of command would be a simple one, if not irrelevant. While he there is no actual shortage of information, the elements of uncertainty and ambiguity are introduced by flooding commanders with too much information. According to Czerwinski, command requirements are not information-intensive, but information-sensitive and that checklist-generated data might be called "cyber junk"[19]. Such an accumulation of cyber junk hampered decision-makers during the Gulf War as they sought to extract the information that was crucial to their needs. The remainder could be termed as background *noise* with the potential to reduce the speed and efficacy of decision-making.

With the rush towards information-age warfare, the days of soldiering by the checklist are over. Trainor (1994) writes that Schwartzkopf rejected a battle by formula of the sort taught at the Army schools and practised by United States forces in NATO. He had learned from the United States' Army's poor performance in Grenada where they had attempted to conduct operations from a checklist. Czerwinski (op.cit.) explains that warfare is non-linear, as inputs and outputs are not proportional, phenomena are unpredictable, unpredictability frustrates planning, solution as self-organisation defeats control, and a premium is placed on holistic, intuitive processes.

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[19] Sherman (1996) discusses experimentation with digitization of warfare in the United States...Tank operators during the Focused Dispatch digitization exercise in August 1995 suffered from information overload; they were provided more data than they could process...And experimentation with individual soldier digitization during Warrior Focus...indicates that the technology is not yet ready for prime time. Sherman argues that equipping an individual soldier - already carrying a 40-pound rucksack - with 24 pounds of batteries, computers, mouse pads, and head-up displays does not improve his overall performance...In many cases it's getting in his way. It's not enabling him and not helping him (p. 40).

British Army Doctrine (1994, pp. 2-5) states that subordinates aware of the big picture are far more likely to continue acting purposefully in the light of an unexpected situation (para. 0215). This is further emphasised with the next statement written in bold print:

> *Successful mission command*[20] *depends on a climate of command that encourages subordinate commanders at all levels to think independently and to take the initiative. Subordinates will also expect to know the 'reason why'. A wise commander will recognise this; he will explain his intentions to his subordinates and so foster a sense of involvement in decision-making and shared commitment (para. 0226).*

In his report for the U.S. Joint Staff titled *Towards A Dangerous World,* Kugler (1995) concludes by referring to the future world as one in which there will be more than one hegemonic power to be guarded against. He claims such a world would offer an insidious combination of nineteenth-century politics, twentieth-century passions, and twenty-first-century technology: an explosive mixture of multi-polarity, nationalism, and advanced technology. Above all he predicts that it will be ever changing and complex. Specific problems may arise quickly, then go away, only to be replaced by entirely different challenges. He predicts that the core features of the international system may change repeatedly as one structure gives way to another. The one constant will be that, in marked contrast to the past 50 years, the chief problem will be managing several different challenges that compounded, will make the world a troubled, complicated place. Blank (1996) speculates that a mechanical progression from

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[20] Mission Command is a core attribute of manoeuvre theory requiring a style of command which promotes decentralised command, freedom and speed of action, and initiative. Mission Command meets this requirement and is thus a central pillar of manoeuvre theory doctrine. It has the following key elements:

a. A commander gives orders in a manner that ensures subordinates understand the commander's intentions, their own missions and the contexts of those missions.
b. Subordinates are told what effect they are to achieve and the reason why it needs to be achieved.
c. Subordinates are allocated the appropriate resources to carry out their missions.
d. A commander uses a minimum of control measures so as not to limit unnecessarily the freedom of action of subordinates.
e. Subordinates then decide within their delegated freedom of action how best to achieve their missions (para. 0210, British Army Doctrine, 1994, pp 2-3).

Operation Desert Storm to the next war is doomed to extinction and that if this happens, the militaries of the United States and most other major states face either wrenching and cataclysmic transformations, or future irrelevance as they become grossly maladapted to future small wars. Ironically, in light of this view, he claims that many analysts believe that Operation Desert Storm established the technological paradigm for future warfare in which information technologies, information war, electronic technologies, and electronic fire strikes are critical. According to that view, electronic operations, and aerospace systems incorporating electronic and information technologies will take warfare into a third dimension.

This is the world for which the New Zealand Army prepares its people and this is its dynamic and unpredictable operating environment.

The Application Of Manoeuvre Theory

Competencies required for an idealistic directive control and manoeuvre theory-dominated environment should be heavily weighted in favour of such descriptive terms as *technically proficient*, *creative, innovative, intuitive, team-focused, learning-oriented, flexible, analysing, conceptualising*[21]. Do these terms describe the actual routine functions of officers in the New Zealand Army?

The New Zealand Army doctrine publication, NZ P12 states:

> *35. Success in conflict is best achieved by disrupting an opponent's systems, plans and support rather than by the frontal application of force. Units capable of acting with considerable latitude but within clearly defined, broad objectives in accordance with the commander's intent are necessary. This requires the highest standard of leadership at all levels and calls for intelligent, well trained and competent commanders and staff possessing considerable self-reliance, adaptability, resilience, and motivation (emphasis is mine) (Para.35, Part One, Section One).*

NZ P12 continues:

> *15. The NZ Army's adoption of this command philosophy must aid in generating the agility necessary in manoeuvre warfare. Decentralised command emphasises initiative and decisive action by commanders at all levels. Similarly the independent nature and innate quality of initiative possessed by the New Zealand soldier suits this approach (Para.15, Part One, Section Two).*

Instructions in the New Zealand Tactical School student text in Staff Procedures (1996, pp. 1-4 to 1-5) describes the New Zealand Army command philosophy as follows:

> *1.14. War has always been characterised by confusion and uncertainty, often described as the fog, friction, and chaos of battle. Rather than having a command philosophy that attempts to impose order onto this confusion and uncertainty, the Army must be able to function within and take advantage of it. Decentralised command is the best means of achieving this. The sphere of influence of one single commander on an entire battlefield is limited. Decentralised command aims at having commanders at all levels using their individual spheres of influence to cover all parts of the battlefield. Fleeting opportunities can be taken advantage of by immediate decisions rather than waiting for higher authority.*

> *1.15. The command philosophy must also complement the New Zealand Army's operational philosophy. This command philosophy must aid in generating the agility and tempo of operations fundamental to manoeuvre warfare. Decentralised command emphasises initiative and decisive action by commanders at all levels and is an essential corollary to*

[21] Jones (1996, p. 1) includes what he calls a key ability: being able to exercise intuition under stress. He also adds the ability to simplify complexities and ambiguities

> *manoeuvre warfare. This concept is embraced within the technique of directive control and has been adopted by the New Zealand Army.*

The Tactical School students' text continues (p. 4-1)(paraphrased):

> *4.1. Directive control is a command philosophy based on the absence of detailed orders. The concept is founded on the precept that battle is a series of accidents, requiring that unforeseen opportunities be seized. It is argued that troops once engaged are beyond the direct control of their higher commander. The capacity for engaged troops to take advantage of a change in situation must be encouraged without the need to await new orders. Rather than seeking to impose order on what is essentially chaos, directive control seeks to prevent changes from interfering by simply not issuing detailed orders.*
>
> *4.2. The philosophy embodies the requisites of:*
>
> a. *Initiative*
> b. *Improvisation*
> c. *Recognition of responsibility, and*
> d. *Freedom of action*
>
> *Directive control requires originality of thought, as opposed to template solutions.*

Command Systems

The above doctrine requires a mindset entirely at odds with previous doctrine which lacks a single common descriptive title but could be termed *attritional/positional warfare,* where strength was pitted against strength and where orders were given and followed to the letter. Czerwinski (1996) categorises command systems into three broad groups:

- *Command by direction* - regarded as the oldest of command methods, it involved the commander finding a vantage point and being able to do little more than observe the battle. This type of command system has been largely out of favour since the mid 18th Century. A compromise used by most commanders applying this type of command was to attach themselves to what they considered to be the most crucial or decisive element of their force and direct its actions while having tenuous, and often no communication with the remainder of their force.

- *Command by plan* - in response to the difficulties associated with command by direction, the army developed the concept of plans, templates, and standard operating procedures. The dynamics of war and enemy knowledge of such plans and templates however reduced this method of command to a stalemate situation as was demonstrated in WW1, where the combatants faced each other for several successive years, suffering massive losses and few gains, or, as in the Bay of Pigs fiasco, where the plan was based upon five false assumptions (Dixon, 1976, pp. 397-398):

1. *The Americans assumed that no one would guess that the U.S. Government was responsible for the invasion.*
2. *In their contempt for the Cuban Air Force they assumed that it would be annihilated before the invasion began.*
3. *They assumed that the small invasion force led by unpopular ex-officers from the Batista regime would be more than a match for Castro's "weak" army of 20,000 well-equipped Cuban troops.*
4. *They assumed that the invasion would touch off a general revolt behind Castro's lines.*
5. *They assumed that even if unsuccessful in their primary objective the exile force could hole up in Cuba and reinforce anti-Castro guerrillas.*

PANEL 5.2 Dixon (1976, pp. 397-398) On The Bay Of Pigs

As a result of the United States Government establishing their plans on too many assumptions, all of which turned out to be false, the term Bay of Pigs has become synonymous with total failure[22]. Janis (1972) identified a central cause of this planning failure in what he termed as 'group think'. Symptoms of the group think process according to Janis include:

1. *An illusion of invulnerability that becomes shared by most members of the group.*
2. *Collective attempts to ignore or rationalise away items of information which might otherwise lead the group to reconsider shaky but cherished assumptions.*
3. *An unquestioned belief in the group's inherent morality, thus enabling members to overlook the ethical consequences of their decision.*
4. *Stereotyping the enemy as either too evil for negotiation or too stupid and feeble to be a threat.*
5. *A shared illusion of unanimity in a majority viewpoint, augmented by the false assumption that silence means consensus.*
6. *Self-appointed 'mind guards' to protect the group from adverse information that might shatter complacency about the effectiveness and morality of their decisions.*

PANEL 5.3 Janis (1972) On The Central Cause Of Group Think

[22] As Dixon (1976, p. 398) explains it, nothing went as planned...Nobody believed the C.I.A. cover story, the ships carrying reserve ammunition failed to arrive - two were sunk and two fled, by the second day the invaders were surrounded by Castro's army, and by the third they were either dead or behind bars. Seven months later the United States recovered what was left of their invasion force for a ransom price to Castro of 53 million dollars.

Janis' findings are possibly well summed up in the words of Joseph Schumpeter (1976),

> *Every parliament, every committee, every council of war composed of a dozen generals in their sixties, displays, in however mild a form, some of those features that stand out so glaringly in the case of the rabble, in particular a reduced sense of responsibility, a lower level of energy of thought and greater sensitiveness to non-logical influences* (p. 257).

Clearly command by direction and command by plan are not viable options in a manoeuvre warfare environment as such command doctrines are incompatible with the requirement of self-determination and the application of initiative.

- *Command by influence* - In this method of command only the outline and minimum goals of an effort are established in advance. Such a command perspective takes the chaos of battle into consideration and places greater reliance on the initiative of subordinate commanders aware of the local situation. While being the obvious choice of command method for manoeuvre warfare, its use is under threat due to a perceived capability of technology that could make such a method of command redundant. This particular point is not the focus of this discussion[23] however.

Czerwinski speculates that the digital leaders of the 21st Century would communicate mission-type orders through symbolic imagery rather than voice or text, leveraging subordinates' initiative to exploit chaos through greater situational awareness.

Harig (1996) pushes Czerwinski's speculations further by suggesting that the digital general some 35 years from now might not just communicate differently but will actually think differently from his or her predecessors, because conceptual behaviour

[23] Increased belief in technological warfare capability, according to Czerwinski (1996, p. 122) will return the army to command by direction after an absence of 250 years. This is due to the perceived capability of technological observation, command and control. It is believed that the advent of real-time information will provide a central command with an unprecedented amount of data concerning the battle space, thus accommodating the ability to direct events with improved effectiveness. While this may be true, lessons from the past indicate that command by direction is fraught with dangers. It is also the antithesis of the philosophies underpinning manoeuvre theory and directive control. Foss (1997) voices his concerns by writing that the army can choose two paths - a strong command path, or a strong control path. He believes that technology and electronic devices will push the army toward control, which he sees as a dangerous path. He writes that the command path provides for initiative, the acceptance of risk,

itself is evolving during the information age (p. 135). Harig supports his assertion with evidence documented by the psychologist James Flynn who first demonstrated that IQ has risen in many technologically advanced countries by an average of three IQ points per decade, more than a full standard deviation since the last generation of military leadership was born. Harig claims that *the complexity of life may produce corresponding changes in complexity of mind* (Ibid, p. 135).

Harig enumerates a few of the elements resulting from the conceptual transformation from pre- to post-microprocessor generations:

- Information management and manipulation are replacing knowledge acquisition and inference. Harig claims that in the past, experts learned how to become experts by acquiring facts and by learning how to distinguish truth. Experts now are defined by their ability to recognise underlying patterns so that new facts can be acquired and integrated. Experts learn how to match these underlying patterns or heuristics to new data sources in order to advance composite knowledge. Harig points out an inherent danger resulting from this overabundance of information supplied by technology and which, if matched with an uncritical approach to thinking, could result in *efficiency* outweighing *reliability*. Some information may gain credence simply as a result of its existence, but its reliability may remain untested and unproven.
- The basis for learning is changing. Virtual reality has largely replaced the lessons learned from direct experience and suffering of real-world consequences. Harig worries that the virtual theatre of war may desensitise players to the damage of real-world catastrophes. He relates a story - possibly apocryphal - of an officer who, in the pitch of virtual battle, swore at his terminal, "Damn, I lost an icon!" as an overrun battalion was flagged by the computer.
- Systematic decision-making is eclipsing intuition. Harig claims that there is an inseparable relationship between knowledge and intelligence - the more you know, the smarter you become; so to become smarter, you must know even more. He asks

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and the rapid seizure of opportunities on the battlefield, while the control path appears safer but leads to that if the quantity of evidence determines the certainty of a hypothesis, then how much evidence is enough? Harig argues that the answer is determined by the amount of ambiguity in the problem, because computers reason in all-or-nothing terms and have limited tolerance for partial evidence. Uncertainty is resolved by redundant observations, so that more data is collected to resolve the uncertainty. As Harig explains, the irony is that systems that can scan a situation in great depth and analyse in great precision and can provide a decision-maker with so much capability that s/he becomes addicted to the information and consequently paralysed by it. He relates an example of a computer-assisted exercise where, during a battle, staff hadn't noticed it was being overrun by the enemy because the commander was preoccupied with obtaining more data from his battlefield computer. Through technology, it is not only possible to suffer paralysis by analysis, but also to neglect intuitive skills that give commanders an important advantage in ambiguous situations. Harig emphasises that this capacity is particularly important in peacekeeping, where the traditional combat decision-making model does not fit.

Harig concludes by expressing the following fears concerning an officer corps that may be mesmerised and addicted to high technology and reluctant to move without computerised decision-making systems, impinging more on the strategic level of command as opposed to the operational level:

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caution, a more deliberate manner, and an emphasis on process as opposed to outcome.

- *Reluctance to 'break out of the box'.* The demand for hard evidence can become the enemy of hunches, eventually suppressing new perspectives on a situation. Personal feelings and other channels of reality must never be ignored when sounding out the pros and cons of an issue.
- *Death of the metaphor.* Strategic vision requires the ability to think in metaphors, to seek related patterns in unrelated objects, situations, and events. Developing and testing of analogies - the patterns that allow leaders to see the important under data overload, is a skill that could waste away under a sterile diet of expert systems and virtual reality simulations.
- *Fear of risk and error.* Preferring to avoid risk and making mistakes, leaders may opt for greater 'certainty' by substituting intuition for computerised decision-making models.

PANEL 5.4 Harig (1996) On The Potential Dangers Of An Addiction To High Technology

While it can not be stated with certainty that technology-driven changes will have such negative impacts on future decision-makers, Harig emphasises that the consequences of such an occurrence could have dire repercussions.

It becomes clear that the doctrines directing the command and management style and culture of the Army cannot function in isolation from the technology it utilises. A total paradigm shift is required encompassing an holistic approach, drawing together all aspects of human and technological progress, ultimately resulting in a compatible and appropriate interface.

Such a shift in combat and command paradigms cannot be implemented without changes to the learning and development processes. Nowowiejski (1995) suggests that the Army should eliminate classroom routine that teaches subjects irrelevant to developing battle command qualities and which do not stretch an officer's intellectual abilities toward creativity, intuition and vision. He further suggests that the Army must use the classroom to train leaders to deal with ambiguous conditions requiring improvisation, and that institutional education should focus on qualities of high-order thinking that demonstrate synthesis and integration, innovation, intuition and will, information management and world vision. Nowowiejski (Ibid, p. 74) concludes that the Army schools must create learning scenarios that require students to deal with circumstances where there is inadequate or misleading information or limited resources. Willingness to risk and make mistakes in these uncertain situations must be rewarded. According to Nowowiejski, the education and training system must equip battle commanders with the capacity to accommodate new ideas, models and solutions and encourage them to deal with uncertainty and change by taking calculated risks and being innovative.

The United States Army referred to the Airland battlefield that operated on the same principles as the manoeuvre theory and directive control-type battlefield prior to the formal introduction of such terms. FM 22-103 (United States Army Doctrine) describes the requirements for commanders as exhibiting extended perspectives and adaptability. They are expected to rapidly assess the situation and form their battlefield vision. They are to cope with the unexpected, demonstrating high tolerance for ambiguity and uncertainty. They are to possess a high degree of technical and tactical competence and finally, they must have the capability to learn rapidly since the free will of the opponent will ensure that most situations and circumstances appear different from what is expected. This is well encapsulated in a statement attributed to Carl von Clausewitz, that if given three possible options the enemy will always take a fourth (FM 22-103).

Furthermore there should be no doubt that the function of command and the person of the commander both serve a critical function. FM 100-5 (United States Army Doctrine quoted in FM 22-103, p. 1) establishes leadership as the *most* essential element of combat power. It emphasises that the human dimension will be decisive in future battles and campaigns just as it has in the past. Horner (1995, p. 82) quotes DA Pam 350-58 where it is written that "confident leaders are our most enduring legacy to the future of the Army and the nation," and this is particularly linked to the growth of leaders in order to fully exploit present and future doctrine.

Thus far in the discussion, there has been a predominant emphasis on battle command and conflict command. In the case of New Zealand Army officers, a commander will rarely see real conflict or be in a position to influence strategic decisions should they be serving with a multinational task force in a conflict zone[24]. The majority of a New Zealand Army commander's time is taken up with administrative and functionary matters in times of peace. They are essentially serving a bureaucratic function with the potential for mobilisation being real but highly unlikely. With this in mind it may be appropriate at this stage to define command and its attendant functions.

Summary

The New Zealand Army has adopted the doctrine of *manoeuvre warfare*. This doctrine, in conjunction with its complementary command style of *directive control*, represents a marked paradigm shift for every member of the Army. This paradigm shift demands mental agility, adaptability, and the demonstration of initiative by everyone at every level of command. The new paradigm is in direct contrast to the former style of command that is perhaps best termed as *directed control*, operating on a philosophy of obedience and command by direction.

New Zealand's major allies have also adopted a similar philosophical stance culminating in external as well as internal pressure pushing for acceptance of manoeuvre theory.

The new command orientation must operate on a foundation of knowledge and information to succeed. The actual operating environment in which the New Zealand soldier finds him/herself is generally one of peace rather than conflict. This may develop behaviours more suited to the bureaucracies most peacetime armies have become, rather then developing the desired behaviours needed for directive control.

The literature suggests that manoeuvre warfare is a superior form of warfighting. It also indicates however, that such a change in doctrine may not have been considered in its entirety. Several authors express concerns at the implications for education/training that at the time of writing still appears to produce a product oriented towards the former

[24] There are exceptions, such as those experienced by Roger Mortlock in Angola.

paradigm of warfare. Several authors also indicate an impending potential conflict between the manoeuverist and the increasing use of and dependence on technology.

Operating under a command climate of manoeuvre theory entails changes in cognitive processing, placing a greater burden of responsibility on the individual than was formerly expected. Some writers infer that there may also be a need for more leadership skills when operating under directive control and manoeuvre theory. It has been suggested by Harig (1996) and Nowowiejski (1995) that the climate within military organisations is not conducive to the development of these necessary leadership skills.

The Command Climate

This chapter discussed the theoretical beliefs underpinning manoeuvre theory and directive control, to which the New Zealand Army is committed. In brief, these doctrines ideally attempts to embody:

- Initiative
- Improvisation
- Recognition of responsibility, and
- Freedom of action.

Manoeuvre theory works in combination with directive control. Directive control has been described as a command philosophy based on the absence of detailed orders in order to flow with the expected chaos of battle, enabling opportunities to be seized, and facilitating a system of self-initiated actions by those in the forefront of the situation. Such philosophical beliefs espouse *command by influence*, where situational awareness permits self-directed action, guided by knowledge of the greater intent, but without the enforcement of restricting and detailed orders.

Such a command climate as described above is reliant on information and knowledge dissemination. It is dependent on the intelligence and experience of decision makers at all levels as the former structure maintaining a few key decision makers is replaced by a more decentralised decision making system. There is an increasing emphasis on intuitive decision making, although arguments concerning a clear definition of what constitutes intuitive decision making and its actual utility have not yet been satisfactorily resolved. This will be discussed in more detail in the next chapter.

Completion of objectives for officers operating under conditions of manoeuvre theory and directive control is complicated by an increased need for higher conceptual-level skills, among an increasingly greater number of people further down the chain of command, than was previously required prior to the new command climate. This greater degree of decision making freedom also inadvertently introduces a growing emphasis on the *control* function of command as various interested parties higher up the command chain closely monitor objectives. Bureaucratic procedures dominated by control functions can undermine the freedom with which objectives are approached This can result in paper work for seeking permission, paper work for seeking resources, and paper work for reporting on the success of the work. The increased opportunity for more control and its attendant antecedent functions, potentially serve to undermine the spirit of the new philosophical approach to command. In essence commanders become trapped by accountability.

In summary, the new warfare and command paradigms clash with the old as they are in direct conflict. The new paradigms demand changes in the organisational structure, command style, operations, equipment, and education/training, but mostly they require conceptual changes. It is suggested that the level of success of the conceptual changes of members of the New Zealand Army can be assessed with the aid of a model such as MAPA. Current cognitive architectures can be identified and compared with the ideal. Discrepancies will indicate the types of changes required and the most appropriate types of interventions, such as education/training. Chapter six will help to build a profile of the conceivable cognitive architecture of an officer operating under a command climate of directive control in both manoeuvre warfare and peacetime situations.

Chapter Six. Command, Management, And Leadership

Introduction

This chapter discusses numerous definitions for command and the subsequent implications of the various definitions and their interrelationships. In this chapter, command is separated into three sub-groups comprising of command, management, and leadership. The different skill requirement for each group will be described. The command function's constituent parts of management and leadership are discussed, particularly as influenced by contemporary army doctrine. The variables of war and peace are also reviewed in accordance with their subsequent influence on the various functions of command.

Chapter five discussed manoeuvre theory and directive control. Chapter six takes a more critical perspective of the implications of these operating doctrines particularly as they impact on the function of command. The ideals of such doctrines are confronted with the reality of human behaviour, decision-making, and the future of warfare. The literature discussed in this chapter will continue to build on the material in chapter five. The contents of both chapters will help to describe the profile of an officer in a command position, with modern manoeuvre warfare capabilities.

The details described in this chapter influence the development of the data collection instrument by providing an insight into skills, knowledge, and abilities required in order to hold a command position. It discusses what is known about command, but more importantly, it highlights what is not known. An abundance of information exists concerning appropriate behaviours and characteristics for military commanders. Little is known however, concerning the knowledge and decision-making processes used by commanders, hence the need for this research.

Command Definitions

Command is defined by the US Joint Chiefs of Staff[25] as, *command and control (abbreviated to C^2), being the system by which authority and direction are exercised by legitimate commanders.* Jensen (1995) views command as having the authority to be in charge of a situation, and that such command should not be relinquished to the demands of personnel not authorised or skilled to make appropriate command judgements. Command and Control Warfare is defined as *the integrated use of operations security...military deception, psychological operations...electronic warfare...and physical destruction, mutually supported by intelligence, to deny information to, influence, degrade and destroy adversary C^2 capabilities, while protecting friendly C^2 capabilities against such actions. Properly executed, command and control warfare offers the commander the potential to inflict damage of such magnitude or decisiveness that traditional hostilities (for example, hostilities which are prolonged and costly in both lives and resources) are avoided.* A more user-friendly definition of battle command is given by Miller and Reitinger (1995), *Battle command is the art of decision making, leading and motivating troops into action to accomplish missions at least cost in soldiers and materiel* (p. 5).

Martin Van Creveld (1985, p. 1) defines command as C^3 (Command, Control, and Communication). Toffler (1993, p. 140) defines command as C^3I (Command, Control, Communications, and Intelligence). FM 22-103 (United States Army Doctrine) defines command as *the art of direct and indirect influence and the skill of creating the conditions for sustained organisational success to achieve the desired result* (p. 3). The NATO definition of command as given in the British Army Doctrine Publication (1994, 1-1) is the *authority vested in an individual for the direction, co-ordination, and control of military forces.* The manual continues by stating that...*in principle, command (in particular, what needs to be done and why) embraces both management activities (allocating the means (resources) to achieve it) and leadership (getting subordinates to*

[25] Memorandum of Policy No. 30 issued May 6, 1993

achieve it). Figure 6.1 depicts the command model in its interactions with leadership and the management functions.

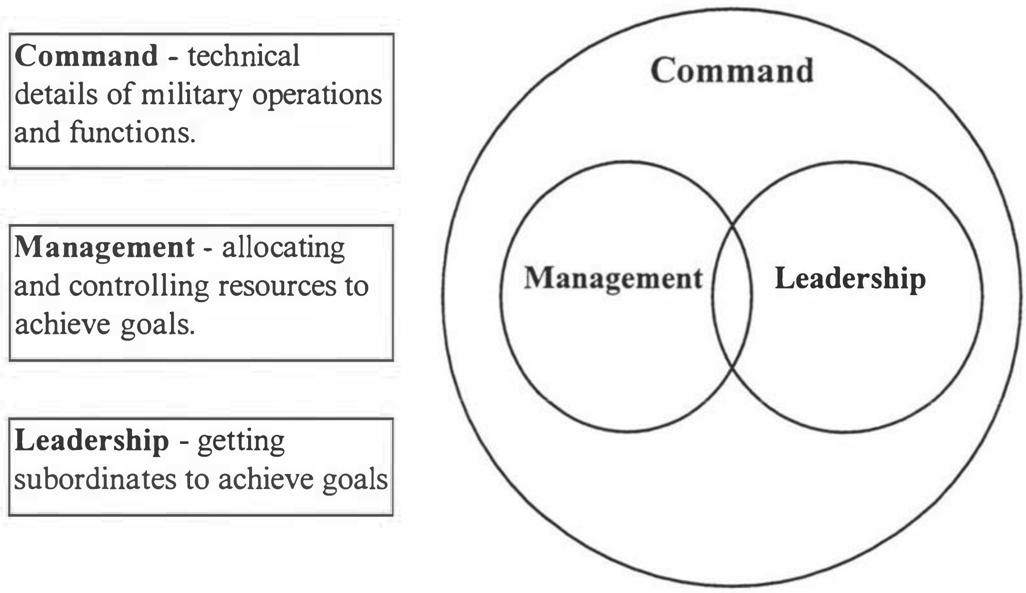

FIGURE 6.1 The Command System

The Australian Command and Staff College course in Command Studies (1994, p. 1-3) attempts to explain the relationship between command, leadership, and management as follows:

> **Command** - Command is the authority which commanders lawfully exercise over their subordinates by virtue of rank or appointment. Command includes the authority and responsibility for using available resources effectively to accomplish the mission.
>
> **Management** - Management is the process of identifying and achieving objectives. The functions involved consist of planning, organising, directing, evaluating and controlling the use of time and resources such as finance, materiel and facilities.
>
> **Leadership** - Leadership is the art of influencing and directing people to willingly achieve the leader's purpose.

> **Relationship between Command and Leadership**. A commander, by virtue of lawful authority, is the appointed formal head of a formation, unit or sub-unit and therefore assumes the role of the leader. Commanders must exercise leadership to achieve their mission, otherwise they remain leaders in title only and will ultimately fail.
>
> **Relationship between Command and Management**. Commanders must also manage time and resources efficiently to achieve their mission. They will spend a great deal of time performing management functions and must do so competently in peace and war.
>
> **Relationship between Leadership and Management**. Command entails leading and managing to achieve the mission. Leadership and management complement each other and are integrally related to the extent one cannot exist without the other.[26]

It is apparent from the above quotations that command cannot be described in isolation from its attendant and inter-related functions of management and leadership. The Command and Staff College Course (Ibid, pp. 12-3-4) categorises skills employed for command into three basic levels:

1. **Technical skills** pertain to what is done and working with things. They require technical knowledge and the ability to apply it to perform tasks.
2. **Human skills** pertain to how something is done and to working with people. They comprise one's ability to work with people to achieve tasks.

[26] The relationship between management and leadership is not viewed in this manner by everyone. General Meyer of the US Army (Meyer, 1997) writes that techniques which work well for the management of resources may prove disastrous when substituted for leadership on the battlefield and conversely, techniques which work well for the battlefield may prove disastrous when substituted for management. He emphasises that management and leadership are coequally important and not substitutes for one another.

3. **Conceptual skills** pertain to why something is done and to one's view of the organisation as a whole. They comprise one's ability to understand the complexities of the organisation and how it relates to its environment.

Figure 6.2 is a copy of the Staff College course illustration used to describe the relationship between the three categories of skills at the three distinct levels of command (Ibid, p. 12-4).

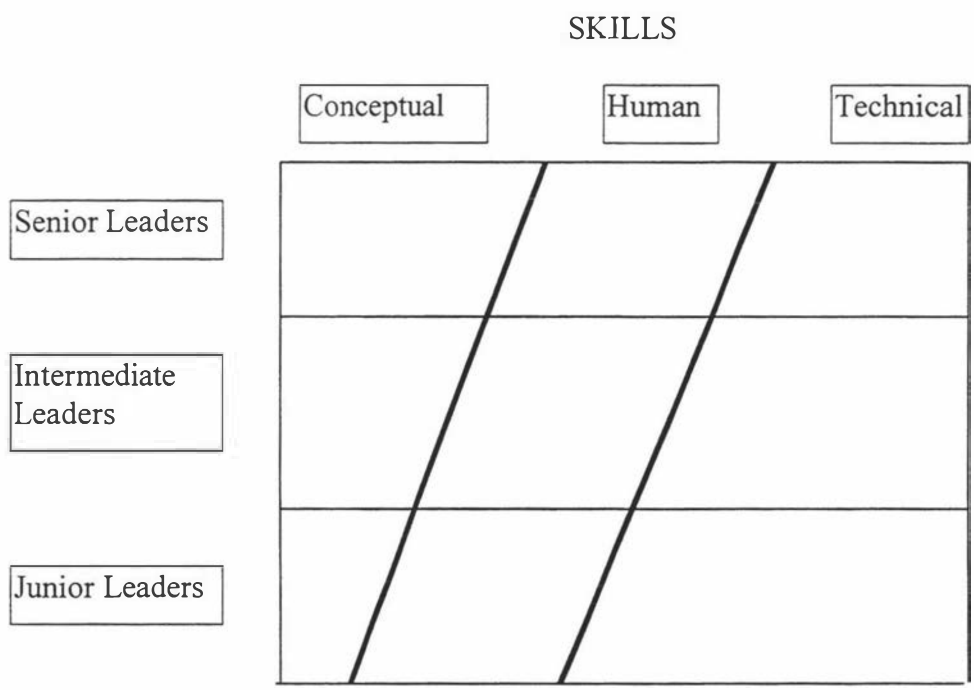

FIGURE 6.2 Skills Required At Different Levels Of Command

The implications of the mix of skills at different levels of command are cited as follows (Ibid, p. 12-4):

1. Senior commanders should concentrate on providing vision and direction. While still being concerned with team building and supporting subordinates their central focus must be on strategic-level issues.
2. With increasing emphasis on conceptual skills, a junior officer's potential for higher command cannot be assessed through his or her technical competence - technical ability is not enough for higher-level command.

3. Training for junior-level command positions should focus upon the technical skills of their profession and the associated communication skills. Progression up the ranks should be reinforced with an emphasis on self-improvement through education, which stresses conceptual skills dealing with complexity, ambiguity, and wider issues.

The previous discussion helps to illustrate the problems associated with finding a single and appropriate definition for the term *command*. While Figure 6.1 illustrates the relationships between the three critical domains constituting the function of command, the components of communication, control, and intelligence must also be integrated. Keeping this in mind, a New Zealand-specific definition and model for command will be established at the conclusion of this study by incorporating the findings of the research.

An Increasing Emphasis On Conceptual Skills

The following is adapted from Yukl (1994, p. 253) where he classifies managerial skills in terms of a three-skill taxonomy:

1. *Technical Skills* - Knowledge about methods, processes, procedures, and techniques for conducting a specialised activity, and the ability to use tools and equipment relevant to that activity.
2. *Interpersonal Skills* - Knowledge about human behaviour and interpersonal processes, ability to understand the feelings, attitudes, and motives of others from what they say and do (empathy, social sensitivity), ability to communicate clearly and effectively (speech fluency, persuasiveness, and ability to establish effective and co-operative relationships (tact, diplomacy, listening skill, knowledge about acceptable social behaviour).
3. *Conceptual Skills* - General analytical ability, logical thinking, proficiency in concept formation and conceptualisation of complex and ambiguous relationships, creativity in idea generation and problem solving, ability to analyse events and

perceive trends, anticipate changes, and recognise opportunities and potential problems (inductive and deductive reasoning).

Yukl adds that technical skills are primarily concerned with things, interpersonal skills are primarily concerned with people, and conceptual skills are primarily concerned with ideas and concepts (Ibid). From the discussion in the previous chapter it could further be extrapolated that technical skills are largely developed by training, interpersonal skills are largely a combination of training, experience and inheritance, and conceptual skills are largely developed through the influence of inheritance, environment, and education. Nowowiejski's (1995) push for a change in the Army learning process (discussed in the previous chapter) is validated by the change in focus from technical skill and obedience to conceptual and people skills, self-efficacy, and decentralised decision-making. This represents the change from *command by direction* to *command by influence* (see Figure 6.3).

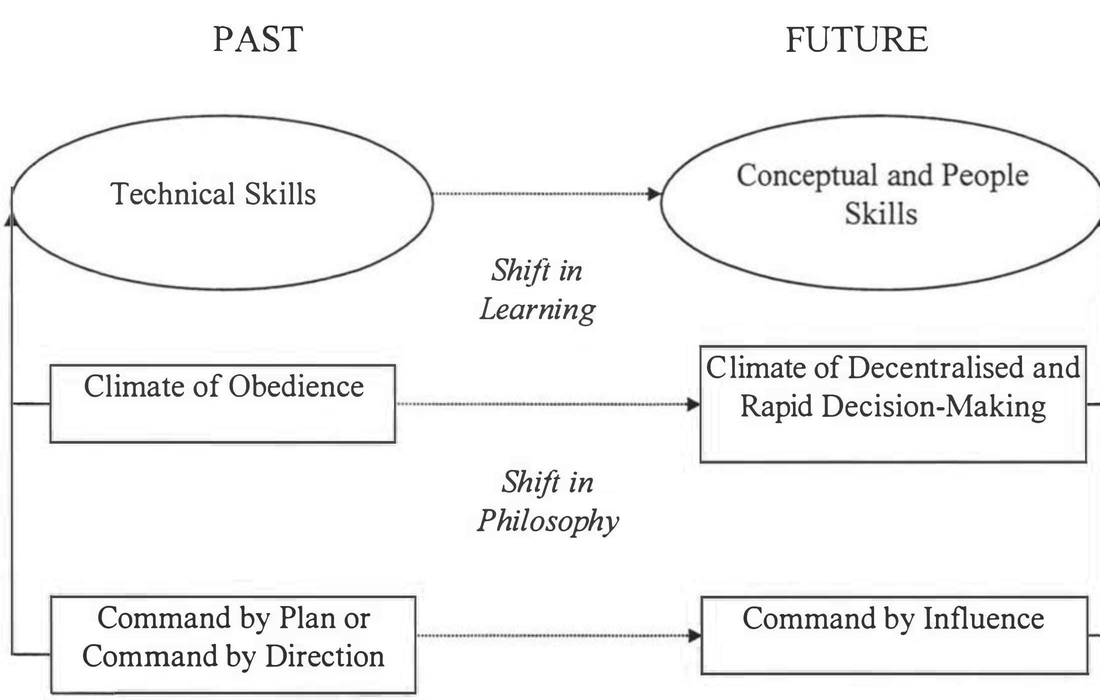

FIGURE 6.3 The Climate Of Command - Past And Future

Continual paradigm shifts appear to be requisite for career progression and to successfully integrate command expectations and requirements with newly learned skills, knowledge, and abilities. While the technical requirements of lower-level command can be more easily identified, problems arise with the higher-level conceptual requirements, particularly in a dynamic, ever-changing environment. The skills required by senior officers a decade ago may be incompatible with the demands of today. Some of these conceptual changes were discussed in the previous chapter of this study.

Furthermore, in a battlefield situation the neat and tidy representations of command requirements (Figure 6.2) are no longer valid as the chaos of war and the influence of directive control ideally facilitates decentralised decision-making and pushes implementation and accountability down to the lowest tactical levels. Suddenly officers at junior command level are making decisions with enormous potential repercussions. The requirement for conceptual-level skills will supersede the efficacy and significance of all others[27]. Miller and Reitinger (1995) assert that the key to understanding the new battle command focus is to grasp the role of knowledge and the value of information. They claim that commanders at all levels require the means to optimise timely battlespace information, thereby making more informed decisions and translating them into actions consistently faster than the enemy. The ability to make, communicate and enact these decisions before an adversary acts provides the commander the means to operate at a tempo the enemy cannot sustain.

According to Yukl (1994), more conceptual skill is needed by middle management in organisations where these managers are expected to participate in strategic planning and management of innovation, and that more interpersonal skill is needed by middle managers and supervisors in organisations that make extensive use of self-managed groups - such as would be ideologically practised under conditions of directive control.

[27] Blank (1996) claims that the technological change increases the importance of strategic vision and operational art (or their functional equivalents) because the boundaries between tactical, operational, and strategic operations or levels are steadily disappearing. In Desert Storm there was only a 'first strike', not a campaign (p. 22). Such dynamic changes in warfare indicate conceptual shifts for which many

Yukl also claims that the quality of strategic decisions ultimately depends on conceptual skill - and this is particularly relevant within the framework of the military and modern warfare as the ability to identify significant differences between strategic and tactical decisions and who makes those decisions becomes less distinctive. This change in command requirements is alluded to in NZ P12:

> *21. ...It is important, however, to appreciate how directive control impacts on military leadership at all levels. Through the decentralisation of command, directive control requires a higher degree of leadership at lower levels than has previously been acknowledged. Junior commanders are required to take the initiative, to exercise independent judgement, and to act according to the existing conditions.*
>
> *22. The NZ Army's light infantry manoeuvre warfare concept requires intelligent leaders with a talent for boldness and initiative down to the most junior level (Part One, Section Four).*

The importance of conceptual-level skills must therefore be regarded as a key command element in the deliverance of manoeuvre theory in an environment regulated by directive control. Conflict in command expectations becomes apparent, particularly when comparing command in peace with command in war. The ability for junior officers to 'switch' modes of thinking from a largely technical/obedience orientation to one requiring greater conceptualisation/influential abilities, increases the already stressful and ambiguous nature of the function of command. This would be especially so for those not experienced in switching operating modes.

With the increasing emphasis on conceptual-level ability, it would appear that a higher level of intelligence is now required than was necessary before the introduction of manoeuvre theory. Directly implying the existence of a correlation between intelligence and better leadership is a contentious issue. How much intellectual ability is enough?

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practitioners have been ill-prepared as training has been superseded by both doctrine and operational reality.

Research with military leaders conducted by Csoka (1974) found that leaders with high intelligence were not necessarily the higher performers and that when they had very little experience, their intelligence was not beneficial. Csoka writes that in effect, the less intelligent leaders could not use their experience and the inexperienced leaders could not use their intelligence in better directing the group. Csoka concludes that the findings of his research seem to indicate that leader intelligence should be viewed as a moderating variable which affects the usefulness of one's experience and that this in turn should substantially influence the relative expertise that a leader has in any given situation. Csoka indicates that such expertise is essential in the determination of the power and influence of a leader over his or her members. This research highlights the need for both experience and intelligence - training and education[28].

Structured Decision-Making Versus Intuition

In 1989 Gary Klein wrote an article in the Military Review sparking off an ongoing debate concerning the utility of intuitive decision-making skills, which he refers to as *recognition-primed decisions* or *RPD,* versus more structured logical thinking which is popular in the military and commonly referred to as *analytical decision-making* or *ADM,* or *concurrent option comparison* (Klein, 1989). Klein (Ibid, p. 60) contrasts the two decision-making approaches in the following manner:

- The RPD model concentrates on 'satisficing', whereas models of decision analysis and concurrent option comparison have emphasised optimising.
- The RPD model focuses on situation assessment. In contrast, concurrent option evaluation models have placed more of the emphasis on selecting among options than on recognising situations.

[28] Csoka's findings have a sense of intuitive correctness. However research based on respondent perceptions of another person's performance requires cautious interpretation. In a study by Atwater and Yammarino (1993) researching variations between superiors' and subordinates' perceptions and subsequent ratings of leadership found that while subordinates in the military rated intelligence very highly as a leadership factor, superiors were more concerned with the leader's degree of conformity. This demonstrates the fickleness and subjectivity of research respondents and highlights the difficulty associated with the interpretation of respondent perceptions. Just how well informed are they concerning the subject matter and ultimately, how correct are their perceptions?

- The RPD model assumes that decision-makers evaluate typical actions by imagining how they will be carried out in that situation. Such an evaluation lets the decision-maker improve the option and also reject it, if necessary. Analytical models present strong (they follow a template) methods for evaluating sets of options. These models make it inconvenient for the user to improve options since that would force the evaluation to begin again.
- The RPD model assumes that decision-makers will have an option available regardless of how tight the time constraints are. Experienced decision-makers usually start with a typical option. If time permits, this option will be evaluated; if defective, it will be replaced by the next most typical option. In contrast, analytical models provide no guidance until after options are generated, evaluation criteria and weights established, ratings accomplished and tabulations completed. If a reaction is needed before this process is finished, the decision-maker is out of luck.

Klein writes that recognitional decision making is more important when experienced personnel are working under time pressure on concrete, contextually dependent tasks in changing environments and have a *satisficing*[29] criterion for selecting the first option that looks like it will work. Concurrent option comparison is more helpful for novices who lack an experience base and for seasoned decision-makers confronting novel conditions. It is more applicable when there is ample time for the decision. It comes into play when the data are abstract, preventing decision-makers from using concrete experiences. It is especially important when it is necessary to justify the decision to others, since justification usually requires a listing of reasons and indications of their importance. Analytical decision making is more helpful when there is a conflict to be resolved, especially when the conflict involves people with different concerns. It is usually a better strategy to use when one needs an optimal solution. Finally, Klein argues that analytical decision making is needed when the problem involves so much computational complexity that recognitional processes are inadequate.

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[29] A term created by Herbert Simon. Satisficing means taking courses of actions and making decisions regarded as being "good enough" under the circumstances, or satisfying the minimum acceptable criteria.

In essence what Klein is arguing is that the military needs to give up the single theory analytical perspectives and appreciate that there are a variety of decision making approaches and strategies and that their application and utility are dependent upon the situation and the people employing them. Probably the most decisive factor being a person's experience of a given situation or their ability to transfer lessons learnt from similar previous experiences. Klein's argument conforms with the literature on directive control and manoeuvre theory, which requires rapid decision-making, resulting in both creative and correct but unpredictable action (Klein, 1989, pp. 56-64)

The previous chapter emphasised *speed* as being a decisive factor in future military conflicts. The subsequent outcome of a situation is said to hinge on the commander's ability to make a rapid decision, employing skills of leadership to influence subordinates to achieve the ensuing action.

Armour (1994) argues that the decision-making process is central to the role of military staff operations and the principles of effective leadership. He quotes US Army Field Manual (FM) 100-5, Operations, which describes the concept of command as having two vital components - decision making and leadership (p70). Armour then continues by briefly discussing Tversky and Kahneman's research which categorised decision-making approaches into two basic types: algorithmic and heuristic. He describes the algorithmic concept as representing the development of a specific rule or set of rules for the solution of a problem. He explains that these procedures often consist of structured, detailed and complex criteria, much as those espoused by the traditional decision-making model - the ADM or concurrent option comparison as discussed above. Armour explains that the heuristic concept is more closely related to the RPD (recognition-primed decisions) model and relies on the 'rule of thumb' principle. He writes that the heuristic decision process is quickly formulated, but there is no guarantee that the correct solution will be rendered. He writes that this process also contains weaknesses, such as inaccuracies and omissions; however, it mirrors actual human thought processes more closely than the tightly structured algorithm (Ibid, p. 71).

Armour (Ibid, p. 73) continues his discussion by describing Chase and Simon's (1973) three guidelines to improve problem-solving and decision-making techniques:

- Increasing knowledge domain
- Automation of some parts of the problem-solving process
- Following a systematic plan

Armour concludes by writing that all the above concepts should be incorporated into the Army training system by:

1. increasing teaching content which develops and enhances officers' heuristic ability as opposed to 'teaching the exam', and
2. ensuring that officers undertake lifelong learning through advanced education to develop both the heuristic and algorithmic processes.

The emphasis is however on the heuristic process and its ability to facilitate improved efficiency, self-confidence, and the ability to make the necessary decisions in critical situations. Both Klein and Armour have provided a well-argued perspective on decision making, highlighting the need for rapid, intuitive information processing skills for people in command positions ahead of more systematically defined approaches . The extreme perspective on this theme began to surface the same year as Armour's article was published.

Rogers (1994) argues in support of the idea of intuition to facilitate rapid decision-making, as opposed to the use of detailed analytical and scientific approaches. His views appear extreme in his support of intuitive decision-making processes and also extreme in his rejection of the ADM or algorithmic approaches. The thrust of his argument is based upon the need for rapid processing of information. He claims that *the more information you give a commander, the more reluctant he is to make decisions. He either becomes overloaded or delays making a decision in the belief that if he waits he will receive the vital piece of information that tends never to come* (Rogers, 1994, p. 38). He expresses the concern that the analytical processes developed to sift information are too time consuming and too dependent upon logical analysis. His fear that intuition is being ignored at the expense of more scientifically based problem solving and decision-making techniques may also be well founded, particularly in light of the new philosophical approaches to warfighting and command. The danger lies in his extremism. Rogers emphasises the need for intuitive decision-making at the expense of other more procedural approaches. He concludes that *if we wish to succeed in manoeuvre warfare, then we must train and educate our officers in intuitive thought that emphasises the 'art' in command rather than the 'science' in command* (Ibid, p. 50)[30].

The promulgation of such beliefs is inherently dangerous in their extremism. Rogers' reasoning may be well-founded as intuitive, heuristic-type thinking *does* need to be emphasised, but not at the expense of other more structured problem solving techniques. Armour's description of Chase and Simon's first point in their guidelines for improving problem solving and decision-making must be reiterated, *increasing the knowledge domain* is a vital first step. Mintzberg (1994) confirms this when he writes *one cannot be (effectively) intuitive unless one has intimate knowledge of the subject in question, which sometimes requires years to develop* (p. 325).

Kerr (1994) also emphasises the importance of intuitive decision-making but argues a more balanced perspective in his conclusion...*Despite the value of intuitive decision making being very clear, it is neither desirable nor recommended that this should replace the analytic estimate process. Indeed it is generally accepted that the two processes should be employed in tandem to save time, but upon occasions intuition can be used to make decisions independent of any logic-based system* (Ibid, p. 12).

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[30] Rogers provides many war-time examples of brilliant decisions being made by intuition to support his beliefs but he appears too zealous in his pursuit of what resembles a one-best-way approach. He also makes some enormous blunders on page 40 when he describes the left side of the brain as the seat of motion, music and art and the right side of the brain as the side responsible for logical thought, mathematical analysis and language. He then implies that the right side provides the science of command while the left is responsible for the art of command. This is totally incorrect both physiologically and philosophically. He continues by writing that the left brain is more dominant in women, that they are therefore more intuitive, and that they may as a consequence be more suited to the complexities of the modern battlefield and manoeuvre warfare. Such errors discredit Rogers' arguments as possibly well-meaning but of an uninformed nature.

Some of these authors paint a disparaging picture of analytical, logical, and structured thought processes. Authors such as Stephen D. Brookfield would probably debate such deprecating and critical assertions regarding structured thinking processes. Brookfield clears up what he believes are commonly held misconceptions about one form of structured thinking - critical thinking - by explaining that training in critical thinking develops logical reasoning abilities, encourages reflective judgement, fosters an awareness to go assumption hunting, encourages the recognition of ambiguity in reasoning, tests empirical soundness of generalised conclusions, and increases curiosity, flexibility, scepticism, and honesty (Brookfield, 1987). All of these factors enhance the capability of a leader or commander and should not be cast aside in favour of a so-called 'superior' but enigmatic and illusive intuitive thought process.

The debate took on a life of its own as it continued to grow (in a more acrimonious manner) after Schmitt (1995) argued in support of intuitive decision making in circumstances which are typically fluid, uncertain, high-stress tactical situations. This was interpreted by Ball and Jones (1996) to mean that Schmitt was advocating the use of intuition over more formal approaches *in every instance.* Schmitt responded by defending his position (Schmitt, 1996). He also had Gary Klein provide an insert (Ibid), arguing against Ball and Jones' stance, particularly their view that their analytical strategy would augment intuitive decision making, which Klein refuted. Schmitt reinforced the need for experience to aid rapid, intuitive decision making when under time pressure as opposed to Ball and Jones' position that officers refer to a list of proforma questions when faced with a difficult, time-pressured decision.

Perhaps Klein, Armour, Rogers, Kerr and others write from a perspective influenced by their personal experiences of the Army problem solving process, as it is promulgated by the Army. It is often taught by rote, lacking in-depth understanding by those who teach it and it is generally portrayed in a template format, thereby restricting its usefulness beyond the classroom, due to its extremely rigid structure and a need for strict adherence to inflexible rules[31]. These authors appear to be saying that what they want is faster cognitive processing as opposed to the more cumbersome, structured cognitive processing resulting from the decision-making techniques taught within the Army. They also want more creative solutions than is currently possible with the Army method of problem solving. This not only calls for an improvement in problem solving and decision-making techniques promulgated within Army, it alludes to the use of procedural knowledge, based in experience, over declarative knowledge, which is more generally based on vicarious and/or rote learning. If the learners cannot learn by experience, they require at minimum a better understanding of the *how* and *why* aspects of their learning content.

Nelson (1989) explains that the German Army, whose doctrines were the precursor for much of the manoeuvre warfare doctrine, has historically favoured decentralisation of decision-making to encourage initiative and leadership development. One method of facilitating this was by communicating to subordinates what was to be accomplished without telling them how it should be done. Nelson claims that *[T]he object was not to teach subordinates what to think, but how to think* (p. 30). Under manoeuvre warfare conditions the *why* knowledge is critical, to the extent that well-learned principles can be translated across setting or different sets of circumstances in response to increasing complexity, unpredictability, and ambiguity.

Teaching For A Transfer Of Learning

Transfer of learning across settings is only the beginning. Ideally what should be desired is increased cognitive flexibility to prepare army personnel for the unexpected. While there are numerous terms used to describe such cognitive flexibility, this study uses *generative learning* (Wittrock, 1986; Bennett & O'Brien, 1994), that is, purposeful learning and changing in order to anticipate what might happen. It tries to anticipate

[31] I have encountered numerous occasions when teaching command and problem solving where a class of senior NCO's and/or officers would voice a collective word of appreciation that they finally had someone teaching theoretical material understood by the presenter and that it could therefore be critically questioned and evaluated as to its efficacy and applicability. They claim that a common response to

what might happen if a particular strategy is implemented. It tries to predict the outcome if several strategic or tactical options are being considered. It tries to react appropriately when surprised by a new development. Generative learning demands a deep understanding of the way things work. Patch (1997) points out that while the manoeuvres of Napoleon, Rommel, von Schlieffen, Lee, von Moltke and others startled the world and provided temporary advantage, total reliance on manoeuvre alone may well prove decisive if the opponent is almost prostrate but should not be relied upon as the only hope of victory. In the above cases Wellington, Alexander and Montgomery, and others quickly learned from their respective opponents and utilised their new knowledge in order to defeat their enemies. Generative learning in action.

Generative learning is based upon the more general constructivist approach to learning which states that learners must individually discover and transform complex information, checking new information against old rules and revising rules when they no longer work (Slavin, 1997). Generative learning is learner-centred and is closely associated with *discovery learning* where learners are encouraged to learn largely on their own through active involvement with concepts and principles, thus, mirroring Nelson's words, the learners are encouraged to think, to move away from the storage of facts and information and instead to understand the process required in the acquisition and utilisation of knowledge.

According to Slavin (1997, p. 255) *transfer of learning depends in large part on similarity between the situation in which information is learned and applied, and that by providing a variety and range of learning situations, learners become accustomed to applying solutions or principles over a range of different contexts.* In chapter five Nowowiejski (1995) was quoted as appealing for changes in the learning and development processes employed by the military, much of which is based upon templates and rote. Slavin's comments suggest a caveat to Nowowiejski's argument in that some of the most effective procedures for enhancing transfer of learning are exactly

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questions directed at trainers within the military is..."I don't know why, I've been told to teach this stuff and that's what I'm doing".

the opposite of those for initial learning, indicating the need for carefully structured initial learning programmes. Slavin cites research indicating that teaching a concept in many different contexts was confusing to students if it was done at the beginning sequence of instruction, but it enhanced transfer if it was done after students understood the concept in one setting (Ibid). The implication for the military suggests that concepts should be taught using similar examples initially and that a variety of examples should only be utilised once the learners thoroughly understand the concept. In utilising many examples, the essential features of the concept should be pointed out to learners so that the learners can apply these when new instances are encountered. Learning approaches should perhaps be encouraged to utilise constructivist approaches to instruction, such as generative learning and discovery learning.

To achieve the rapidity of decision making demanded of commanders in conflict situations, commonly referred to as intuitive decision making, requires *automaticity*. Automaticity refers to a process where thoroughly learned tasks can be performed with little mental effort. Bloom (1986, pp. 70-77) studied the role of automaticity in the performances of gifted pianists, mathematicians, athletes, and others. He called automaticity the *hands and feet of genius*. According to Slavin (1997, p. 202) *automaticity is gained primarily through practice*. Problem solving and decision making across a variety of settings can be practised until it becomes second nature thus freeing up short term or working memories for other more complex tasks.

As explained in chapter three, knowledge can be divided into two types: according to Anderson (1983) *declarative knowledge* could best be described as knowledge which informs you *that* something is, or works, or happens. On the other hand; *procedural knowledge* is knowing *how* or *why* something works or happens. Declarative knowledge is required to explain a concept, while procedural knowledge is required to apply a concept in a practical sense, such as, going beyond simply knowing something to fully understanding how and why it is so. Both types of knowledge appear to be necessary for the problem-solving skills required by the military.

It can be concluded that a wide variety of decision-making approaches exist, with some appearing more structured than others, and with some approaches having more applicability in certain situations than others. Having the ability to apply a variety of decision-making techniques provides an armoury of cognitive tools, and although it may be accurate to say that manoeuvre theory deliberately emphasises the use of initiative and creativity, this should not be purchased at the expense of other supposedly more structured or formal approaches, although perhaps the content and teaching of such approaches should be reviewed.

Taggart and Valenzi (1990) discuss the results of their research on the human information processing styles employed by successful managers and their concluding remark succinctly captures the right mood for this discussion by writing...*Reason (the rational style) and passion (the intuitive style) are the twin companions of successful management* (p. 170). Perhaps this is also the case for military command.

Authors such as Klein, Armour, Rogers, and Kerr emphasise the importance of intuitive thinking, and this will not harm the Army as an organisation, as the use of intuition and personal initiative are areas requiring attention under the new command doctrine, as demonstrated by a succession of authors. Perhaps a more accurate way of articulating what is required, is to say that military personnel need to be able to utilise the *intuitive use of knowledge* - thus emphasising intuition but also alluding to the need for both knowledge and experience to facilitate effective decision making and problem solving.

Conflict Between Managing The Task And Managing The People

Hays and Thomas (1967) categorise skills required for command into two broad groups: *task skills* and *social skills*. Task skills are concerned with the accomplishment of the group mission including the solution of technical and tactical problems and skill in the efficient employment of the group in the accomplishment of the mission. Social or human relations' skills are concerned with the social interaction process within the group. They include the ability to motivate the unit to accept the mission as its own goal and to provide for the satisfaction of the individual needs of the group members. They also include the ability to solve the many human relations' problems that arise in the group. These are the human skills of the leader. Hays and Thomas (Ibid) claim that these are more difficult to develop than the more mechanical task skills, involving the ability to evaluate the reactions of others and to apply the knowledge thus gained to obtain the co-operation of the members of the group.

Such categorisation is supported by The Ohio State Leadership Studies (cited in Bartol and Martin, 1994, p. 487) identifying two basic leader behaviours: those who *initiate structure*, the degree to which a leader defines his or her role and the roles of subordinates in terms of achieving the unit goals with an emphasis on task-related issues, and, those who are high on *consideration*, the degree to which a leader builds mutual trust with subordinates.

Bartol and Martin explain that The Ohio State studies lead to *situational* theories of leadership (Ibid). They write that the most well known of these is Fiedler's Contingency Theory model[32] which posits that leaders differ in the degree of their orientation toward the task versus that toward the people. It is claimed that this difference makes leaders more effective in some types of situations than in others.

Situational leadership theory is based on the premise that leaders need to alter their behaviours depending on one major situational factor - the readiness and acceptance of followers. The theory focuses on two leader behaviours that are similar to the initiating structure and consideration behaviours pioneered by the researchers: *Task behaviours* refers to the extent to which the leader engages in spelling out the duties and responsibilities of an individual or group. It includes telling people what to do, and how to do it, where to do it, and who is to do it. *Relationship behaviour* refers to the extent

[32] Robbins, Bergman, and Stagg (1997) appear to disagree on this point. They claim that the most widely followed situational leadership theory model is that of Paul Hersey and Kenneth Blanchard (p. 577). This model resembles aspects of The Ohio State studies by focusing on task behaviours and relationship behaviours. The model has been widely used in management training programmes in Australia and New Zealand but has not undergone extensive evaluation to test its validity. Robbins, Bergman, and Stagg (Ibid, p. 578) assert however that it is widely accepted due to its intuitive appeal.

to which the leader engages in two-way communication. It includes listening, facilitating, and supportive behaviour (Ibid).

A relatively new model on leadership developed by Fiedler appears to reconcile some of the disagreements concerning task and people orientations. Fiedler (1986) has called his theory the Cognitive Resources Theory (CRT) and it deals with the cognitive abilities of leaders. The theory examines the conditions under which cognitive resources, such as intelligence and experience, are related to group performance. According to the theory a complex interaction among two leader traits (intelligence and experience), one type of leader behaviour (directive leadership), and two aspects of the leadership situation (interpersonal stress, and the nature of the group's task) determine the performance of a group.

Fiedler's first proposition for his CRT is that leader ability contributes to group performance only when the leader is directive and subordinates require guidance to perform the task effectively. It should be noted that the term *directive* in this context was conceived entirely independent of the descriptive term *directive control*. The theory assumes that intelligent leaders devise better plans and action strategies for doing the work than non-intelligent leaders, especially when the task is of a complex nature. The theory also assumes that a leader's plans and decisions are communicated to subordinates through directive behaviour. If the leader has low ability but group members have high ability and also share the leader's task objectives, a non-directive (participative) leader is more effective than a directive (autocratic) leader for a complex task. For a simple, routine task that subordinates already know how to perform, there is unlikely to be any relationship between leader intelligence and group performance, even for directive leaders.

Fiedler's second proposition for his CRT is that perceived stress moderates the relationship between intelligence and decision quality. It is thought that under low stress, high intelligence results in good plans and decisions. In this situation, a highly intelligent leader relies on intellectual ability to analyse the problem and find the best solution. In contrast, the theory assumes that under high stress, there is no relationship (or a negative relationship) between leader intelligence and decision quality. The theory provides several possible explanations why highly intelligent leaders sometimes make terrible task decisions under stress. According to Yukl (1994), the most plausible explanation it offers is that stress interferes with information processing and decision-making. Under high stress, a leader is likely to be distracted and unable to focus on the task. The leader may withdraw and let the group drift, or anxiety about protecting his or her self-image and reputation may result in a poor decision by the leader.

The theory's third proposition is that perceived stress moderates the relationship between leader experience and performance. Experience is usually measured in terms of time on the job, and it is assumed to result in habitual behaviour patterns for effectively dealing with task problems. It is also assumed that people under stress tend to deal with task problems by reverting to previously learned behaviour rather than by treating them as new problems. According to the theory, experience will be positively related to the quality of the leader decisions under high interpersonal stress, but is not related to decision quality under low stress. It is presumed that experienced leaders rely mostly on intelligence under low stress, and they rely mostly on experience under high stress. Inexperienced leaders may rely on intelligence in both situations, since they don't have much experience.

According to Yukl (Ibid), the theory is relatively new and therefore lacks in-depth corroborating research. He writes that the most controversial aspect of the theory is the idea that leader effectiveness is predicted by intelligence in low-stress conditions and by experience in high stress conditions.

Leader Power And Leader Functions

From the discussion thus far, it can be stated that while there is no universally accepted definition of the function of command or of the attributes that make up an 'ideal' commander, there is a conclusive theme running throughout. Command is viewed as legal authority vested in an individual which, according to French and Raven (1959) gives him or her *legitimate power* over subordinates. Legitimate power is obviously not considered to be adequate for command however with constant references made to leadership and the need to have followers willingly achieve the commander's goals. Yukl (1994), referring to the work of McClelland and Burnham, (1976), emphasises the significance of this aspect of leadership when he makes the observation that *managers with a socialised power orientation are more emotionally mature. They exercise power more for the benefit of others, are hesitant about using power in a manipulative manner, are less egoistic and defensive, accumulate fewer material possessions, have a longer-range view, and are more willing to take advice from people with relevant expertise*[33]. Their strong need for power is expressed by using influence to build up the organisation and make it successful. *Because of their orientation toward building organisational commitment, this kind of leader is more likely to use a participative, coaching style of managerial behaviour and is less likely to be coercive and autocratic* (Yukl, 1994, p. 269) (for detailed research and discussion on this topic see McClelland, 1975).

The Over-Controlling Leader

Matthews (1996, p. 32) discusses changes in army leadership philosophy over the last decade. He claims that *There come moments during military endeavour when, to save the day, the leader must impose his will on subordinates instantly in the face of chaotic and primordially intractable forces, and to do so he must resort to measures that in any other context would be judged as extreme if not harshly tyrannical. But such moments are the rare exception rather than the rule.* Matthews continues *...there has, for sound reasons, been a steady evolution away from autocratic, centralisation characteristic of earlier days.*

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[33] As opposed to managers with a personalised power orientation who use power to aggrandise themselves and satisfy their strong need for esteem and status. They have little inhibition or self-control, and they exercise power impulsively. They seek to dominate subordinates by keeping them weak and dependent. Authority for making important decisions is centralised in the leader, information is restricted, and rewards and punishments are used to manipulate and control subordinates. Assistance and advice to a subordinate is done in a way that demonstrates personal superiority and the inferiority and dependence of the subordinate. Subordinates are reluctant to take any initiative in solving problems - they prefer to wait for explicit directions from the leader. Any subordinate loyalty that may occur is to the leader rather than the organisation, and when the leader departs there is likely to be disorder and a breakdown in team spirit (Yukl, 1994, p. 269).

Matthews quotes Training and Doctrine Command Pamphlet 525-5, Force XXI Operations (August 1994), in which it states...*[A] provisional view of operational concepts for the information age Army now in design, suggests a greater need for empowerment: This new way of managing forces will alter, if not replace, traditional hierarchical command structures with new internetted designs...Because this internetted structure can diffuse command authority, new leadership and command approaches will be required...Individual soldiers will be empowered for independent action* (Ibid, p. 32). Matthews asks the question, if enlightenment and empowerment are indeed the official policies what is left to discuss? Despite the official policies of loosening the reigns of authoritarianism, the overcontrolling leader and the micromanager remain alive and well, in fact, many of them are thriving[34]. *We eloquently talk the talk of empowerment but we do not eagerly walk the walk* (Matthews, 1994, p.33).

Matthews continues, *a military organisation in which each soldier is entrusted with a significant area of responsibility and authority will perform more successfully than one whose leader arrogates unto himself all responsibility and authority, using soldiers as mere feet and hands to execute his orders* (Ibid). The question must then be asked: If this opinion is so widespread and embedded in official doctrine, why do so many leaders and manager feel impelled to overcontrol? According to Matthews (1994), possible reasons for the occurrence of overcontrol include:

- Overcontrol may be a careerist manifestation by an untrusting leader. In fear of a lost career opportunity due to someone else's slip-up, the leader imposes rigid control.
- Overcontrol is often a reflex of the commander's own career insecurity. This is clearly explained by Dixon (1976) when he compares command personality types as fitting on a behavioural continuum ranging from the *task specialist* who is often a competent leader driven by hopes of success and who empowers subordinates, or an

[34] The British also admit that overcontrol is still a problem as Kerr writes that the pervasive military authoritarian culture has not encouraged intuitive thought processes and, more probably, has stifled them

extreme *social specialist* who is often an authoritarian type and who is driven by a fear of failure resulting in incompetent leadership behaviour[35].

- An obsessive need to exercise power over other human beings is frequently at the root of overcontrol.
- Obsessive-compulsive personality disorder suffered by a leader will manifest itself in painstaking attention to detail, reluctance to delegate responsibility and an obsession with maintaining total control.
- Other causes may be through an inability to prioritise, an inability to develop staff, paranoia, and poor opinion of subordinates.

Ungson et al (1981) allude to a biologically plausible description of neural activity which could also be responsible for some overcontrolling behavioural manifestations. They write that the specific characteristics of [neural] organisational structure that may impede filtering and pigeon-holing activities[36] of individuals are: favoured information channels, specialised vocabularies, communication checkpoints, and standard operating procedures. The military are guilty of excessive use of specialised vocabularies and standard operating procedures (S.O.P.`s) which may reflect on the internal neural representation of its members. Such environmental work factors may result in rigidity of thought, a desire to obey and follow instead of facilitating and leading (at least in terms which could be considered creative or original in concept), and an inability to

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(Kerr, 1994, p. 13).

[35] Dixon (1976, p. 285) writes that such people are authoritarian, conformist, conventional, overcontrolling, rigid, possessed of closed as opposed to open minds, and they like to be governed by rules and abhor what is spontaneous, flexible or unusual. As examples he includes General Buller of the Boer War and General Haig of the First World War. Note the behavioural similarity between Dixon's *social specialist* and McClelland's *personalised power orientation*. While the terms applied by Dixon and McClelland are in fact thematically opposite (Yukl was quoted earlier in this chapter stating that McClelland's *socialised power* oriented people are more mature) and yet the personality types which they describe and their subsequent behaviours are very similar.

[36] Broadbent (1971) studied the arousal level that a decision situation created in an individual. He reported that individuals received more information about the state of the world than they could possibly process. Therefore, some sources of information would receive more attention than others, depending upon previously learned probabilities of correct stimulus interpretation. The first filtering stage would be followed by a second state called pigeon holing, that is where previously learned categories would be used to define the state of the world. Applying Broadbent's framework, an army commander/leader/manager is an active filterer and pigeon holer of information obtained from the rest of the organisation (paraphrased from Ungson et al, 1981, p. 126).

question assumptions and procure original thought. Such cognitive rigidity is anathema to the philosophical underpinnings of directive control and manoeuvre theory. Kao (1989) claims that rigid adherence to standard operating procedures reduces individuals' sense of responsibility, motivation, and use of initiative. This is apparent within many military organisations. Ironically, these are the organisations which, according to the literature, should be most able to depend upon the initiative of their members.

It is expected that some examples of overcontrolling leaders *will* be represented amongst respondent numbers contributing to this research. Respondents displaying overcontrolling behaviours within the Army, may manifest behaviour that is authoritarian, defensive, politically motivated, predominantly internally focused, demonstrating a preoccupation with minor details and the placing of promotional aspirations ahead of the Army's greater purpose (Pech, 1996)[37].

Matthews concludes by stating that the overcontrolling leader is one of the significant phenomena in contemporary organisations, being present everywhere, and that the army must either reform the way such leaders operate or failing that, identify these people and purge itself of them (Matthews, 1996). Failure to do so will make a mockery of contemporary command doctrines.

Power orientations should not however be viewed from an entirely negative perspective as the previous discussion may to some extent infer. Miner (1985) reported that people who are low in need for power usually lack the desire and assertiveness necessary to organise and direct group activities, to negotiate favourable agreements, to lobby for necessary resources, to advocate and promote desirable changes, and to impose necessary discipline. People who find it difficult or believe it is wrong to exercise power over others would be unlikely to satisfy the role requirements of a managerial or command position. Yukl (1994) writes that a strong need for power is desirable, but

[37] Such manifestations are more predominantly ascribed to the rank of lieutenant colonel and above as these are the people who have the most invested in the current system and the status quo and who therefore have the most to alternately gain or lose with the onset of change. Respondents for the MAPA questionnaire range in rank from lieutenant to major.

that a manager's effectiveness also depends on how this need finds expression. He quotes a great deal of research indicating that a socialised power orientation (Dixon's task specialist) is more likely to result in effective leadership than a personalised power orientation (Dixon's social specialist).

Command, Management, Leadership - Functions

Command is seen to be concerned with task achievement to which end it is integrally related to the functions of management and leadership. While management in this context focuses more on the efficient use of resources, leadership is solely focused on influencing and directing people to willingly labour towards achievement of the task. This suggests the use of referent power through the attainment of loyalty and followership, achieved through respect, identification, and understanding. Adair (1988) categorises this under five distinct *nuances*, which he claims are not found in management alone. These nuances imply a sense of direction, teamwork, inspiration, example and acceptance by others. Adair has grouped these nuances into his well known three circles, describing the achievement of the task, the building of the team, while developing and motivating the individual.

Rocke and Haydon (1993) summarise the nine leadership functions listed in the US Army doctrine manual FM 22-100 Military Leadership. They maintain that officers are expected to be competent in the following:

- **Communications** Exchange information and ideas from one person to another in a clear, concise and measured fashion to ensure that others understand exactly what you are trying to tell them.
- **Supervision** Control, direct, evaluate, co-ordinate and plan the efforts of subordinates to ensure task accomplishments.
- **Teaching and Counselling** Improve performance by displaying the interpersonal skills needed to increase knowledge, overcome problems or gain new perspectives and skills.

- **Soldier Team Development** Create strong bonds between leaders and soldiers so that units function as cohesive, disciplined organisations.
- **Technical and Tactical Proficiency** Demonstrate levels of professional competence required to train soldiers, maintain and employ equipment and provide the combat power required to win battles.
- **Decision-Making** Demonstrate a mastery of the skills required to make high quality decisions that soldiers and organisations will accept and execute quickly.
- **Planning** Prepare to accomplish unit missions through forecasting resources, setting goals and objectives, developing strategies, establishing priorities, delegating, organising and standardising procedures.
- **Use of Available Systems** Know how to use modern technological means and manage information to enhance combat performance.
- **Professional Ethics** Behave in a manner consistent with the professional army ethic and setting an appropriate example for subordinates to follow.

In his writings, de Czege (1992) describes something very similar to Adair and provides a more detailed perspective to that of Rocke and Haydon's reiteration of FM 22-100. He explains that leaders are to provide purpose, establish direction, generate motivation, and sustain effectiveness. His elaboration of these four points is paraphrased below.

Provide and instil purpose

- The leader must have a clear idea of his/her contribution to the overall organisational vision and how his or her subordinates are to contribute to the intent of higher command.
- It is the duty of leaders to clarify the purpose of their mission and to inform subordinates appropriately.

Providing direction

- Effective leaders provide unambiguous direction and guidance for action. They clearly articulate and assign objectives, missions, and goals to subordinates. In addition to such direct guidance, they also provide indirect guidance.
- Leaders promote values, set standards for the accomplishment of tasks, enforce discipline, establish standard operating procedures, ensure the training of soldiers and units, and establish policies and regulations. At the highest leadership levels they may also be responsible for development of doctrine, methods and techniques in some areas.
- In providing direction leaders employ command and control skills, processes and functions: information gathering, analysis, decision making, issuing instructions or orders, performing appropriate supervision and monitoring the effectiveness of the resulting actions.
- Effective leadership in combat is measured in terms of the speed and effectiveness of the decision cycle relative to that of the enemy.
- Leaders are also involved in the management functions of control, co-ordination and sequencing of events.
- Leaders develop unobtrusive means of gathering information, particularly information concerned with subordinate performance.

Providing motivation[38]

- Effective leaders harness the willingness of subordinates to work toward common goals, missions, objectives, and tasks.
- In combat leaders must motivate soldiers to do difficult things in trying circumstances. In peacetime, motivation to perform tasks well is important.

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[38] Adams, Prince, Instone, and Rice (1984) concluded from their critical incidents research with officer cadets at West Point that *respondents perceived the ability to motivate, inspire and encourage subordinates as a salient characteristic of good leadership which, of all characteristics and behaviours, most clearly distinguished the good from the average leader* (p. 607).

- Effective leaders elicit willing compliance and devote a considerable effort to obtaining it.
- Leaders work hard to establish and maintain mutual trust and confidence.
- Leaders ensure that subordinates are informed and educated and at higher levels this may involve information programmes of great complexity and subtlety.

Sustaining continued effectiveness

- While providing purpose, direction and motivation has immediate payoffs for the leader, the future continuity, health and further development of the organisation must also be ensured - sustaining the effectiveness of the organisation over time.
- Effective leaders provide for their succession and develop high performing units.

Scanning the literature on leadership has produced little which can be regarded as being more practical and descriptive concerning effective leadership behaviours in the military than the descriptions given by de Czege. What de Czege has written is indeed, as the title of his article states, a comprehensive view of military leadership behaviour.

Command, Management, Leadership - Characteristics

Stogdill (1974) describes his study of leadership characteristics. His analysis was based on 52 studies published since 1945 including surveys of large numbers of military personnel. The results shown in Table 6.1 suggest that the leaders surveyed were predominantly occupied in peace-time and stable conditions. This assertion is based on the low frequency of occurrences of such factors as courage, physical energy, communication, and creativity. In this sense Stogdill's results may have little relevance to the requirements for an army operating under a doctrine of manoeuvre theory, as outlined in the previous chapter.

TABLE 6.1 Factors Appearing In Three Or More Leadership Studies, From Research By Stogdill (1974, p. 93).

Factor No.	Factor Name	Frequency
1.	Social and interpersonal skills	16
2.	Technical skills	18
3.	Administrative skills	12
4.	Leadership effectiveness and achievement	15
5.	Social nearness, friendliness	18
6.	Intellectual skills	11
7.	Maintaining cohesive work group	9
8.	Maintaining co-ordination and teamwork	7
9.	Task motivation and application	17
10.	General impression (halo)	12
11.	Group task supportiveness	17
12.	Maintaining standards of performance	5
13.	Willingness to assume responsibility	10
14.	Emotional balance and control	15
15.	Informal group control	4
16.	Nurturant behaviour	4
17.	Ethical conduct, personal integrity	10
18.	Communication, verbality	6
19.	Ascendance, dominance, decisiveness	11
20.	Physical energy	6
21.	Experience and activity	4
22.	Mature, cultured	3
23.	Courage, daring	4
24.	Aloof, distant	3
25.	Creative, independent	5
26.	Conforming	5

Factors identified by three or more researchers are listed in Table 6.1. As Stogdill (Ibid, p. 93) points out, the most frequently occurring factors are descriptive of various skills of the leader. These are described as making effective use of interpersonal, administrative, technical and intellectual skills. These factors are as follows:

- social and interpersonal skills
- technical skills
- administrative skills

- intellectual skills
- leadership effectiveness and achievement
- social nearness, friendliness
- group task supportiveness
- task motivation and application

Thus while being highly task motivated, the leader is also capable of maintaining close, friendly, personal relationships.

The next most frequent set of factors is concerned with the leader's relationship with his/her group. These factors describe the leader maintaining group cohesiveness, co-ordination, task motivation, task performance, and high quality of output. Nurturant behaviour and the use of informal controls soften concern for group performance. These factors are as follows:

- maintaining cohesive work groups
- maintaining co-ordination and teamwork
- maintaining standards of performance
- informal group control (group freedom)
- nurturant behaviour

Next in frequency Stogdill identifies factors concerned strictly with personal characteristics of the leader describing him/her as emotionally well-balanced, willing to assume responsibility, ethical in conduct, able to communicate readily, dominant, energetic, experienced, courageous, and mature. These factors are as follows:

- willingness to assume responsibility
- emotional balance and control
- ethical conduct, personal integrity
- communicative, verbality

- ascendance, dominance
- personal soundness, good character
- physical energy
- experience and activity
- mature, cultured
- courage, daring
- aloof, distant
- creative, independent
- conforming

Stogdill concludes that the listed factors do not constitute a complete catalogue of the leader's qualities and abilities. He writes that the generalised behaviours listed in Table 6.1 produce a more meaningful, logical picture of the leader than would be provided by a list of 100 haphazardly selected items, all correlated with leadership status and effectiveness. He claims that there is no need for an infinitely large number of factors in order to obtain a well-balanced description of the leader.

Stogdill appears to be supported by Hunt and Kinross (1988) where they point out that a small number of functions (the Accomplishments) can capture a particular leadership domain, which in their case was the domain of top-level health executives.

In searching for common factors attributable to the leadership/command domain, Quinn, Faerman, Thompson, and McGrath (1990, p. 21) identified eight managerial leadership roles and competencies and these are shown in Panel 6.1:

Director Role	1. Taking initiative 2. Goal setting 3. Delegating effectively
Producer Role	1. Personal productivity and motivation 2. Motivating others 3. Time and stress management
Co-ordinator Role	1. Planning 2. Organising and designing 3. Controlling
Monitor Role	1. Reducing information overload 2. Analysing information with critical thinking 3. Presenting information, writing effectively
Mentor Role	1. Understanding yourself and others 2. Interpersonal communication 3. Developing subordinates
Facilitator Role	1. Team building 2. Participative decision making 3. Conflict management
Innovator Role	1. Living with change 2. Creative thinking 3. Managing change
Broker Role	1. Building and maintaining a power base 2. Negotiating agreement and commitment 3. Presenting ideas

PANEL 6.1 **Managerial Leadership Roles And Competencies From Quinn, Faerman, Thompson, And McGrath (1990)**

Along with the above roles and competencies, Graco (1988, p. 3) has identified seven key personality traits required of a commander which are seen as major contributing factors determining the competence of 37 World War I and II commanders[39]. These seven personality traits are shown in Panel 6.2:

[39] Graco's study includes WWI and WWII commanders recognised as being successful from Germany, the Ottoman Empire, France, Russia, Australia, Britain, USA, and Japan.

1. **High stress tolerance** - the ability to cope with psychological stress and pressure,
2. **High self-sentiment** - the possession of strong beliefs in self and mission, and the drive and application to succeed,
3. **High character** - moral strength,
4. **High masculinity** - physical and emotional toughness,
5. **Effective social skills** - political adroitness and discretion, and the possession of good communication skills,
6. **Effective leadership** - the ability to influence subordinates to carry out assigned tasks while maintaining their morale,
7. **Effective intellectual ability** - the possession of effective problem solving, decision-making, and organisational skills.

PANEL 6.2 Key Command Personality Traits (Graco, 1988)

This is not a study of personality traits per se however the embodiments of such traits appear to provide convenient platforms from which commanders' actions issue forth[40].

[40] Jenkins (1947) reviewed 74 military studies concerned with characteristics and concluded that there was little agreement among them. He wrote that military leadership is situationally-specific so that generalisations across different settings have little validity. An example can be found by comparing Generals MacArthur and Simpson. Both generals were successful army commanders during WWII. Both men were the sons of civil war confederate army veterans. They were both graduates of West Point (the former graduating at the top of his class while the latter graduated at the bottom) and veterans of WW1 and yet their command styles were diametrically opposed. Simpson, commanded the U.S. Ninth Army numbering more 300,000 troops in 1944-45. He demonstrated a consultative style of leadership. He did everything by the book. Detailed plans were always issued early, and carefully co-ordinated with specialist staff. He had daily staff meetings and dined daily with his staff. An aid recalled that *the informal atmosphere of these gatherings permitted the airing of matters that would not ordinarily come to an army commander's attention* (Stone in Matthews & Brown,1989; 107). Eisenhower, in *Crusade in Europe*, wrote that he was aware of no mistake the Ninth Army Commander had made...*He was the type of leader American soldiers deserve* (Eisenhower, 1948, p. 376).

MacArthur on the other hand was charismatic, flamboyant, and egotistical. He demonstrated an autocratic style of leadership, consulting with virtually no one and disagreeing with most. He was a hero who demonstrated the value of the situational approach to leadership. Ambrose (1976) describes MacArthur as being different to other Generals - *to come to a conclusion about the nature of his generalship or his character is extraordinarily difficult...He simply refused to fit into any known category* (p. 420). Ambrose claims that MacArthur commanded some of the most brilliant offensives in history, but conversely, he was responsible for some of the most disastrous defeats ever suffered by American forces. He is described as a task specialist. *He was mission oriented and hated by many of his peers, subordinates, and superiors, while being simultaneously praised to a remarkable degree by others* (Ibid, pp.419-420). Perhaps Mac Arthur's task orientation is best epitomised by the following line:

> "Bob, I want you to take Buna, or not come back alive"
>
> (Eichelberger & MacKaye, 1949, p. 23)

In this sense traits and behaviour are interrelated in that behaviour is largely influenced by the existence and dominance of selective traits[41] and a myriad of complex neurophysiological and biochemical interactions. Bradley (cited in Matthews & Brown, 1989), discusses what he believes are the distinguishing qualities of a leader. Paraphrased these distinguishing qualities are:

- Knowing the job - not as a specialist but more as a generalist.
- Showing interest in subordinates by providing deserved praise and recognition as well as constructive criticism where required.
- Possess outstanding mental and physical energy.
- Demonstrate human understanding and consideration for others.
- Possess and demonstrate confidence in themselves and their units/subordinates.
- Possess imagination.
- Possess character, determination, and toughness.
- Possess the ability to maximise opportunity when it arises.

Intellectual skill and ability are mentioned by Stogdill (1974), Graco (1988), and Bradley (1989), and not mentioned by Quinn et al (1990) but probably implicitly assumed. Quinn et al's findings can be generalised into either task oriented or people

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The situation in which both Generals operated were entirely different. MacArthur was a theatre commander literally fighting for his life while complaining vociferously that he was being persecuted by the Joint Chiefs of Staff *who were under the domination of communists and British imperialists* (Ambrose, 1976, p. 424). Simpson on the other hand was fighting a war in Europe for which the outcome was all but known. Regardless of these points however, both commanders were in many ways entirely polarised in their modus operandi while also still being regarded as successful commanders. The point Jenkins (1947) brought out that generalisations across different settings have little validity when looking at command characteristics is exemplified in Simpson and MacArthur's differing and yet generally regarded as highly successful approaches to command.

[41] This is an enormously complex area for discussion and will not be entered into in depth as it is considered to be beyond the scope of this study. Kalat (1995, p. 4) relates four biological explanations for behaviour: A physiological explanation describing how the brain and other organs function, even at the chemical and cellular levels. An ontogenetic explanation describing the influence of genes and the environment. An evolutionary explanation relating behaviour to the evolutionary history of the human species. A functional explanation which explains how a particular gene responsible for a particular

oriented behaviour while Graco's findings indicate dispositions which would promote the appropriate behaviours required to undertake command responsibility.

Prior to the introduction of directive control the commander would be expected to be more task orientated as s/he directed subordinates in the *who, how*, *what,* and *where* of task accomplishment. Under directive control the senior commander *communicates intent* as opposed to directing and controlling, ideally with greater emphasis upon the *why* aspect of task attainment. The junior commander is ideally given greater liberty and flexibility to formulate and effect a plan of action. This again reinforces the impression that conceptual ability is critical at all levels of command as well as the ability to communicate clearly. It becomes obvious that the study of command is literally a study in motion. Changes in command philosophy require changes in command style and behaviour. To counter the current thrust of the changes however, technology is driving its own changes, and the two forces may not be operating in congruence.

Referring once again to Figure 6.3, the command climate of the past, which was expressed in obedience, conflicts with the philosophy, training, and expectations of people operating under the new command paradigm of directive control. Yet technology may facilitate a return to command by direction through the centralised capture and analysis of data. It has been suggested that few commanding officers will be able to refrain from directing subordinates because of their access to quantities of information which probably exceed the quantity (but not necessarily the quality) of that which is available to the commander in the field (see footnote 22 in chapter five which quotes Czerwinski, 1996).

An analysis of command identifies a significant portion of time being devoted to administrative functions. These largely task orientated functions promote a climate of bureaucracy which is the antithesis of what is currently desirable as decisions are

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behaviour increased reproductive success, resulting in a proliferation of a particular behavioural trait in a significant number of people.

delayed and procrastinated upon. Both technological change and a preoccupation with administrative tasks may potentially serve to undermine the aims and ideals of directive control if they are not integrated and woven into an holistic command/management system[42].

Van Fleet and Yukl's Military Leadership Findings

Van Fleet and Yukl (1986) published a compilation of numerous comprehensive studies based upon military leadership research. Using a content analysis of critical incidents of officers in the U.S. Airforce the authors identified 23 distinct behavioural categories which they describe as meaningful and measurable. They explain that the behaviour categories are conceptually distinct but that in practice they are not entirely independent; actual behaviour incidents often involving more than a single behaviour category (see Panel 6.3):

- **Emphasising performance** - The extent to which a leader emphasises the importance of subordinate performance and encourages subordinates to make a maximum effort.
- **Showing consideration** - The extent to which a leader is friendly, supportive, and considerate in his/her behaviour toward subordinates.
- **Career counselling** - The extent to which a leaders offers helpful advice to subordinates on how to advance their careers, encourage them to develop their skills, and otherwise manage their professional development.
- **Inspiring subordinates** - The extent to which a leader stimulates enthusiasm among subordinates for the work of the group, and says things to build their confidence in the group's ability to successfully attain its objectives.
- **Providing praise and recognition** - The extent to which a leader provides appropriate praise and recognition to subordinates with effective performance, and shows appreciation for special efforts and contributions made by subordinates.
- **Structuring reward contingencies** - The extent to which a leader rewards effective subordinate performance with tangible benefits, such as a pay increase, promotion, better assignment, better work schedule, extra time off, etc.
- **Clarifying work roles** - The extent to which a leader informs subordinates about their duties and responsibilities, clarifies rules and policies, and lets subordinates know what is expected of them.

[42] At the time of writing the New Zealand Army appears to have more headquarters than should ideally be required in order to expedite and simplify the decision-making process. The stated purpose for this top-heavy organisational structure is to provide OJT training for staff by allowing them to operate in realistic settings. Opinion varies on the effectiveness of such a scheme. Yes, more people have the opportunity to practice command and decision-making, but the resultant bureaucratic burden is a cost which such a small army may not be able to sustain - in both financial and practical terms.

- **Goal setting** - The extent to which a leader, either alone or jointly with a subordinate, sets specific, challenging, but realistic, performance goals for each important aspect of the subordinate's job.
- **Training - coaching** - The extent to which a leader provides any necessary training and coaching to subordinates, or arranges for others to provide it.
- **Disseminating information** - The extent to which a leader keeps subordinates informed about decisions, events, and developments that effects their work.
- **Encouraging decision participation** - The extent to which a leader consults with subordinates before making work-related decisions, and otherwise allows subordinates to influence his/her decisions.
- **Delegating** - The extent to which a leader delegates responsibility and authority to subordinates and allows them discretion in determining how to do their work.
- **Planning** - The extent to which a leader plans in advance how to efficiently organise and schedule the work, co-ordinate work unit activities, accomplish task objectives, and cope with potential problems.
- **Innovating** - The extent to which a leader looks for new opportunities for the work unit to exploit, proposes new activities to undertake, and offers innovative ideas for strengthening the work unit.
- **Problem solving** - The extent to which a leader takes prompt and decisive actions to deal with serious work-related problems and disturbances.
- **Facilitating the work** - The extent to which a leader provides subordinates with any supplies, equipment, supportive services, and other resources necessary to do their work effectively.
- **Monitoring operations** - The extent to which a leader keeps informed about the activities within his/her work unit and checks on the performance of subordinates.
- **Monitoring the environment** - The extent to which a leader keeps informed about outside events that have important implications for his/her work unit.
- **Representing the unit** - The extent to which a leader promotes and defends the interest of his/her work unit and takes appropriate action to obtain necessary resources and support for the work unit from superiors, peers, and outsiders.
- **Facilitating co-operation and teamwork** - The extent to which a leader emphasises teamwork and tries to promote co-operation, cohesiveness, and identification with the group.
- **Managing conflict** - The extent to which a leader discourages unnecessary fighting and bickering among subordinates, and helps them settle conflicts and disagreements in a constructive manner.
- **Criticism** - The extent to which a leader criticises specific acts of subordinates that are unacceptable to the organisation, finds positive things to say, and provides opportunities for subordinates' explanations.
- **Administering discipline** - The extent to which a leader takes appropriate disciplinary action to deal with a subordinate who violates a rule, disobeys an order, or has consistently poor performance.

PANEL 6.3 **Van Fleet And Yukl's Definition Of Managerial Behaviours (From Van Fleet & Yukl, 1986, pp. 38-39)**

Van Fleet and Yukl (Ibid), with the help of their students, undertook a content analysis of biographies and autobiographies of military leaders. Tally marks were made on a worksheet each time a behavioural description was encountered which exemplified one of the above 23 behaviour categories. The study was conducted on only those military leaders who achieved some degree of fame and recognition for their successful leadership. Ten leaders were selected, and most of these were generals and admirals from World War II. The authors justify their choice of subjects by writing that sufficient time has elapsed for these individuals to become the subject of a biographical or autobiographical book, and the effectiveness of these leaders becomes easier to judge as a respectable interval of time has passed since the incidents from which the research data were taken. The research results cannot be directly related to rank as the career descriptions covered periods during which the individuals held different ranks and no effort was made to separate these different periods. Panel 6.4 illustrates the behaviour categories arranged from highest average frequency to lowest.

The authors argue that based on the statistical significance of the weighted averages, four behaviour categories were important for these leaders and four others were close behind. The authors compared these results with the earlier analysis of the Air Force critical incidents and found a remarkable consistency. While some categories had to be omitted as they were not included in both studies and others had to be combined due to similarities, the Spearman rank correlation is 0.60 (significant: $p<0.01$), Van Fleet and Yukl report that the top five behaviour categories are identical - Problem Solving, Inspiration, Planning, Performance Emphasis, and Clarifying Work Roles and Objectives. As the authors point out, for wartime these results provide no surprises (Ibid, p. 85).

- Clarifying work roles and objectives
- Monitoring the environment
- Planning
- Inspiration
- Performance emphasis
- Monitoring operations
- Problem solving
- Representing the unit
- Facilitating co-operation and teamwork
- Autonomy-delegation
- Information dissemination
- Innovation
- Providing praise and recognition
- Facilitating the work
- Showing consideration
- Managing conflict
- Encouraging decision participation
- Training/coaching
- Constructive criticism
- Administering discipline
- Structuring reward contingencies
- Career counselling

PANEL 6.4 **Content Analysis By Van Fleet And Yukl Of Career Descriptions Of Military Leaders (From Van Fleet & Yukl, 1986, p. 84)**

The results of Van Fleet and Yukl's research cannot be easily compared with Stogdill's results as the category description terms used by the different researchers are difficult to relate, although it could be noted in general terms that both studies depict a balance of task and people consideration aspects. Care must be taken however when interpreting and comparing results as sample sizes are not comparable and neither were the populations.

Van Fleet and Yukl also compared their behaviour taxonomy (Figure 6.4) with Mintzberg's managerial roles (Mintzberg, 1973). They write that Mintzberg's roles are represented in these behaviours except for the figurehead role as they were not sure where that role fitted in. They continue by writing that an important difference between the two taxonomies is the capacity of Yukl's to describe how a manager relates to subordinates, directs them and motivates them. That taxonomy has 12 behaviours dealing with these processes, whereas Mintzberg has only a single, undifferentiated "leader" category. The authors claim that a major difference between Yukl's taxonomy and other military approaches is that Yukl's work is more solidly linked to existing theory (Van Fleet & Yukl, 1986, pp. 37-41).

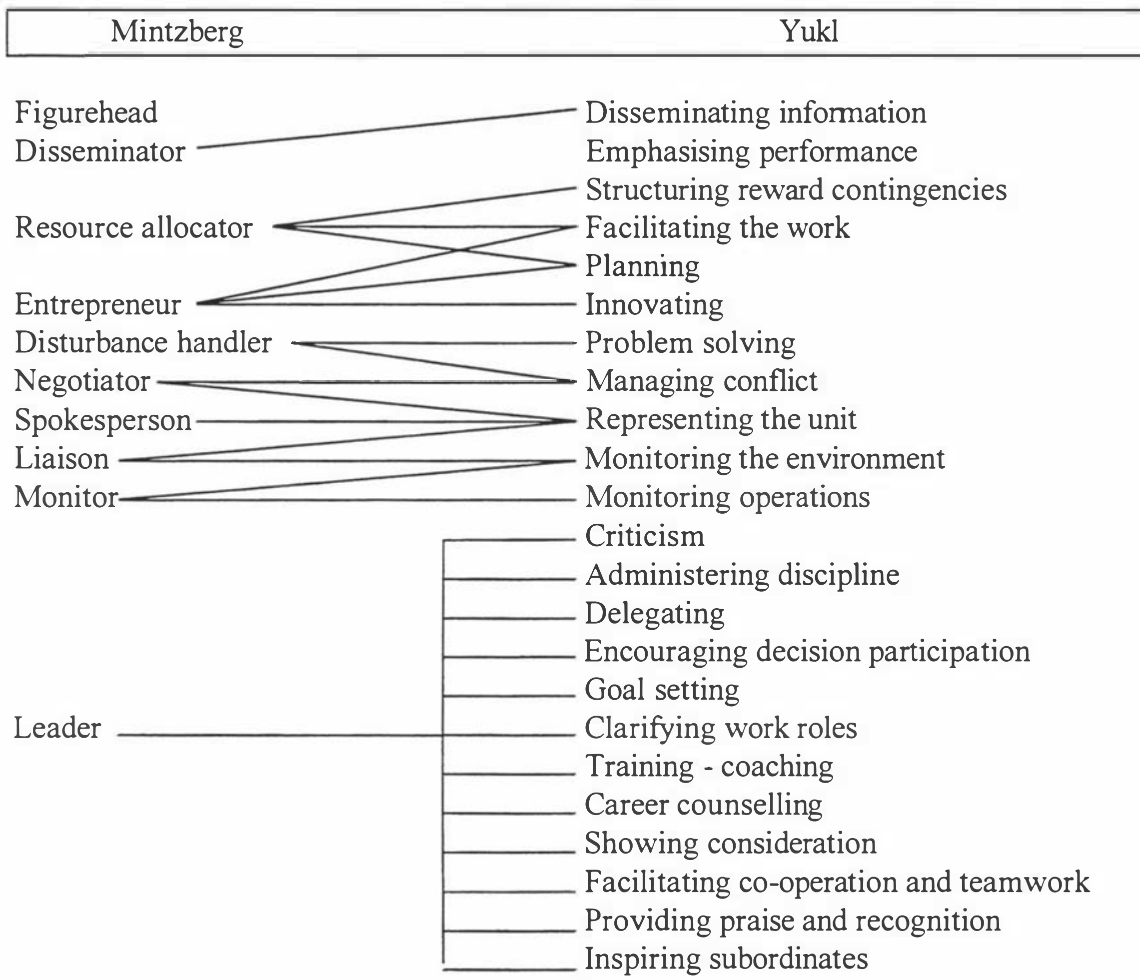

FIGURE 6.4 **Approximate Correspondence Of Yukl And Van Fleet's Taxonomy With Mintzberg's Taxonomy. (From Van Fleet & Yukl, 1986, pp. 37-41)**

The Yukl taxonomy provides a comprehensive list of behaviours that parallel the definitions and requirements of command described earlier in this chapter. The greater emphasis appears to focus on human and conceptual skills with little if any mention of technical skills - perhaps these are taken for granted. Difficulties arise from such *list approaches* in that they indicate which behaviours appear favourable to the completion of the job but still lack significant detail (see comments concerning the difficulties with such list-gathering approaches in chapter three). For instance, too much emphasis on consideration or people skills, and the commander may have difficulty emphasising performance, too great an emphasis on delegation may be interpreted by subordinates as an abdication of responsibilities, and too much time spent in planning will prohibit the ability to inspire, train, and counsel. Such approaches do little to increase understanding of the cognitive activities underpinning these leader behaviours. They simply provide a starting point that identifies the value these people add but not how it is done - or even a clear description of what is being done.

The contents of the Yukl taxonomy will feature later when comparisons are made with the MAPA results. Before leaving Van Fleet and Yukl it may be worth noting however the comment made by the two authors concerning the two most widely-used categories for describing managerial/leadership behaviour - consideration and initiating structure (or in military terms, showing concern for the people and accomplishing the mission). Van Fleet and Yukl write that these two broadly defined categories provide too general and simplistic a picture of what leaders do. Specific behaviours within each of these categories are frequently intercorrelated, even if only at a moderate level. This means that if one particular aspect of either category is much more important for effectiveness in a given situation than are others, it is less likely to be noted by measures based on these broad categories. According to Van Fleet and Yukl, training and developmental activities based solely or primarily on these general activity dimensions will, therefore, not necessarily lead to general improvements in effectiveness of any substantial amount.

Van Fleet and Yukl's taxonomy appeals for more reasons than its comprehensive approach to defining military management (command) behaviour. Although the research which resulted in the development of the taxonomy was undertaken with officers who had experienced battle conditions, it does not therefore exclude the reality of the command function in New Zealand, as a large percentage of a commander's time is consumed with administrative matters far removed from the battlefield[43].

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[43] The discussion up to this point in no way claims to portray a comprehensive review of leadership theory and/or research. For an excellent and comprehensive text on leadership research read Clark and Clark (1990) Measures of Leadership. While not offering any novel approaches for comparing information processing research with existing leadership research it does provide the reader with an overview of numerous approaches, techniques, models, and tools utilised in the search to quantitatively attempt to measure leadership.

The New Zealand Situation

A further influential factor in the command equation is the situation. Situational leadership theories state that some leader behaviours will differ in their outcomes, depending upon the situation (Fiedler, 1986; Hersey & Blanchard, 1988). War and peace are at extreme opposite ends of the situational environment therefore it does not necessarily follow that effective commanders in times of peace would be effective in times of conflict and vice versa. This study, while able to distinguish between respondents who have served overseas (not necessarily implying conflict situations), focuses on respondents' perceptions of the function of command as applicable to the New Zealand Army operating in New Zealand. It is therefore predominantly a study in peacetime command.

Diminishing resources for many Western armies has seen an increasingly pronounced struggle between being seen to be efficient, while still retaining the capability to be effective in any situation when called upon. Efficiency and effectiveness are two states that can be independent of each other and yet their interrelatedness is undisputedly essential. An army can be efficient by utilising its resources economically but it is not necessarily being effective. It can also be effective but squander vast resources and therefore be inefficient. A balanced operation is critical for every army and by virtue of the authority vested in the function of command, a significant portion of a commander's time and effort must be directed toward this task. This demands a high level of managerial knowledge and skill.

Other Variables In A Theory Of Military Leadership

The discussion to this point stresses the skills, knowledge and abilities required for command, with a brief mention of personality and behaviour (more on this later in the chapter). Rejai and Phillips (1996) undertook a detailed study of forty-five high-ranking and well-known military figures from thirteen countries, spread across four centuries. They concluded that command could not be defined by looking at single factors or influences. They therefore attempted to identify why their selection of commanders were the way they were and this resulted in an interplay between the following (see Panel 6.5):

Sociodemographic variables

- age
- birthplace
- socio-economic status
- family life
- ethnicity and religion
- education and occupation
- activities and experiences
- ideologies and attitudes

Psychological dynamics

- some combination of nationalism or imperialism
- relative deprivation
- love deprivation
- marginality
- vanity

Situational variables

- birthplace (physical location)
- family influence
- national crisis or emergency
- luck or chance

PANEL 6.5 Some Variables Influencing Commanders' Personality And Behaviour (From Rejai & Phillips, 1996)

The authors were led to conclude that exclusively sociodemographic, experiential, and attitudinal data could not identify military leadership. Elements of all three categories shown in Panel 6.5 were present in their study sample resulting in what they describe as an interactional theory of military leadership. The problem with such research, which the authors acknowledge relied upon a non-random, purposive sample and only provided descriptive-historical models of leader traits and attributes, is that its predictive ability is dubious, and in fact also fails to prove causality. For example Rejai and Phillips argue that the presence of most and preferably all of the following variables will predict whether a person becomes a military leader:

1. The person is a native-born male
2. The person is born to a military family
3. The person is born in a military town or garrison
4. The person experiences relative deprivation or love deprivation
5. The person is vain and egotistical
6. The person is a nationalist or imperialist.

Retrospective studies of larger samples of past leaders may concur with the above findings and this knowledge may fill an information gap for historians. It would be extremely dangerous to apply such findings as part of a premeditated selection criteria in the hope of identifying future officers and emulating past successes. The characteristics, traits, circumstances, and variables identified by the authors may explain a great deal about the leaders from their study, particularly concerning their personalities. This still does not explain *how* they did what they did. It largely describes the personal platform from which they operated, indicating background, behavioural justification and motivation. It does little to demystify the actual cognitive processes leading to military successes.

Historical context and an interactional theory integrating sociodemographic, psychological, and situational variables all help to expand upon existing knowledge concerning military leadership (and probably all forms of leadership). Such data should however be treated with caution if searching for predictive determinants of military success. The question needs to be asked, how many people have failed or disappointed the military system and yet may have had identical variables mould their lives? Background and situational variables should not be ignored in the study of achievement, success, and greatness, but it is proposed that there is more value in studying *how* people achieve success and *what* it is that people do specifically to achieve success.

Command And Adding Value

The next issue to be discussed is the addition of value by organisational leaders and managers. Farkas, De Backer, and Sheppard (1995) interviewed 160 chairmen, presidents, and chief executives of some of the largest and most successful businesses in the world. They asked these people how they perceived that they made a difference to their organisations and how they added value to those organisations. While demonstrating the complexity of modern leadership, an analysis of the respondent's replies resulted in the following five generalised approaches to the challenge of leadership:

1. **The Strategic Approach** - in which respondents claim to manage for success by acting as the organisation's top strategists, systematically envisioning the future, and specifically mapping out how to get there. Day-to-day operations are delegated to others while they spend their time asking big-picture questions. They repeatedly emphasise that if they are not given time to 'stare out the window', 'the little stuff will take over'.

2. **The Human Assets Approach** - in which respondents claim to manage for success through people policies, programmes and principles. Respondents list such abilities as knowing the capabilities (and weaknesses) of their people, designing training systems and programmes for measuring performance, teaching employees desired values, empowering people, and rewarding desirable behaviour.

3. **The Expertise Approach** - in which respondents manage for success by becoming the champion of a specific, proprietary expertise, and using it to focus the organisation. Some respondents spend their time ensuring that the expertise that gained them market dominance in the first place is continually updated and improved.

4. **The Box Approach** - in which respondents build a set of rules, systems, procedures, and values that essentially control behaviour and outcomes within well-defined boundaries. Energy is concentrated on control issues, both financial and cultural, as the strategy for maintaining competitive advantage.

5. **The Change Approach** - in which respondents claim to manage for success by acting as agents for radical success, transforming bureaucracies into organisations that embrace the new and different. While all successful organisations undertake change, the leaders espousing this approach are concerned about changing the fundamental underpinnings of their organisations.

The above discussion may in some way seem irrelevant to the tenor of this study as it concerns leaders of huge, multinational companies who have the liberty to choose their own approach for adding value and who, in fact, are often hired expressly for their ability to provide a particular value for which they have a reputation. The terminology applied in Farkas et al's (1995) research is particularly applicable however, in the way it creates a few large but descriptive value-added categories. In conformance with aspects of situational theories of leadership, the single chief strategy employed by respondents appears to be dependent upon the type of industry in which they operate and upon the situation in which the organisation finds itself. The strategies are also largely divisible between people, the task, and the approach/process.

The army could be largely described as a *box* organisation, having its day-to-day operations dominated by rules, procedures, systems, structures, values, and its own independent process of law. While it may be argued that the army, of all the services, is the most people-orientated, this is, according to Burke (1995) a fallacy. The box-effect, in combination with an apparent high task orientation prohibits a people focus from dominating the army's modus operandi (Burke, Ibid). If Burke's assertions are correct it could create serious conflicts with the philosophy underpinning manoeuvre theory and directive control. Essentially; it is implied that on a day-to-day basis there is little room for the expression of initiative, creativity, and individuality[44]. Rather, the emphasis is on conformance, observation of and adherence to the rules - whether written (of which

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[44] At the height of his fame, Liddel Hart was asked whether he would like his son to go into the Army. To this he replied, 'No, because for all its good points it is no place for a thinking man...and the root of the trouble is the Army's fear of the truth' (quoted in Terh, 1989, p. 297).

there are a multitude) or unwritten[45], and the on-going often paradoxical battle between the team and the individual's career. The culture of the army has a significant impact on the *liberty* officers have in undertaking their work.

Command: A New Interface

The question requiring an answer at this point in the discussion is, how does MAPA and its approach to the acquisition of new knowledge integrate with existing theories and knowledge in a military context?[46]. Perhaps an alternative perspective to this question could provide a suitable direction in which to search for an answer. Sherman (1996) in a discussion concerning the digitization of warfare and the United States' Army's attempts at integrating technology into current warfare systems, quotes Andrew Krepinevich,

> *It seems to me the Army is asking, 'how do you make an armoured division more effective?' as opposed to, 'Given all these new tools, is there some other way we ought to organise and think about fighting?' The most recent military revolution affecting conventional forces produced a new army organisation, Germany's Panzer division, and a new concept of war, the Blitzkrieg. The idea is not to create just a better version of the armour division but basically to try and identify the Panzer division of the military revolution* (p. 42).

Similarly, perhaps the results of human information processing research should not be built into existing paradigms but be allowed to position itself as a totally new concept in understanding human intelligence in operation. The *digitized* battlefield and the study of human information processing may have much to offer each other[47] as science comes

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[45] Burke (1995, p. 10) blames the accumulation of principles, success factors, procedures, regulations and rules on the Army's long history and tradition.

[46] It may at this stage, be worth paraphrasing the words of Van Fleet and Yukl (1986) that great care should be taken when attempting to generate theories developed for business organisations to military organisations [and vice versa]. To be useful to either organisation, a theory must have been demonstrated to fit those organisations (p. 28).

[47] While the New Zealand Army is, at the time of writing, a *considerable* distance behind U.S. attempts at integrating technology and people for the purposes of more efficient and effective warfare, technological

closer to discovering the similarities, differences and vicissitudes between human and artificial intelligence information processing and their increasingly ubiquitous but all too often incompatible interface.

The aviation industry was perhaps the first organised body to examine the human-machine interface in its study of human factors (HF). Edwards (1988, cited in Wiener & Nagel) claims that pilots' tasks are now little concerned with the direct control of the vehicle during normal operation but rather with providing strategic decision making and supervisory management of the automatic systems. He argues that *they remain, however, standby controllers and may be called upon suddenly to perform a task at which they have had little recent - or even total - practice* (p. 21). This situation is analogous to that which is developing within the Army and its attempts at increasing automation. There is an increasingly greater forced reliance on technology, often reluctantly accepted by human elements, with an increasingly greater emphasis being placed upon higher cognitive functions and generative learning abilities required to cope with unique situations and developments.

Some of these difficulties came to light during a laser-gun battle exercise in early 1997 in the Mojave Desert. Sullivan (Time Magazine, 1997, p. 59) stating that, aside from the numerous technical difficulties identified during the exercise, adapting humans to the new [computerised] equipment was also difficult, especially in a hide-bound bureaucracy like the US Army. *Armies are by nature conservative institutions, generally resistant to change* (Ibid). He continues, *In fact, soldiers tend to be such traditionalists that the Army is having trouble getting them to believe what appears on their computer screens.*

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pull and the leapfrog effect will one day see the implementation of something similar to the digitization programme. In this sense small armies such as the New Zealand Army have the advantage over larger armies as much of the AI technology utilised in warfare is commercially available, development costs have been incurred prior to purchase, and it will be less expensive to re-equip and retrain a smaller force in preparation for digitization (or the equivalent term then being utilised to describe high-technology warfare).

Such weaknesses identified during digitized exercises help emphasise the difficulties faced by a rigidly bureaucratic organisation as it attempts to alter both its operating philosophy and its approach to warfare. Regardless of these difficulties however, the military is committed to change which it perceives as its only option in the race to stay ahead of potential opponents and in order to reduce the number of its own casualties in conflict situations.

To emphasise the significance of the changes occurring, Boorda (1995) advises that:

> *We are in a revolution of no less importance than the advent of steam propulsion, carrier aviation, or nuclear submarines. The so-called revolution in military affairs has moved information and the need for information dominance to centre stage in thinking about warfare. Development of advanced information and communications technologies will continue. Successful implementation of these innovations requires their integration into force structure and operational concepts (p. 14).*

Clearly it is suggested that the future will best be met through revolutionary thinking as opposed to evolutionary and incremental development. As Boorda states, technology is moving faster than it can be integrated, *As a result technology may become obsolete by the time a system is fielded* (Ibid, p. 16). To revolutionise the integration process between AI and human intelligence it may be necessary to identify the high-tech soldier of the future and work backwards from that point instead of slowly wending towards an idealistic point in time and thought carrying all of today's baggage and accumulated limitations along on the journey.

Killebrew (1996) points out that the systems and doctrines of the French collapsed before the newer-model Wehrmacht of 1940, not because the Germans possessed significantly better technology, but because they possessed doctrines which bound their technology together with their people and allowed them to operate in a totally new manner. He is also of the belief that the pattern of change within armies is evolutionary although its ideas may be revolutionary and he cautions policy makers and planners to resist the temptation to design the future army within a few weeks but rather to consider the future with great care and deliberation.

It is apparent that technology may be driving change because of continual improvements, further miniaturisation, larger capacities, faster processing, and better access. Without soundly considered doctrine to accompany this technologically driven future it may be difficult to maximise potential benefits due to a lack of synergy and user-friendly interfacing. An increased understanding of human information processing may more easily facilitate the essential human - technology integration. It must be emphasised that an increase in technology must not be studied in isolation from the interfacing human and doctrine components.

Wickens and Flach (1988, p. 126) point out that *a computer user's ability to locate and use information will be more efficient if the computer's knowledge base is organised in a fashion consistent with the operator's.* The two authors discuss the application of multidimensional scaling to uncover pilots' mental representations of aircraft systems. Such representations are utilised in the design of computerised menu systems facilitating pilot access to relevant information about each aircraft system. It is claimed that the structure of the menu produced in this way proved to be much more compatible and user-friendly than was the conventional menu organisation. Extrapolating from this, it can be hypothesised that the interfaces between humans and knowledge-based information systems within the military will significantly improve in efficiency by integrating human representations of their surroundings, work processes and competencies.

Summary, Synthesis, And Implications

The discussion to this point has identified many conclusive and generally agreed upon factors and principles contributing to the function of command. Also several directions for the future of command have been indicated, not all of which are in agreement. It is implied that the function of command is greatly influenced by the underlying doctrine driving it and by the circumstances in which it finds itself. It has also been stressed that technology will have an increasingly greater effect on the function of command if not its doctrine. Incompatibilities between the two may already be developing with more predicted to come, as the downstream impact of information acquisition, interpretation, and distribution increases in quality and quantity.

In summary, the literature indicates that commanders require skills in motivating people to achieve tasks exceeding ordinary levels of accomplishment and endurance. They are required to understand more of the overall, bigger picture in which they operate, to inspire and initiate creative, innovative, and unpredictable actions and to do so at a pace that leaves opponents literally gasping (in times of conflict). The exact nature of the decision-making processes utilised by successful commanders is the topic of much heated debate, with two opposing camps.

It has been shown that commanders are expected to be multi-talented, demonstrating expertise at warfare, peace keeping, technology, administration, planning, organising, directing, and controlling, developing and showing concern for their people, operating on reducing budgets to achieve more outputs in less time while displaying higher concern for quality than ever before.

The above demands can perhaps best be met by officers who are able to exercise generative learning, demonstrating the ability to anticipate and respond accordingly within extremely brief time frames. The necessity to lead, sometimes under high levels of stress, while processing great amounts of information in order to apply such cognitive abilities as anticipating, predicting, moralising, judging, and initiating, indicates a need for a balanced character, capable of the highest-level conceptual abilities while exercising disciplined behavioural characteristics.

This description essentially proposes that command is a two-faced occupation, one position dealing in conciliation, restoration, development, negotiation, diplomacy, tact, teaching and learning, and the other dealing in forcefulness, assertiveness, aggression, violence, destruction, and control; all moderated by exemplary ethical conduct. Both aspects of a commander's work require well-developed knowledge and rapid processing abilities contrasted with a need for both *soft* and *hard* approaches as the situation demands. The former engages eclectic knowledge and abilities practised in the realm subsumed under human behaviour, politics, and management. The latter, still requiring an understanding in human behaviour, is of a more brutal nature, demanding qualities such as courage, endurance, determination, fitness - both mental and physical, and something variously described as 'presence' and 'toughness', a quality without which it may be difficult to lead, inspire, endure, and sustain under conditions where death, pain, grief, hunger, thirst and other deprivations are not uncommon.

Such Janusian occupational requirements, often depicted to exist at opposite extremes of the scales by which they are described and measured, and sometimes required to be applied within sight of each other, suggest a flexibility of mind, an ability to switch, that does not come easily for everyone. Coupled with the need for both intelligence and experience, it can be seen why weaknesses in commanders in times of peace are exacerbated in times of stress and conflict, and why such weaknesses have repercussions, the substance of which fill libraries full of history books. It was perhaps this understanding which prompted Liddell Hart to observe in 1941:

> *Anyone who had long experience of watching the 'form' of generals in peacetime exercise could anticipate that weaknesses or limitations shown there will be accentuated rather than diminished under the stress of war. A commander who is hesitant under peace conditions, becomes worried over what his opponent may be doing, or is easily thrown off his balance by an unconventional move, is likely to be still more susceptible to paralysis in real war.*

Heredity, upbringing, experience, and learning, all influence the commander and how s/he functions. Ignoring the majority of ad hoc, ill considered, and/or spontaneous actions, a commander's functions are the result of knowledge and/or intuition, and their preceding cognitive process abilities. Such process abilities result in the choice of hard or soft approaches, provide the certitude and conviction to pursue an idea or course of action. The computational architecture of the mind facilitates both decision making and the identification of solutions when problem solving. Connectivity resonates and grows with experience, improving automaticity and thereby increasing the speed of knowledge processing, enlarging functional repertoire, and multiplying potential solution options. Such cognitive activity may be best facilitated through constructivist approaches to instruction. Slavin (1997, p. 269) explains that *constructivist theories of learning state that learners must individually discover and transform complex information, checking new information against old rules and revising rules when they no longer work.* McInemey and McInerney (1998) indicate that such theories of learning foster creativity within individuals and stimulate giftedness and talent, and are therefore more suited to individual needs.

The key to a greater understanding of a commander's mind appears to lie in the disclosure of his/her knowledge structures and process abilities, underwriting critical competencies and decision making/problem solving abilities. In this manner researchers may be able to reveal how a commander's external world is internally represented. Such a revelation of a person's knowledge can act as a window to the mind, exposing the cognitive software in its acts of directing the hardware that actualises appropriate functions, behaviour and actions. The study of human knowledge structures and process abilities in relation to the interface between technology and doctrine is an appropriate way of minimising risks and reducing faults in human operation for the changing future. It is also the most direct route towards creating a seamless human/machine interface.

Section one of this study reviewed the problems associated with research of the mind functions, and suggested possible ways of solving, minimising, or circumventing these problems. MAPA was posited as an appropriate model for analysing information processing within the mind. The remainder of this study will examine MAPA's efficacy for achieving this, while incorporating the information and lessons from section two. This detail can be utilised to create a theoretical profile of the ideal army officer.

Building A Theoretical Profile

Wishart (1997) perhaps best sums up the literature in section two by writing that *command can best be facilitated by developing intelligent, bold, risk-taking leaders,* *while control is best improved by the application of sound doctrine and the intelligent use of technology* (p. 63). Unfortunately, the rigidity of the military organisational structure and its predisposition for standardisation of operating procedures is predicted to stifle the encouragement, application, and development of creative or uniquely original practices and actions. In this sense the military is accused of paying little more than lip service to the theories of directive control and manoeuvre. As a result, an officer may not necessarily display the requisite behaviours and have the competencies desired for directive control. Organisational adaptation may select for people with an ability to cope with the rigid military form of structure. Authors such as Dixon (1976) suggest that officers are expected to operate in an environment which does little to encourage military competence.

> *[I]t seems that there is much in military organizations to invite incompetence. Officers are selected for the wrong reasons, required to fill incompatible roles and expected to function adequately in a communication system of dubious efficiency* (Dixon, 1976, p. 236).

Ideally an officer will demonstrate all the requisite behaviours identified by Stogdill (1974), Van Fleet and Yukl (1986), and de Czege (1992). Furthermore the officer will demonstrate the appropriate leadership behaviours discussed by all the writers in this section, but, the key areas appear to be in the realms of possession of the necessary knowledge and experience, a balanced concern for the task and the people, and, while being assertive and confident, demonstrating flexibility of mind and action, with an ability to be creative under stressful conditions. These are functions related to directive control. These abilities must be integrated with the operating environment, whether in times of peace or in times of conflict.

Figure 6.5 illustrates the possible cognitive profile of such an officer, based upon the literature reviewed in this section. The constituent parts of the architecture are presented in hierarchical format, with what could be expected to be the most *important* knowledge, functions, and processes at the top of the diagram. The word *important* has been emphasised to point out that the entire contents of the diagram are potentially shown to be important from research and writings, but those items appearing at the top describe the knowledge and processes which are superposed over the remainder. In other words, when evoking lower hierarchy connectivity, it is expected that the pattern of activation will be inclusive of the top of the hierarchy. The research will either support or refute this, or, it will produce prototypes of cognitive architectures challenging expectations by implying configurations of connectivity that the literature has not anticipated.

As is usual when displaying cognitive processes, the resultant architecture lacks comprehensiveness due to the author's knowledge limitations and limitations in the presentation format and approach. The following architecture, as with any mental model (Norman & Rumelhart, 1975), is therefore not complete. Figure 6.5 only attempts to illustrate the upper conceptual details of the cognitive architecture. The proposed Accomplishments are in the column on the left of Figure 6.5, while the proposed Performances are arrayed in the column on the right. Abilities have not been included as it would be purely speculative at this stage to attempt to predict their composition and organisation.

In accordance with the research in schematic processing theory (or schema theory as some refer to it, for example Pressley & McCormick, 1995, p. 61), it could be suggested that each Performance is separated by a reminder, or encoding specificity (Tulving & Thomson, 1973), concerning the influence of context and memory (Rumelhart, 1981). Pattern recognition, which is a top-down operation, is facilitated or influenced by the context (Tulving & Thomson, 1973; Matlin, 1994), in which people receive or perceive information. Schemata affect the encoding of newly acquired information, and also the nature of recalled events (memory construction) (Gagné & Glaser, 1987, p. 62). Memory is influenced by schemas but the elements in memory may be isolated from each other rather than integrated together (Matlin, 1994).

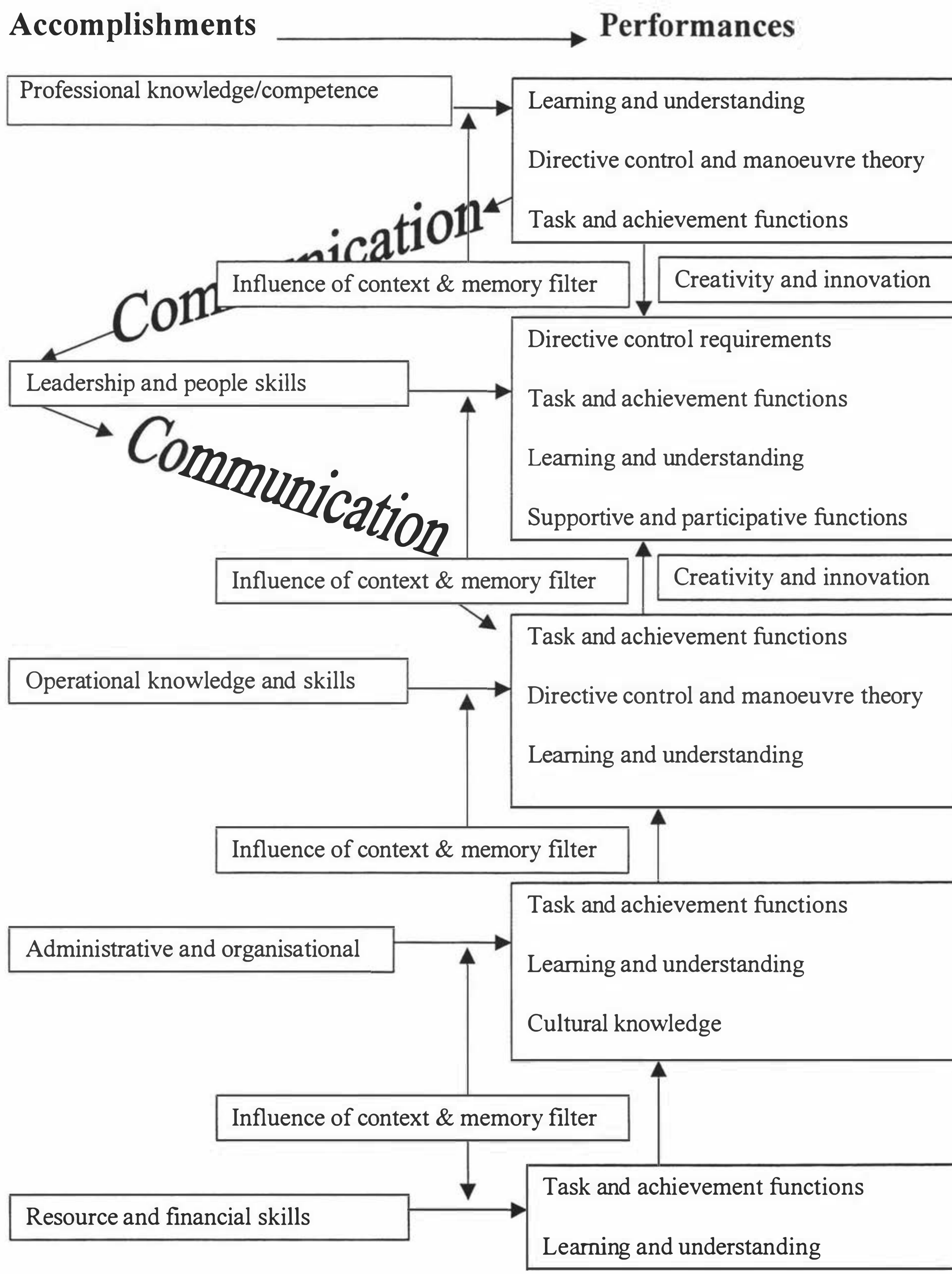

FIGURE 6.5 **A Conceivably Ideal Hierarchical Cognitive Profile And Influences Upon An Officer Displaying The New Command Paradigm**

Figure 6.3 implies that all or most functions undertaken by officers in the New Zealand Army will in some way require military and/or function-specific knowledge. Such knowledge is acquired through various modes of deliberate learning and through experience. This knowledge would be applied for the purpose of achieving set goals and objectives. Every time another Accomplishment function is evoked, the pattern of activation should include knowledge-related Accomplishments in its resonation. Schema recognition filters resident in long term memory would attempt to interpret the information depending upon the context, thereby creating parameters and priorities. As Van Fleet and Yukl's (1986) research has pointed out, the context in which officers find themselves greatly influences what they do (Brookfield, 1987, also makes this point regarding the importance of context in the decision-making process). From what has been written thus far, it may be posited that while a combination of both experience and intelligence are most desirable, experience is a better tool than intelligence (without experience) for choosing between what is effective in a given situation and what is not. If this is correct, it becomes all the more imperative that knowledge imparted to officers during their careers is not of an inert nature (as defined by Whitehead in chapter three), but that it can be linked to numerous experiences, potential situations, and/or possible uses.

After knowledge and its application, the literature implies that leadership and people management should be the next most commonly evoked Accomplishments. Leadership is largely dependent on communication, both by the leader and the led. The significance of communication is so critical that it could become an Accomplishment itself, but it is also regarded as being pervasive throughout all the other Accomplishments. Under a command climate of directive control the officer may evoke task and achievement management Performances involving learning and teaching. Supportive behaviours will be employed, particularly within the people-oriented Accomplishments.

It could be assumed that a military commander would draw on, or initiate, both the knowledge and leadership Accomplishments during the majority of his/her work requirements. An officer's job revolves around his/her ability to lead from a sound knowledge-base and experience. This is implied in Figure 6.5 by having knowledge-related and leadership Accomplishments at the top. If this was a feed-forward network, most patterns of activation would flow from the top down, encompassing knowledge and leadership. The order of the remaining Accomplishments may be arguable, but the literature appears to suggest that leadership and management of operations will be next down the hierarchy. Operations would appear to consist largely of task and achievement functions, again highly dependent on communication.

The literature suggests that the substructure of the hierarchy may be laced with administrative and organisational Accomplishments. This would encompass the managerial functions supporting and reconciling the other Accomplishments. It may also be posited that during times of peace, the hierarchy will become inverted, with the administrative functions taking greater precedence over leadership and operations – particularly the financial and resource management Accomplishments which appear at the bottom of the hierarchy if mapping cognition in a conflict condition. An inversion on Figure 6.5 may of course also occur during times of conflict if the officer occupies a logistical function and/or s/he is a considerable distance from the disturbance.

The literature has suggested that prototype cognitive architectures could illustrate the information processing hierarchy and superposed connectivity of a group of respondents. Using Figure 6.5 as a reference point[48], it is posited that officers superpose[49] their knowledge for the purpose of managing and leading people to achieve their various work-related functions. With this understanding, the effectiveness of education and training could be increased by improving connectivity through the inclusion and integration of all the critical Accomplishments within the curriculum. This means for example, that all training in financial management should integrate the Accomplishments of administration/organisation, operations, and people management, while being based around the critical and relevant knowledge domains. With all of the Accomplishments being centred around people management/leadership (see Figure 6.5), it is crucial to include management functions in every work-related training/education

[48] Figure 6.3 has no empirical basis at this stage.

[49] See chapter four where Smith (1996) applies the term superposed to describe the manner in which a representation is spread over an entire network.

programme for officers. By doing this, connectivity through learning, should be encouraged to replicate reality. Learning would therefore never be independent of extant and authentic work requirements.

If such arguments are correct, carefully planned teaching/learning systems will evoke new knowledge by integrating it with existing knowledge as it is slotted into the appropriate level of the information processing hierarchy. The literature indicates that generative learning will be facilitated and enhanced by introducing a range of different contexts and superimposing them upon the resonation of existing knowledge. Old rules will be constantly tested and, where deemed necessary, revised with alterations to match the changing contexts of the information.

It is suggested that learning systems designed to harmonise with users' cognitive architectures will enhance connectivity, encourage whole-brain thinking, and generally increase the effectiveness and efficiency of their information processing ability. The literature has pointed out that information processing architectures are difficult to identify and portray. The challenge posed by the lack of transparency within cognitive processes will be tackled with the aid of Hunt's (1986) knowledge process hierarchy. The model will be modified and adapted to meet the needs of this particular research, its objectives, and the unique qualities of the research sample.

Theories of command, leadership, and management discussed in this chapter will provide a basis for the design of the research instrument, by supplying details of context, behaviour, and characteristics for command. It is now necessary to discover *how* command is accomplished from a cognitively-based perspective. This means identifying the most important cognitively-based command competencies and the critical knowledge required to perform these competencies.

SECTION THREE

Chapter Seven. Methodology: Data Collection, Its Storage, Editing And Coding

Introduction

This chapter describes the research problem, and the design and format of the research instrument, which has been given the acronym MAPA (Mission, Accomplishments, Performances, Abilities). The opportunity sampling method used for this research is also described.

Research Problem

In their introductory book on management research, Easterby-Smith, Thorp, and Lowe (1991) explain that a large portion of scientific literature, particularly the literature which is representative of the pure positivist paradigm, scathingly ridicules or totally ignores some phenomenologists' attempts at research. According to Bunge (1993) and Guba and Lincoln (1994) the pure positivist researcher may find it inconceivable that a researcher should attempt to study the mind. An example of this positivist paradigm is provided by the biologist George C. Williams (1996, p. 66) when he asks the question, *how is an animal's mind to be studied?* He continues by arguing that *ultimately the only mind you can really know is your own, not those of computers or animals or friends. I think that this removes the domain of the mental from biology and from material science in general* (Ibid, p. 67). Attempts at understanding the mind are met with a degree of scepticism from a number of members within the scientific community, including behaviourists.

Keeping the positivist bias against phenomenological research in mind, the research question can be worded along the following lines, using a combination of both positivist and phenomenological approaches.

How can the critical knowledge and mental processes used by people as they respond to their work demands and interact with their work environment, be identified and portrayed?

Storr (1987) claims that observations of people are inevitably contaminated by the subjective experience and prejudice of the observer, no matter how detached s/he tries to be, and so cannot be regarded in the same light as observations of a chemistry of physics experiment. Behaviours may be observed, and perhaps from a physiological perspective, some data on cognitive processes can be contributed using brain scanning techniques such as CAT, MRI, and PET. Use, retention, and labelling of knowledge and information processing strategies however, cannot be adequately observed in such a manner.

The proposed solution, probably to the chagrin of many positivist-biased scientists, in simple terms, is to ask a number of people to report what they are thinking and then to draw an architecture derived from their responses. Statistical tools are used to analyse the data. The real research problem then, lies in the search for an instrument that can optimise people's articulation of their perceptions. Zikmund (1991) states that *experiments have shown that the range of error due to vague questions or use of imprecise words may be as high as 20 or 30 percent* (p. 295). Zikmund claims that *relevance and accuracy are the two basic criteria to be met if the questionnaire is to achieve the researcher's purpose and that this may be achieved by answering the following questions* (Ibid, p. 296):

- What should be asked?
- How should each question be phrased?
- In what sequence should the questions be arranged?
- What questionnaire layout will serve the research objective?
- How should the questionnaire be pretested? Does the questionnaire need to be revised?

This chapter attempts to answer Zikmund's questions as it describes the challenge of maintaining relevance and accuracy in the research design, while relating the process of instrument design, piloting, and sample selection.

The Research Goal

The explicit goal for this research is:

To identify and map the perceived cognitive structures, processing abilities, and information processing strategies used by a select sample of officers employed in command positions within the New Zealand Army.

This research is designed to extend knowledge by adding to existing theories of mind. This will be achieved through the examination and testing of an information processing model. The goal for this research is defined through the following concomitant objectives:

1. Recognising, describing and interpreting the cognitively-based competencies of a select sample of people.
2. Identifying and describing respondents' perceptions of their critical competencies in information processing terms.
3. Identifying and describing respondents' perceptions of their work competencies, to identify and map their cognitive architectures.
4. Developing prototypical cognitive architectures from the combined sample data.
5. Testing the efficacy and applicability of the MAPA model and its complementary analytical model PAVA.

Instrument Design

Variants of the MAPA instrument had been piloted and successfully applied to identify knowledge process abilities in top-level health executives (Hunt & Kinross, 1988), airline pilots and flight instructors (Hunt, 1990), and health professionals in the forensic psychiatric service (Lockett-Kay, 1992), providing a pretested model upon which this particular research instrument could be based. As a starting point, Hunt's 1992 flight instructor's and flight crew command questionnaires, Hunt and Kinross (1988) health executive questionnaire, and Lockett-Kay's (1992) questionnaire for forensic psychiatrists were examined for their contents and applicability to the present research. While aspects of all the above were considered and used, particularly for formatting purposes, it was decided that Hunt's (1992) flight crew command questionnaire could offer an informed point from which to begin the instrument design.

The Pilot Phase

In February 1995 the first of what were to become many iterations of MAPA, was piloted by three officers, for the purpose of developing an instrument that was user-friendly while achieving the research goals. The instrument was based largely on Hunt and Kinross' (1988) questionnaire for health executives and Hunt's (1992) needs assessment questionnaire for flight crew command. The questionnaire was found to take nearly two hours to complete and all three respondents voiced their concerns that the questionnaire was too complicated. It would technically have been possible to create two questionnaires from the one, in order to simplify the process. It was decided however, that the questionnaire would be best administered to groups of respondents for continuity reasons, and in order to economically explain what the research was about. Such groups were difficult to come by, and the chances of administering both parts of the questionnaire to the same group over a prolonged period of time was thought to be virtually impossible. It was therefore decided to simplify the instrument, but not by dividing the instrument in two.

In early August 1995 the second MAPA instrument was piloted by five officers with the rank of major. With respondent fatigue and subsequent instrument simplification in mind, the questionnaire was still structured similarly to Hunt's 1992 questionnaire for Flight Crew Command. It did not have the facility for adding a personal mission, and it only gave three examples of Accomplishments: Organisational Management, Military Knowledge, and Resource Managing. The questionnaire asked respondents to list four Accomplishments required to meet the New Zealand Army's mission. The

Performances given in the questionnaire for respondents to choose from were: Task Management, Supportive Management, Participative Management, Achievement Management, Directive Control, Self Learning, and Cultural Management. Three of the Performances, Supportive Management, Participative Management, and Achievement Management were taken directly from Hunt's 1992 Flight Instructors Questionnaire. The remainder evolved from the earlier instrument and discussions with various officers concerning the contents of their work. Hunt's 1992 Flight Crew Command Questionnaire contained 35 example Abilities. The same officers who helped decide on the Performances, also helped to point out which Abilities should be kept, and some that should be added.

The second instrument pilot administration identified the following:

- The questionnaire needed a personal mission statement to make the overall mission relevant to each respondent.
- Respondents objected to the need to reduce their work to only four Accomplishments.
- Respondents found the questionnaire complicated and clumsy, having to constantly turn pages when referring to Accomplishments, their Performances, and subsequent Abilities.
- Respondent replies enabled the Accomplishment list to be expanded for later iterations of the instrument. They appeared to agree with the contents of the Performances list, and they added a few Abilities which were incorporated into the next iteration.

Equipped with a newly designed questionnaire incorporating the lessons from the first and second pilots, a new instrument was created and administered with five different majors at the end of August 1995. Their comments were as follows:

- The instrument was not difficult but very labour-intensive.
- What do we (the respondents) get out of all this work?
- What happens with the findings?
- We (the respondents) have completed many of these types of questionnaires and have never received feedback.

The questionnaire was subsequently simplified further by the addition of fold-out pages, thereby minimising the amount of page turning for respondents. It was also decided to create a comprehensive, structured, fifteen minute pre-questionnaire presentation, for the purpose of informing respondents of the aims of the research, how the instrument differed from other similar-appearing research with which they may have come into contact, and what advantages such research could provide for the respondents and the army in general.

At the end of September 1995, twenty-five newly designed questionnaires were administered to a group of officers ranging from lieutenant to major, who were, at the time completing their Grade II promotion course. This was the fourth pilot of the instrument. As experienced earlier, respondents appeared frustrated with the amount of work involved. It had been hoped that piloting would be over and that this would finally be the completed questionnaire. Respondents were asked to list six of the most critical Accomplishments for their work – they were still not happy with six Accomplishments as they were concerned that their jobs were being over-simplified. They were asked to list their Performances in order of importance, but no rating system was included at this stage. The questionnaire was still too complicated and could not capture all the necessary information. A great deal of data was now at hand after this administration, but the questionnaire was still not satisfactory, therefore the data from this instrument administration was not included in the final database.

From the previous instrument administrations and continuing discussions with officers it was now possible to:

- Include a personal mission statement in the questionnaire.
- Provide the facility to rate the perceived importance of each of twelve Accomplishments from 0 – not applicable, to 5 – very important.
- Provide the facility to add and rate other Accomplishments.
- Rate seven Performances, add and rate others, and add the Abilities for the four most important Performances without having to turn any pages.

- Describe the greatest challenge faced by the respondent during his/her New Zealand Army career.
- Provide biographical data deemed relevant to this research.

In January 1996 there was a Grade III promotion course for lieutenants, captains, and majors. The latest iteration of the instrument was administered to the group. They still complained, particularly once they had worked their way to the Abilities section. As a result of this experience, the instrument had some cosmetic changes made to it for the next group, with the addition of lines, so that respondents could find their way around the questionnaire more easily. The complexity of the questionnaire was to be an ongoing problem. It was felt that further simplification would however have failed to reflect the variability and diversity of the respondents' work. The opposing interests demonstrated in the conflict between the need for instrument user-friendliness and the need for a comprehensive data capture was not to be resolved without compromising one or the other of these interests.

In April and May of 1996 two further pilot administrations were completed. The contents never changed from the instrument administered in January of the same year, but the layout continued to be improved, largely influenced by respondent suggestions. Not until August of 1996 was the MAPA instrument first administered in its current and final form (see Appendix 1). From this time onwards, the data collected in each administration was stored in the database.

Research Sample And Population

Respondent selection resulted from an opportunity sampling approach which depended upon any gathering of five or more officers attending grade II, grade III, or graduate study army courses offering access for the research instrument's administration. Two filtering conditions were imposed upon the above selection procedure.

1. The officers must be attending Grade II or Grade III promotion courses or Masters degree courses at the time of selection. This particular condition was imposed in the

hope of gathering data from officers demonstrating qualities desirable to the organisation and to ensure that the sample only included lieutenants, captains, and majors. Over a period of two years, 103 officers who met the research criteria, completed the MAPA questionnaire (see Table 7.1).

2. Officers attending courses run by the researcher[50] were not asked to complete the questionnaires or take part in the research. This was done in order to comply with a condition stipulated by the Massey University Ethics Committee (Appendix 2). The University Ethics Committee was concerned that the researcher's position as course controller could in some way influence a respondent's freedom of choice, firstly, by possibly forcing respondents to take part in the research against their will, and secondly, by possibly influencing the responses given to questions in the instrument. Permission for this research was sought from and approved by the University Ethics Committee after submitting a research proposal and making a personal appearance before the committee. The committee stipulated that the research instrument be accompanied by an explanatory letter and a consent form (Appendix 1). They also stipulated that respondents should only participate on a voluntary basis, and that their responses remain confidential.

Permission to undertake this research was sought from the Chief of General Staff (CGS). The chain of command dictated that permission be sought first from my immediate superior, then Headquarters Army Training Group, then from Headquarters Support Command, followed by Director Corporate Services, and finally the Chief of General Staff (CGS). Several requests had been made over a period of time without receiving a response. Finally a request was made directly to the CGS, who was out of the country at the time of the application. The Deputy Chief of General Staff (DCGS) responded to the request for research permission in the CGS's absence. Clearance was granted for access to officers for research purposes and permission was given to visit officers within New Zealand. Headquarters Army Training Group were directed to provide access to officers and arrange travel should it be necessary to visit officers

[50] I was course controller for two army masters-level papers during the data collection period.

located externally to Waiouru. While permission was granted for the research; no advice, aid, or invitations to use gatherings of officers ever eventuated beyond the giving of permission (see Appendix 3, highlighting the difficulties associated with the gaining of permission for research in the New Zealand Army). Gaining access to groups of officers for this research proved to be a challenge, requiring both intelligence gathering and negotiation skills. The former was required to find out when suitable courses were being run and their location. The latter had to be used in order to convince course administrators that some advantage was to be gained by having their course attendees spend one to two hours completing a research instrument which was unrelated to the contents of the course they were attending.

TABLE 7.1 **Sample Size In Relation To The Total Possible Research Population**

ARMY LIST AS AT 1 MARCH 1996 & 1 MARCH 1997[51]				
Rank	**1996**	**1997**	**Sample Number**	**Percentage of Total**
Major	97	106	36	33%
Captain	151	146	25	17%
Lieutenant	112	98	42	43%
TOTAL	360	350	103	29%

Respondents (103 in all) were taken from promotional courses such as the Grades II and III run by Tactical School in Waiouru, and from the Master of Philosophy programme residential courses[52] run by the Military Studies Institute.

[51] This data was compiled from the 1996 and 1997 Army Lists of Regular Officers and only includes regular officers on the active list.

[52] Once officers have completed the Grade II promotional course they are encouraged to undertake an M.Phil. degree. The Military Studies Institute teaches four papers into the programme and Massey University teaches the remaining four papers. There is a drive within the New Zealand Army dated 1996 (CGS Directive) to have all officers at the level of major and above graduate with at least a masters degree. This is not expected to occur until the turn of the 21st century however.

Description Of The Research Instrument

A critical function provided by the MAPA instrument, is its ability to reveal respondents' perceived knowledge structures. A top-down cognitive architecture is the result. The mission statement of the New Zealand Army acts as a prompt for respondents. They are then required to complete their own mission statements as they perceive their work positions to fit in with the greater organisation's mission. A copy of the final questionnaire used to collect data from the 103 respondents is included as Appendix 1.

MISSION

The New Zealand Army's Mission...

The mission statement for the New Zealand Army is:

"An operationally oriented team of integrated Regulars and Territorials - supported by Civilians - who are deployable and light infantry oriented, with structural and operational capabilities which are credible, affordable and sustainable, which have a ready, balanced and fixed utility and which are able to interoperate with our Navy and Air Force, and our friends and allies."

Write your mission statement as it relates to your particular work:

This mission statement should be referred to when completing the remainder of this questionnaire.

A reduced copy of page 3 of the MAPA questionnaire relating the New Zealand Army's mission statement and then asking for the respondent's mission statement describing his/her current position.

Next, respondents rated their perceptions of the given Accomplishments, representing the higher-order conceptual nodes and the value added to the organisation in their work. This is quickly undertaken as the Accomplishments section only require a rating of the given Accomplishments ranging on an ordinal scale from 0 - Not Applicable to 5 - Very Important.

The Accomplishments were arrived at from various sources. Firstly, numerous formal discussions with officers at the ranks of lieutenant, captain, and major, and who were employed across a wide range of occupations within the New Zealand Army, indicated that their work was of a diverse and varied nature involving personnel management, organising, resources management, they were required to lead and set the example, they had to deal in finances, operations, business-related functions, manage training, and liase and communicate. Underpinning everything was the need for both military and specialist knowledge. Hunt and Kinross (1988) identified two Accomplishments from their research which appeared to be common for both studies: personnel management and organisational management. Stogdill (1974) identified large groupings of skills which he described as being of an interpersonal, administrative, technical, and/or intellectual level, and these were also integrated into the list of Accomplishments. The numerous instrument pilots also helped to identify respondents' perceptions of their work Accomplishments. The final list of Accomplishments were derived from the above sources.

During 7-9 February 1996 the New Zealand Army undertook an officer training review. A review panel was established with the aim of reviewing all officer training by identifying core competencies. The panel identified 231 competencies which were organised into the following groupings (next page):

- Communications skills
- Financial skills
- HRM
- Information systems
- Leadership
- Management of materiel
- Military law
- Numerical skills
- Operations management
- Personnel management
- Planning
- Regimental
- Resources management
- Risk management
- Soldier/battle craft skills
- Research and analysis skills
- Training management

The MAPA instrument had already been piloted by the time the panel's findings were promulgated in late February 1996. There is however a marked similarity between the New Zealand Army list of competencies and those finally included in MAPA as Accomplishments (see Appendix 1).

Following is a reduced copy of the Accomplishments described in the MAPA instrument. These measure the respondent's cognitive components at the Accomplishment level. Zikmund (1991, p. 270) defines cognitive components as *ones awareness and knowledge about an object or hypothetical construct*. Measurement of the respondent's perceived importance for each Accomplishment is attained by asking him/her to estimate its importance by circling a quantitative score along a continuum that has been supplied in the instrument (each Accomplishment is a hypothetical construct as it describes a variable that is not directly observable, but can be measured by an indirect means such as through verbal expression, or by indicating a position on a rating scale). The same numerical scale is supplied to measure perceptions concerning the Accomplishments and the Performances.

ACCOMPLISHMENTS

Mission statements are designed to be broad and all-encompassing. The phrase *Accomplishment* has been given to the terms describing the broadest capabilities required to achieve your mission statement.

DIRECTIONS: Some possible Accomplishments and their meanings are presented below. Read each Accomplishment and then circle the number to the right of the description to indicate your perception of its importance in achieving your work mission. There are no right or wrong answers. You may add your own Accomplishments if the given terms do not adequately describe your work.

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

ACCOMPLISHMENT	EXPLANATION	RATING
1. **Personnel management/HRM**	...People management	0 1 2 3 4 5
2. **Organisational management**	...Manage the Army's goals and act accordingly	0 1 2 3 4 5
3. **Military knowledge**	...Technical and military knowledge	0 1 2 3 4 5
4. **Resource managing**	...Managing stores, items, machinery, software	0 1 2 3 4 5
5. **Professional knowledge**	...Knowledge specific to your work	0 1 2 3 4 5
6. **Leadership**	...Providing guidance, inspiration, being an example	0 1 2 3 4 5
7. **Operations management**	...Managing operations, movements, projects	0 1 2 3 4 5
8. **Financial management**	...Dealing with accounts, finances, budgets	0 1 2 3 4 5
9. **Training management**	...Organising and/or managing training	0 1 2 3 4 5
10. **Liaison**	...Go-between, cooperating, implementing, negotiating	0 1 2 3 4 5
11. **Communication**	...Writing, talking, presenting, listening	0 1 2 3 4 5
12. **Business management**	...Administrating, negotiating	0 1 2 3 4 5
13.		0 1 2 3 4 5
14.		0 1 2 3 4 5
15.		0 1 2 3 4 5

A reduced sample copy of the Accomplishments from the MAPA questionnaire asking respondents to rate their perceptions of the given Accomplishments

Performances provide representations of the next connective level of cognition and begin to clarify the actual cognitive processes involved in achieving the value-added functions represented by the Accomplishments. The specialised cognitive processes required to undertake the value-added functions are still abstract and ephemeral at this stage. It is not until the Abilities required to undertake the Performances are defined that the process is clarified and more clearly circumscribed. It is now possible to view the entire cognitive process as perceived by the respondent. Revelation of these processes can indicate prototype models of connectivity for specified functions.

As with the Accomplishments, the Performances were selected from a variety of sources. Firstly, the literature indicates a need for both task and supportive management skills (Hays & Thomas, 1967; Van Fleet & Yukl, 1986). The Australian Command and Staff College course in Command Studies (1994) heavily emphasises the need for achievement. Hunt's (1992) instrument for assessing flight crew command contained the Performances of Supportive Management, Participative Management, and Achievement Management. With the doctrine of directive control providing the command philosophy for the New Zealand Army, it was also seen as a necessary Performance to be included in the MAPA instrument. Officers indicated that they spent a great deal of their time learning and attending training and familiarisation courses. This indicated that learning was a crucial factor for officer promotion. Finally, cultural management was included in the list of Performances due to the high proportion of Maori within the New Zealand Army and the current debate concerning multiculturalism.

PERFORMANCES FOR ACCOMPLISHMENT 1 Personnel Management

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

How important are the following for achieving this Accomplishment?

1. Task management 0 1 2 3 4 ⑤
- comprehend task situation
- clarify goals & objectives
- critique alternative
- prioritize alternatives
- adapt plans and strategies
- creative thinking
- analytical thinking & problem solving

2. Supportive management 0 1 2 3 4 ⑤
- establish relationships and team building programmes
- identify needs of peers, superiors, and subordinates
- share workloads amongst subordinates
- reflect on subordinates' actions and act accordingly
- fulfil your responsibilities
- delegate

3. Participative management 0 1 2 ③ 4 5
- consult with subordinates
- require collective decision-making when appropriate
- take advice

4. Achievement management 0 1 2 3 4 ⑤
- establish challenging goals
- have high expectations and standards
- work to improve subordinate performance
- emphasise personal responsibility for success
- implement strategies and objectives to support vision

5. Directive control 0 1 2 3 ④ 5
- analyse your superior's intent
- anticipate and take initiative
- calculate requirements and implement
- take responsibility for action

6. Self learning 0 1 ② 3 4 5
- defining & solving problems & learning from mistakes
- change your assumptions and ways of thinking
- keep up to date with education and training needs
- initiate continuing learning

7. Cultural management 0 1 2 3 ④ 5
- empathy, diplomacy, understanding values, beliefs & attitudes of people from other cultures & backgrounds

8. *(other Performance)* 0 1 2 3 4 5
- (what it includes)
-
-

9. *(other Performance)* 0 1 2 3 4 5
- (what it includes)
-

10. *(other Performance)* 0 1 2 3 4 5
- (what it includes)
-

A reduced sample copy of Performances from the MAPA questionnaire asking respondents to rate their perceptions of the Performances required to complete the first (most highly ranked) Accomplishment - six duplicate pages allowed respondents to repeat this process for their most highly rated Accomplishments.

Once the Accomplishments and Performances have been completed the process becomes complicated for respondents, as they must relate the Abilities back to the Accomplishment and its subsequent Performances. Respondents were supplied with pullout lists of Abilities to place beside their work sheets in order to simplify the process. As an example the respondent would open pages 6 and 7 and then place page

19 beside page 7 to enable him/her to scan at a glance all the necessary material without having to turn pages.

Performances	Abilities needed for each Performance

A reduced sample copy of page 7 of the MAPA questionnaire which is duplicated six times to accompany the six Performances pages. These pages are not completed until the respondent has finished rating the pages describing his/her Performances.

The majority of the Abilities were taken from Hunt's (1992) needs assessment questionnaire for flight crew command, with the exceptions of the management and attribute Abilities. These two categories of Abilities were added in an attempt to gain a more comprehensive insight into the managerial component of command, and to include more of the attitudinal aspects related to the function of command.

POSSIBLE ABILITIES FOR DESCRIBING YOUR PERFORMANCES

Assessing abilities
(1) assessing (2) calculating (3) comprehending (4) analysing

Reflective abilities
(5) perceiving (6) contemplating (7) reflecting (8) conceptualising

Attitudinal abilities
(9) accepting (10) rejecting (11) empathising

Communication abilities
(12) speaking (13) writing (14) reading (15) questioning (16) listening

Problem solving/Decision-making abilities
(17) interpreting (18) discriminating (19) solving (20) choosing (21) evaluating
(22) implementing

Interpersonal abilities
(23) coaching (24) collaborating (25) counselling (26) delegating
(27) caring (28) facilitating (29) mediating (30) mentoring
(31) guiding (32) disciplining (33) humouring (34) helping
(35) teaching

Management abilities
(36) directing (37) planning (38) coordinating (39) controlling
(40) innovating (41) motivating (42) prioritizing

Attribute abilities
(43) achievement motivation via independence
(44) achievement motivation via conformance
(45) flexibility (46) sociability (47) dominating (48) asserting
(49) machismo

Invent and add additional abilities which you consider important...

(50) ______Common sense___ (51) __Anticipating___
(52) ______Involving______ (53) ______________
(54) ______________ (55) ______________
(56) ______________ (57) ______________

A reduced sample copy from the MAPA questionnaire displaying a list of possible Abilities for describing Performances. A pullout version of this page was provided with each questionnaire to enable respondents to place this list beside their paired worksheets.

Once respondents completed this section of the questionnaire they were asked to describe the greatest challenge faced by them in their careers in the Army, providing a qualitative perspective of their own thoughts and words. This question was included for the following reasons:

- To identify organisational frustrations and shortcomings which complicate officers' abilities to add value.
- To identify peer group and rank-associated peculiarities which complicate officers' ability to add value.
- To provide an overall indicator of the command climate.
- To act as an outlet for MAPA-induced frustration by allowing respondents to articulate their thoughts in words.

Finally respondents complete the biographical section of the questionnaire, providing information on age, gender, nationality, employment type, rank, experience, and educational levels. This helps to build a profile of the respondent in relation to other respondents. Peer, rank, experience, and function groups can be identified and categorised. Such categories are required to form functional prototype architectures representing value added by respondents to the New Zealand Army.

Respondents were invited to add Accomplishments, Performances, and Abilities. This was emphasised during every presentation prior to the instrument's administration.

Hunt and Kinross (1988, p. 13) reported that some respondents in their research had *difficulty in understanding the terminology* used in their version of the questionnaire. They reported that some respondents stated that the exercise took over an hour to complete, and that it made high demands in terms of cognitive processing. Keeping a mission, Accomplishments, and Performances in mind while thinking about the appropriate process Abilities presented a heavy cognitive workload. The structure of the current MAPA questionnaire has attempted to minimise terminological difficulties by applying army jargon that is clearly understood by respondents. The terminology was tested in each pilot and in discussions with officers. The structure of the questionnaire was also designed to minimise the need to retain previous replies in memory while answering questions. This was done by including fold-out pages and by having related worksheets set out side by side. Criticisms of the length of time required to complete the MAPA questionnaire could not be resolved. It was anticipated that too much data would be lost if the questionnaire was simplified in order to reduce completion time.

Procedure And Administration Of The Research Instrument

The MAPA instrument was administered in the following manner:

1. Officers of the ranks of lieutenant, captain, and major were provided with the research instrument (see Appendix 1 for a copy of the MAPA questionnaire) in groups ranging from 5 to 25 in number. The administrations occurred at various locations in Army camps around New Zealand, as opportunities presented themselves, with the researcher personally conducting every administration. The researcher remained for the full duration of every administration in order to answer questions and explain procedural matters. After a fifteen to twenty minute presentation describing the objectives of the research and how such research could benefit the New Zealand Army, respondents began by reading the mission statement of the New Zealand Army. By focusing respondents upon the greater Army mission, it was intended that their thinking should be channelled into a *closed stream of thought,* minimising the intrusion of representations and influences external to the main thrust of their work. In a sense creating a narrowly focused cognitive circuit within which to probe for the all-important finer details of the makeup of their work-related thoughts and actions.
2. Next respondents were asked to write a mission statement for their particular command function as they perceived it to fit with the overall army mission.
3. After completion of their personal mission statements, respondents identified and rated twelve *Accomplishments* broadly describing the functions required for achieving their mission.
4. Each Accomplishment consisted of a number of *Performances* that had to be listed and rated in perceived order of usefulness. Respondents were informed that they should add any Performances they deemed necessary to describe their work which was not already written into the questionnaire.

5. Finally, the four most highly rated Performance are unbundled by respondents, into a number of *Abilities* that specifically described the constituent parts of that Performance. Respondents were asked to concentrate on only the four most highly rated Performances in order to minimise the cognitive workload for this exercise.

6. Respondents completed the greatest challenge question and then concluded by completing the biographical section.

Summary

To summarise the process thus far:

- Respondents for this research were selected using opportunity sampling, on the basis that they were attending promotion courses or masters-level education courses. Administration of the instrument in groups was considered a labour-saving and time-saving requirement due to the complexity of the questionnaire. The length of time required to introduce and administer the questionnaire was considered to be too long to administer to individuals on a one-by-one basis.

- Respondents were selected from the ranks of lieutenants, captains, and majors, thereby choosing from a sample of people with experience and organisational knowledge to provide informed responses[53].

- The instrument was designed so that all results from the research could be related back to the New Zealand Army mission statement, as respondents were required to write their own mission statements and their perceptions of their cognitive processes as they related to the army's mission.

- Accomplishments, Performances, and Abilities were included in the research instrument a priori in order to facilitate respondents' recognition, as opposed to relying on their ability at recall when describing the function of command.

[53] Research by Bettin and Kennedy (1990) found that the leadership performance of Army officers was predicted by the amount of relevant prior experience, but not by the time in present position, time in the service, or number of previous positions. These results call into question the underlying assumptions supporting the criterion for experience and organisational knowledge based upon rank. However it is still regarded as the best predictor for general competence as someone who fails to demonstrate competence

- Respondents rated the importance of the given Accomplishments (and added their own if they thought this was necessary) which represented the value they perceived to be added to the Army through their work efforts.
- Respondents rated the importance of the Performances for their most highly-rated Accomplishments.
- Respondents indicated the most important process Abilities which they perceived to be the main constructs for the four most highly-rated Performances, thereby showing their perceptions of the most important components of their patterns of connectivity. The Abilities were identified but not rated. Pilot studies indicated that respondents were experiencing response fatigue by the time they reached this section in the questionnaire.
- Respondents wrote a paragraph detailing the greatest challenge they have faced in their army careers.
- Respondents concluded the questionnaire by completing the biographical section.

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will rarely be promoted (some exceptions do unfortunately exist to cast aspersions upon the absolute validity of this rule).

Chapter Eight. Results - Transforming Raw Data Into Information

Introduction

Perhaps a good opening for this chapter could be with a quote from Walker and Shipman (1996):

> *Statistics are slippery things, however, beloved by people who generally don't 'see' shape very well but understand numbers. Statistics always involve assumptions about the nature of the underlying reality from which you have selected a sample; if those assumptions are incorrect, they can warp the results into something that is biologically meaningless* (p. 111).

The rationale behind Walker and Shipman's statement provides a note of caution – do not be tempted to create inferences not supported by the data. The sheer magnitude of the data generated by this research invites the application of a multitude of analytical tools in the hope of recognising patterns, trends, and implications. The following chapter describes the methods used to read and translate the raw data, thereby illustrating the final shape of each resulting cognitive architecture. The complete architectures for each Accomplishment eventually materialised using only the most simple of nonparametric statistical methods. More complex approaches failed to add anything to the existing detail, and were therefore, after some consideration discarded.

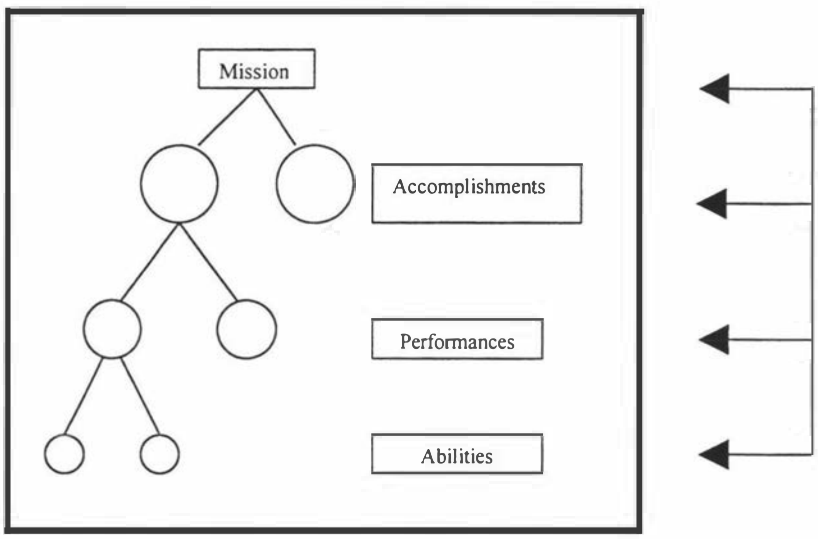
After describing the biographical results, this chapter sequentially follows the MAPA model by discussing the analysis of the respondents' missions, the Accomplishments, the Performances, and finally the Abilities.

This chapter is structured in four parts. Part One begins with the respondents' biographical descriptions. Part Two discusses the results of the Kruskal-Wallis one-way analysis of variance tests, described by Zikmund (1991, p. 527) as *the nonparametric equivalent of the one-way analysis of variance* (ANOVA) test. The Kruskal-Wallis test was used to determine the existence of statistically significant differences between respondents' mission categories and the Accomplishments and Performances required to achieve those missions. It also describes results for identifying differences between perceptions of the three army ranks taking part in the research. Part Two continues by describing the data medians, data shapes, and respondents' overall perceived ratings of importance of the twelve Accomplishments.

Part Three describes twelve prototypical cognitive architectures constructed from the data. Individual architectures illustrate patterns of connectivity for each Accomplishment. These architectures have been constructed by applying a Process Abilities Value Analysis (PAVA). Each PAVA model shows how the combination of respondent results can be made to represent generally-held (but not previously articulated) perceptions of value added to the work place in information processing terms.

Part Four of this chapter classifies the Abilities across three cognitive functions and discusses their distribution throughout the various Accomplishments. The use of Wilks' Lambda discriminant analysis and its appropriateness for this particular research is also discussed. Wilks' Lambda discriminant analysis was used by Hunt and Kinross (1988) and Lockett-Kay (1992) in their data analyses. This chapter concludes with a summary of the responses for the greatest challenge question.

The following illustration (next page) will be used to help the reader navigate through this chapter. Each section of this chapter will be preceded with a copy of this diagram and the relevant level to which the analysis refers will be highlighted with an arrow to illustrate its position on the MAPA model.



The complexity of the MAPA model and the variety of data analyses have prompted the inclusion of this navigational aid, in the hope that confusion for the reader can be minimised. The sample navigational illustration above, presenting a hypothetical scenario, indicates, by way of the arrows, that the discussion is currently focused on the entire MAPA model.

Analytical Methods

The MAPA instrument was adapted and customised to identify the knowledge structures and process Abilities of a sample of lieutenants, captains, and majors from the New Zealand Army. The method of data analysis is as follows:

- Descriptive statistics presented from the biographical sections of the questionnaires, summarise the relevant characteristics of the sample population.
- The Kruskal-Wallis test is used to determine whether statistically reliable differences exist between selected data groupings. The first of these was between the three identified mission statement groups, and the second was between the perceptions of importance of Accomplishments and Performances of the three respondent army ranks involved in the research. Kaplan (1987, p. 177) describes three major assumptions generally required if using a parametric statistical test such as analysis of variance (ANOVA), which is the most commonly-used test for identifying variance (Ibid, p. 170): *(1) that the population from which the sample are drawn are normally distributed, (2) the cases for the study have been drawn randomly and independently from the populations, and (3) that the variances of the populations from which cases are drawn are equal.* None of these assumptions could be made with confidence regarding the data and the sample for this research. As a result, a nonparametric test for analysis of variance would be needed. Kaplan (Ibid) claims that analysis of variance (ANOVA) is relatively robust to violations of these assumptions, but that severe violations may result in inaccuracies with the F-statistics. Therefore, while the ANOVA test is perhaps one of the best known and most powerful for measuring variances between data sets, it could not be used for this research. The Kruskal-Wallis test, ANOVA's nonparametric equivalent, and which is recommended by Kaplan (1987), Zikmund (1991), and Norusis (1988), (1992) in situations where the major assumptions for parametric tests can't be made, is used for this research. As with all nonparametric tests, the assumptions underpinning the Kruskal-Wallis test are less restricting than for its parametric counterpart. The Kruskal-Wallis test, instead of relying upon the data means as is the case for the ANOVA test, uses the sums of the ranks in a particular group, and

then calculates the Chi-square distribution, expressing the discrepancy between the observed and the expected frequencies. Significant variances between data sets are thus highlighted.

- As the data for this research are ordinal, *it is generally considered inappropriate to make the assumption that the sampling distribution is normal* (Zikmund, 1991, p. 479). Consequently, Zikmund states that *the most appropriate measure of central tendency is the median, the most appropriate measure of dispersion is the percentile, and the most appropriate test of statistical significance is the Chi-square test* (Ibid, p. 480). The medians, their significance, and frequency counts are therefore the tests used to facilitate the fabrication of prototype models for every identified Accomplishment and its subsequent pattern of connectivity. The resulting models (Process Ability Value Analysis – PAVA) illustrate the knowledge structures and process Abilities for each of the most important value-adding Accomplishments identified by respondents as a whole. The method used to create the PAVA models is described in Part Three of this chapter.

- Kaplan (1987) warns that *nonparametric statistics typically have lower statistical power than their parametric counterparts*. As a result, *nonparametric statistics are considered to be relatively less efficient because they require more subjects to achieve the same level of statistical power than do parametric methods* (Kaplan, 1987, p. 295). The sample size for this research is deemed large enough to counter any potential lack of statistical power due to the use of nonparametric tests, as it represents 29 percent, or just under a third of the total population of lieutenants, captains, and majors in the New Zealand Army (see Table 7.1 in the previous chapter).

- The results of an exploratory Wilks' Lambda discriminant analysis of the data, as used by Hunt and Kinross (1988), is also described in Part Four of this chapter.

Part One - Biographical Analysis

In the following biographical analysis, the frequencies sometimes exceed the total respondent number of 103 as some respondents were able to give multiple responses, for example, where respondents served an equal number of years in both training and regimental positions, or staff and training.

TABLE 8.1 Biographical Data

Age of Respondents	No.	Gender	Nationality
20 - 24	13	Male 96	New Zealander 103
25 - 29	26	Female 7	
30 - 34	32		
35 - 39	22		
40 - 44	7		
45 - 49	3		

Table 8.1 shows the ages given by respondents, a breakdown of their numbers for each age bracket, their sex, and nationality. The greatest number of respondents are in the 25-39 years of age range, with only a few trailing into the 40's. The small number of females prohibited the use of any forms of comparative study of differences of perceptions between the sexes.

TABLE 8.2 Employment Type For Respondents

Employment	Number
General List Officer	91
Specialist Officer	9
Territorial	3

General list officers made up most of the sample. Specialist and territorial officers were included in the data set only after it was confirmed that they held command positions with responsibility for subordinates, effectively making their roles very similar to general list officers for the purposes of this research. Specialist officers do not have the wide diversity of employment throughout the New Zealand Army however, which is a common feature of general list officer employment. Several respondents felt strongly that their status of Q Commission should be included as a separate category[54]. The creation of another employment category was resisted however, as this research was only concerned with current occupations. The method of promotion was irrelevant to the results. Q Commissioned respondents were categorised as general list officers (Table 8.2).

TABLE 8.3 Rank And Number Of Respondents

Lieutenant	42
Captain	25
Major	36

Several Lieutenant Colonels, Wing Commanders, and Naval personnel were included amongst the initial number of respondents, but had to be removed from the sample as their numbers were too small for comparative purposes (Table 8.3). Lieutenants, captains, and majors made up the greatest numbers of respondents, therefore providing a convenient three-tier sample. The existence of three ranks would facilitate several comparative analyses, as well as opening a window into the work lives of a large number of officers across a progression of levels.

TABLE 8.4 Number Of Respondents Deployed Operationally And/Or For Peace Keeping Purposes During The Course Of Their Careers With Army

Deployed	53
Not Deployed	50

As shown in Table 8.4, over half of the respondents had been deployed overseas in some capacity, either operationally or for peace keeping purposes. This suggests that the respondents had accumulated a considerable amount of experience between them.

[54] Q Commission refers to a Quartermasters commission. Non-commissioned officers (NCO's) may apply or be asked to join the officer ranks. If successful, the NCO becomes a Q Commissioned officer.

TABLE 8.5 Number Of Years Employed By The New Zealand Army

Number of Years	Number of Respondents
4 - 5 years	13
6 - 9 years	29
10 - 14 years	25
15 - 19 years	20
20 - 24 years	13
25 - 29 years	2
30 years or more	1

Table 8.5 shows the number of years respondents have been employed by the New Zealand Army, with the greatest number falling between 6-14 years.

TABLE 8.6 Function In Which The Majority Of Time Was Spent During Career

Function	Number
Training	28
Staff	19
Regimental	63

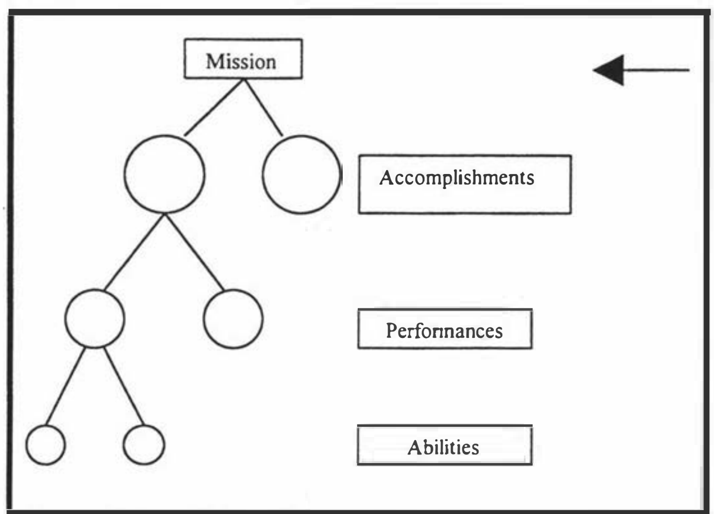
While Table 8.6 illustrates the functions in which respondents felt that they had spent the majority of their time, some respondents felt they had spent their time equally between two of the categories thus explaining why the numbers do not add up to 103.

TABLE 8.7 Highest Educational Qualification At Time Of Completing Questionnaire

Qualification	Number
School Certificate	12
University Entrance	35
Polytechnic based Cert./Diploma/Degree	10
Undergraduate University Diploma	11
University Bachelor Degree	24
University Masters Degree	4
Other	1

With nearly half of the respondents having a Polytechnic qualification or higher (see Table 8.7), and many others studying for their Masters qualification at the time the questionnaire was completed, the New Zealand Army demonstrates a high level of attained and on-going education amongst its officers.

Part Two - Mission Categories And The Identification Of Differences Between The Perceived Importance Of Accomplishments, Performances, And Army Rank



Respondents were asked to read the mission statement for the New Zealand Army. They were then asked to write their own occupational mission statements as they related to the overall Army mission. From the details provided by respondents, the individual mission statements were content-analysed for commonality of purpose and subsequently placed into three distinctive categories (see Table 8.8):

TABLE 8.8 Mission Statement Categories

Mission Category	*N*
1. Management and development of non-human resources	33
2. Command	30
3. Management, development, and support of human resources	40

The three statement categories shown in Table 8.8 were identified from the descriptions provided by respondents. All of the respondents included in the final analysis were officers in positions where they had command over subordinates. The mission statements were content-analysed and a group was identified which was clearly unique by its predominant focus on planning, administration, and management of non-human resources. The second distinctive group held command positions, for example, for an infantry unit. The third unique category appeared to work in various headquarters and/or served in a capacity for managing education, training, careers, human resources, etc.

In order to understand the relationship, if any, between the three identified mission statement categories and the twelve *Accomplishments* – defined by Hunt and Kinross (1988) as *the functional capacity required by an individual or group to accomplish with acceptable expertise that part of the mission which relates to them* (p.18) - a Kruskal-Wallis test was used. The results of the test are shown in Table 8.9. These results show that amongst the three mission statement groups, there were several differences regarding the perceived importance of the twelve Accomplishments.

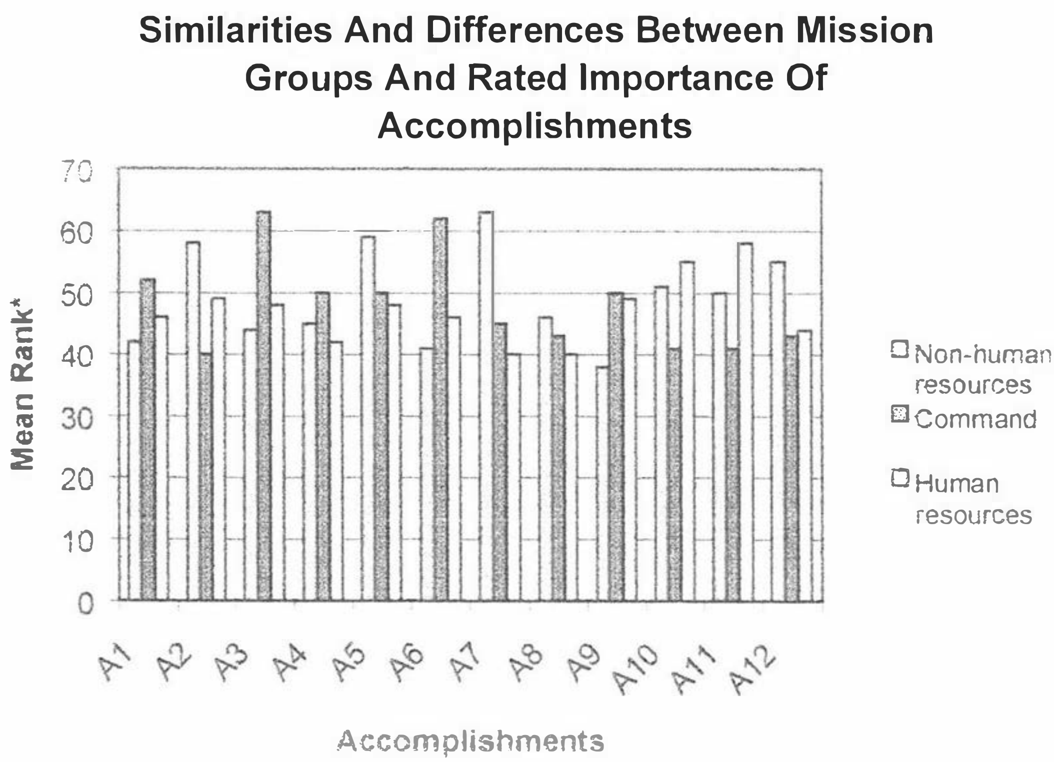
For the Kruskal-Wallis test, all the cases from the three mission groups were combined and ranked. Average ranks were assigned in the case of ties. For each group, the ranks were summed, and the Kruskal-Wallis H statistic was computed from these sums. The H statistic has approximately a chi-square distribution under the hypothesis that the three groups have the same distribution. The output in Table 8.9 shows the *mean rank*, which is the statistical terminology used to describe the value of the summed ranks for each Accomplishment and the mission groups, it does not refer to a *mean statistic*. The value of the Kruskal-Wallis statistic is displayed under the Chi-square title, after it is adjusted for ties. The small observed significance level suggests that the ratings for the mission groups are not the same for all three groups. The mean rank indicates where those differences can be found.

Although the scale provided to respondents was of a numerical nature, it can be defined as an ordinal level of measurement. Reid (1987) and Zikmund (1991) both claim that ordinal scales facilitate the rating of respondents' attitudes and/or beliefs. The scale of importance against which respondents in the MAPA instrument rated their perception is as follows:

0 – Not applicable	1 – Not important	2 – Slightly important
3 – Quite important	4 – Important	5 – Very important

The identified differences between the three mission categories involved the following four Accomplishments:

- A3 – Military Knowledge
- A6 – Leadership
- A7 – Operations Management
- A11 – Communication



* The mean rank is a statistical term used in the Kruskal-Wallis test

Key

A1	Personnel Management	A2	Organisation Management
A3	Military Knowledge	A4	Resource Managing
A5	Professional Knowledge	A6	Leadership
A7	Operations Management	A8	Financial Management
A9	Training Management	A10	Liaison
A11	Communication	A12	Business Management

FIGURE 8.1 Mission Groups And The Importance Of Accomplishments

Figure 8.1 shows the mean rankings of importance identified using the Kruskal-Wallis test for the twelve Accomplishments for each of the three identified mission categories.

The Kruskal-Wallis test results shown in Table 8.9 indicate that there were four significant differences between the ratings of importance for the three mission statement categories. These differences are as follows:

Military Knowledge – A significant difference was identified between mission statement 1 and mission statement 2. This suggests that those respondents identifying with a command mission, rated Military Knowledge more highly than did those who identified with a mission involving management of non-human resources.

Leadership – A significant difference was again identified between mission statements 1 and 2. Those respondents identifying with the command mission rated leadership more highly than those identifying with the mission involving management of non-human resources.

Operations Management – A significant difference was identified between mission statements 1 and 3. Those respondents identifying with the mission involving management of non-human resources rated operations management more highly than those identifying with the mission involving management of human resources.

Communication – A significant difference was identified between mission categories 2 and 3. Those respondents identifying with the mission involving management of human resources rated communication more highly than those identifying with the command mission.

These differences in perceptions of importance of Accomplishments appear somewhat inconsistent. The command mission statement (statement 2) places greater importance on the human interface Accomplishments (Personnel Management and Leadership) and yet, of the three mission statements, rates Communication as being of least importance. It may be implied from these results that the mission groups do not match the commonly-held stereotypes generally associated with the terminology used to describe each mission statement.

The greatest number of differences in perceptions of Accomplishments exists between mission statement 1 – *Management and development of non-human resources*, and mission statement 2 – *Command* (see Table 8.9). The least number of significant differences existed between mission statement 1 - *Management and development of non-human resources*, and mission statement 3 - *Management, development, and support of human resources.* The variance results suggest that those respondents categorised into the *command* mission statement category had fewer Accomplishments in common with the other two categories of mission statements. This further suggests that command is a distinctive function from the two remaining mission statement categories, perhaps differentiating between what could be strictly termed managerial work and military command.

The Kruskal-Wallis test results show that there was no significant difference between the three mission categories in perception of importance of the Accomplishments listed below:

- Personnel Management
- Organisation Management
- Resource Managing
- Professional Knowledge
- Financial Management
- Training Management
- Liaison
- Business Management

Table 8.9 lists each of the twelve Accomplishments and the mission category for which the total mean rank of perceptions of importance is shown. It shows the number (*N)* of respondents classified into each of the three mission categories, and on the row describing the first mission category and Accomplishment, it shows whether the difference between the three mission categories is significant at the .05 level. The Chi-square statistic evaluates the relative frequency in the sample population that fall into well-defined groupings for the three categories.

TABLE 8.9 **Identifying Differences Between Accomplishments Perceived To Be Required For Each Mission Category**

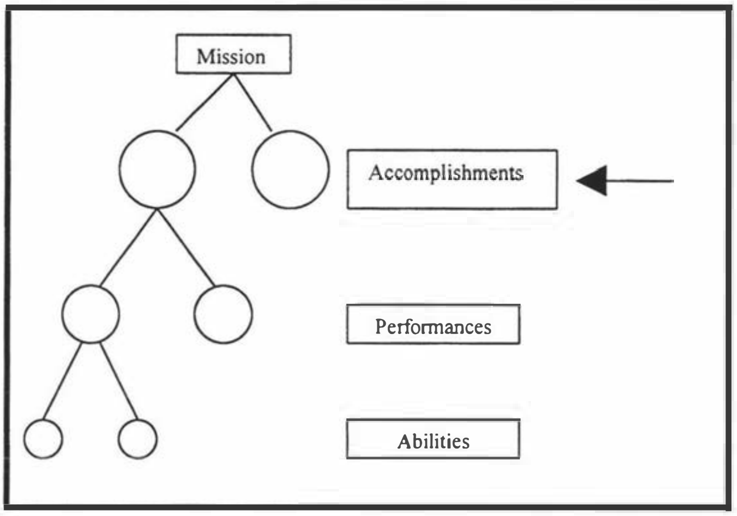
Accomplishment	Mission Category#	Mean Rank	Chi-square	*N*
Personnel Management	1	42.41	1.982	22
	2	52.00		29
	3	45.95		42
Organisation Management	1	57.06	5.108	24
	2	40.45		28
	3	48.95		44
Military Knowledge	1	44.19	7.368*	26
	2	63.21		29
	3	48.32		47
Resource Managing	1	44.74	1.784	21
	2	50.11		27
	3	41.77		41
Professional Knowledge	1	59.19	3.688	26
	2	49.76		29
	3	48.32		47
Leadership	1	41.19	9.585**	24
	2	61.55		29
	3	46.17		45
Operations Management	1	63.19	12.032**	24
	2	44.93		28
	3	40.25		42
Financial Management	1	46.39	1.126	22
	2	43.15		26
	3	39.65		36
Training Management	1	37.65	3.297	20
	2	49.93		28
	3	49.33		45
Liaison	1	51.36	4.202	25
	2	41.27		28
	3	54.58		46
Communication	1	50.38	8.324*	26
	2	41.26		29
	3	58.44		47
Business Management	1	55.33	4.039	24
	2	42.70		28
	3	43.86		40

*p<.05
**p<.01

#MISSION KEY

Management and development of non-human resources	Mission Category 1
Command	Mission Category 2
Management and development of human resources	Mission Category 3

Accomplishments And Their Perceived Importance



Respondents were asked to indicate their perceived level of work-related importance for each Accomplishment on the following numerical scales:

0 – Not applicable	1 – Not important	2 – Slightly important
3 – Quite important	4 – Important	5 – Very important

All twelve Accomplishments listed in Table 8.10 were rated as being Quite Important or better. Some respondents indicated the existence of two further Accomplishments: Caring and Strategic Planning. Both Accomplishments received high ratings of importance but only appeared twice each and were therefore omitted from the final analysis.

The following discusses the data analyses beginning with the Accomplishments, followed by Performances, and finally, their complete integration with the most frequently-cited Abilities.

TABLE 8.10 Descriptive Analyses Of Accomplishments

	N							Percentiles		
Accom.	Valid	Median	Variance	Skewness	Std. Error	Kurtosis	Std. Error	25	50	75
A8/FM	85	3	1.496359	-0.04321	0.261153	-1.032985	0.516756	2	3	4
A4/RM	90	3.5	1.762921	-0.307519	0.254032	-1.066797	0.502936	2	3.5	4
A1/PM	94	4	0.878975	-1.080989	0.248736	0.650801	0.492645	4	4	5
A2/ORGM	97	4	1.061211	-0.740713	0.244975	0.143813	0.48533	3	4	5
A3/MK	103	4	1.181611	-0.937156	0.237938	0.312603	0.471627	3	4	5
A7/OPM	95	4	1.264726	-0.584053	0.247464	-0.543518	0.49017	3	4	5
A9/TM	94	4	1.398421	-0.650213	0.248736	-0.336282	0.492645	3	4	5
A10/L	100	4	1.067071	-0.719668	0.24138	-0.140618	0.478331	3	4	5
A12/BM	93	4	0.859046	-0.441462	0.250029	0.210319	0.495159	3	4	4
A5/PK	103	5	0.435941	-1.672942	0.237938	2.30471	0.471627	4	5	5
A6/LDSP	99	5	1.279736	-1.18859	0.242561	0.39741	0.48063	3	5	5
A11/C	103	5	0.605178	-1.607162	0.237938	2.245832	0.471627	4	5	5

Table 8.10 lists the twelve Accomplishments in descending order, from the Accomplishments given the lowest ratings of importance by respondents, to the Accomplishments rated as being most important. Zikmund (1991) explains that the mean and standard deviation statistics are not appropriate for ordinal-scale data. Therefore the order of importance has been calculated using a combination of the median and, where there are several Accomplishments with the same median, the number of valid responses.

Table 8.10 also shows the percentiles for the Accomplishment data. The 25th percentile is the value below which 25% and above which 75% of the cases fall. The 50th percentile, or median, is the value above and below which 50% (or half) of the cases fall. From these three percentiles, sometimes called quartiles (Norusis, 1992, p. 138), it can be seen that the respondents ratings of importance for all twelve Accomplishments favour the right side of the scale.

It is deemed inappropriate to infer too much into the exact placing of each individual Accomplishment. The results have therefore been grouped into three broad categories in order to highlight the substantive total rating differences:

- Accomplishments with a median of 5, equating with *very important* on the MAPA rating scale
- Accomplishments with a median of 4, equating with *important* on the MAPA rating scale
- Accomplishments with a median of less than 4, equating with *quite important* on the MAPA rating scale.

Attempts at reading more detailed implications into the order of importance for these Accomplishments would be difficult as the statistical approaches used lack the required power to differentiate to such an extent.

An explanation concerning skewness and kurtosis is provided by Norusis (1988). She explains that a distribution is called skewed if it isn't symmetric but has more cases toward one end of the distribution than the other. If the long tail is toward larger values, the distribution is positively skewed, or skewed to the right. If the tail is toward smaller values, the distribution is negatively skewed, or skewed to the left. Table 8.10 shows that all of the Accomplishments are negatively skewed. This is possibly the result of the 5 point scale, as most of the respondent results are to the right of centre, leaving only room for the tails to be toward the left. Norusis continues, if a larger proportion of cases falls into the tails of a distribution than into those of a normal distribution, the distribution has positive kurtosis. If fewer cases fall into the tails, the distribution has negative kurtosis (Norusis, 1988, p. 177). Norusis (1992, p. 154) clarifies this further by explaining that positive values for kurtosis indicate a distribution that is more peaked than normal. Just over half of the Accomplishments indicate a positive kurtosis (Table 8.10), suggesting greater agreement on a smaller number of their ratings by the respondents

If the observed distribution is exactly normal, the skewness and kurtosis statistics will be zero. The Accomplishments of Professional Knowledge and Communication display the highest positive kurtosis, suggesting that respondents collectively had the greatest degree of agreement concerning their ratings of importance for these two Accomplishments.

The results shown in Tables 8.10 and 8.11 (over) suggest that the respondents perceived all of the given Accomplishments to have some degree of importance to their work. Zikmund (1991) explains that *respondents are often unwilling to use the extreme negative side of a rating scale* (p. 277), which could also account for such results. For this reason the numerical rating scale used in the instrument contained more positive response options rather than presenting a bipolar scale of extremes. Regardless of whether respondents were reluctant to include the negative side of the scale or not, the order of importance can still act as a relative sequential ordering of perceived importance.

TABLE 8.11 **Frequency Of Ratings Of Importance For Each Accomplishment And The Percentage Represented By 0 – Not Applicable**

Accomplishment	0	Valid Percent	1.00	2.00	3.00	4.00	5.00
Financial Mgmt	18	17.5	7	22	20	22	14
Resource Managing	13	12.6	11	16	18	25	20
Business Mgmt	10	9.7	3	9	34	37	10
Personnel Mgmt	9	8.7	1	4	15	28	46
Training Mgmt	9	8.7	6	8	24	27	29
Operations Mgmt	8	7.8	3	13	19	32	28
Organisation Mgmt	6	5.8	3	8	21	39	26
Liaison	3	2.9	2	7	23	31	37
Military Knowledge	0	0	4	7	19	35	38
Leadership	4	3.9	3	8	14	19	55
Communication	0	0	0	4	6	29	64
Prof Knowledge	0	0	0	1	7	23	72

Table 8.11 provides a different perspective of the shape of the data, from the information shown in Table 8.10. The Accomplishments are presented similarly in an ascending order from those which have been rated as most important to those which have been rated as less important. From the left of Table 8.11, the columns show the Accomplishment, the frequency of Accomplishments rated as 0 – not applicable, the valid percent of 0's, and the frequency distributions for the remaining five ratings of importance.

The Accomplishments rated as being of relatively lesser importance were also most frequently rated as not applicable. Military Knowledge, Communication, and Professional Knowledge received no 0 ratings, suggesting that every respondent agreed these Accomplishments have some degree of relevance to their work. Four respondents indicated that Military Knowledge is applicable but not important to their work. Every respondent indicated that the Accomplishments Communication and Professional Knowledge are at minimum, slightly important or higher on the scale of importance. It can be suggested therefore that these two Accomplishments, closely followed by Leadership, stand out from the remaining Accomplishments as being the most important for the respondents in their work.

Personnel Management stands out amongst the frequency distributions as its results are skewed to the extreme right of the scale, more in conformance with the three Accomplishments rated as being most important. This is also noticeable in Table 8.10 as the skewness statistic for Personnel Management more closely resembles the statistics of the Accomplishments with the most important ratings. This possibly suggests that overall, Personnel Management was not viewed with such relatively great importance, but that a large number of respondents did indeed perceive it to be very important. Personnel Management may be ambiguously perceived by respondents due to its specialised work nature.

In summary it can be suggested that:

(a) Communication and Professional Knowledge represent some importance for all of the respondents, and are quite or very important to most.

(b) Leadership and Personnel Management are quite or very important Accomplishments to most, but are also less important or not applicable to a small minority.

(c) Financial Management, Resource Managing, and Business Management, all display a relatively normal frequency distribution.

Differences Between Army Rank And The Perceived Importance Of Accomplishments

The goal of this part of the analysis is to identify any important differences between the three ranks of the respondents in their perceived importance of the twelve given Accomplishments. The Kruskal-Wallis test was again used to determine the existence of any significant differences. Only three significant differences at the .05 level were identified (see Table 8.12). The first was for the Accomplishment Military Knowledge which lieutenant rated as being more important than captains.

The second significant difference, also at the .05 level, was between lieutenants and majors, with the latter rating Financial Management as being more important than did the former.

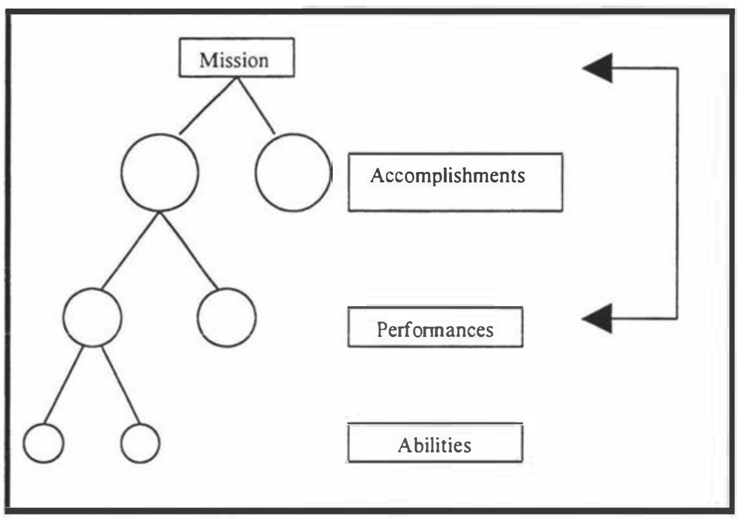
The third significant difference was for the Accomplishment Communication, between the ranks of lieutenant and captain. Lieutenants rated Communication to be significantly less important than did the captains. Except for these three differences, the lack of any other significant differences suggest that there is a high degree of uniformity of perceptions between the three ranks of respondents at the Accomplishment level.

TABLE 8.12 Identifying Differences Between Army Rank And Perceived Importance Of Accomplishments

Accomplishment	Army Rank	Mean Rank	Chi-square	*n*
Military Knowledge	Lt	61.55	8.551*	42
	Capt.	42.22		25
Financial Mgmt	Lt	35.70	7.854*	35
	Maj.	52.55		29
Communication	Lt	43.30	9.875**	42
	Capt.	63.16		25

*p<.05
**p<.01

Identifying Differences Between Mission Statement Categories And Perceptions Of The Importance Of Performances



Hunt (1992, p. 4) defines a Performance as *the procedural knowledge (knowing how to do it) which is required in order to execute (perform) an Accomplishment.* Kruskal-Wallis tests identified only four significant differences between the mission statement categories with which respondents identified and their perceptions of importance for the four critical Performances underpinning each of the Accomplishments. These differences, at the .05 level, are shown in Table 8.13.

The first significant difference was for the Accomplishment Organisational Management, between those who identified with mission statement 1 – management of non-human resources, and mission statement 2 – command, with the latter rating the Performance Achievement Management as being more important than did the former.

The second significant difference was for the Accomplishment Military Knowledge, between those who identified with mission statement 1 – management of non-human resources, and mission statement 3 – management of human resources, with the latter rating the Performance Self Learning as being more important than did the former.

The third significant difference was for the Accomplishment Professional Knowledge, between those who again identified with mission statement 1 – management of non-human resources, and mission statement 3 – management of human resources, with the latter rating the Performance Task Management as being less important than did the former.

The fourth and last significant difference was for the Accomplishment Business Management, between those who identified with mission statement 2 – command, and mission statement 3 – management of human resources, with the latter rating the Performance Achievement Management as being less important than did the former.

The existence of only four significant differences suggests a general agreement concerning the construction of Performances. Considering that there are three mission statement categories, and twelve Accomplishments, each with four Performances, these four differences equate to only a small number of the total possible differences.

TABLE 8.13 Identifying Differences Between Army Work Mission And Perceived Importance Of Performances

Accomplishment	Performance	Mission#	Mean Rank	Chi-square	*n*
Organisational Mgmt	Achievement	1	8.88	14.019**	12
		2	23.60		5
Military Knowledge	Self Learning	1	18.70	6.089*	10
		3	30.73		24
Professional Knowledge	Task Mgmt	1	47.05	9.063*	22
		3	30.69		35
Business Mgmt	Achievement	2	12.00	8.047*	2
		3	5.13		8

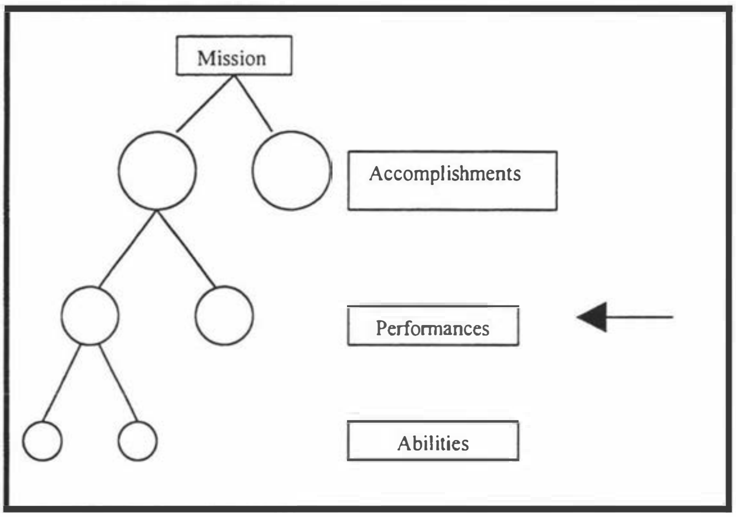
*p<.05

**p<.01

#MISSION KEY

Management and development of non-human resources	Mission Category 1
Command	Mission Category 2
Management and development of human resources	Mission Category 3

Identifying Differences Between Army Rank And Perceptions Of The Importance Of Performances



Kruskal-Wallis tests (see Table 8.14) determined that there were eight significant differences between perceptions held by lieutenants, captains, and majors concerning the Performances of six of the Accomplishments. The first significant difference was with the Accomplishment Personnel Management, between the ranks of lieutenant and major, with the latter rating the Performance Achievement Management as being more important than did the former.

The second significant difference was with the Accomplishment Military Knowledge, between the ranks of lieutenant and captain, with the latter rating the Performance Directive Control as being more important than did the former.

The third significant difference was with the Accomplishment Resource Managing, between the ranks of captains and majors, with the latter rating the Performance Directive Control as being more important than did the former.

The fourth significant difference was with the Accomplishment Professional Knowledge, between the ranks of captains and majors, with the latter rating the Performance Task Management as being more important than did the former.

The fifth significant difference was with the Accomplishment Financial Management, between the ranks of captains and majors, with the latter rating the Performance Achievement Management as being more important than did the former.

The last three significant differences all concern the Accomplishment Communication. The first is between the ranks of captains and majors, with the latter rating the Performance Task Management as being more important than did the former. The second difference is between the ranks of lieutenant and major, with the latter rating the Performance Supportive Management as being more important than did the former. The final difference for this Accomplishment is again between the ranks of lieutenant and major, with the latter rating the Performance Participative Management as being more important than did the former.

As with the previous analysis concerning differences between Performances and mission categories, the eight significant differences between Performances and rank still constitute a minority of potential difference possibilities. This again serves to reinforce the point that while there are some disagreements between the three ranks, generally they indicate the same perceptions of importance for Performances. The differences shown in Table 8.14 suggest that majors participating in this research have a slightly higher task and achievement orientation than the other two participating ranks.

TABLE 8.14 Identifying Differences Between Army Rank And Perceived Importance Of Performances

Accomplishment	Performance	Army Rank#	Mean Rank	Chi-square	*n*
Personnel Mgmt	Achievement	2	27.52	7.087*	29
		4	39.83		23
Military Knowl.	Directive Con.	2	22.73	7.362*	31
		3	36.65		10
Resource Man.	Directive Con.	3	9.63	6.039*	4
		4	16.91		11
Prof. Knowl.	Task Mgmt	3	26.58	8.970*	19
		4	45.16		25
Financial Mgmt	Achievement	3	2.67	7.219*	3
		4	12.50		13
Communication	Task Mgmt	3	30.60	6.494*	24
		4	45.02		29
	Supportive M.	2	31.73	7.212*	22
		4	46.03		29
	Participative M.	2	28.39	7.771*	22
		4	44.71		28

*p< .05

#Key for Army Rank
2 – lieutenant
3 – captain
4 - major

Summary Of The Results Of Part Two

The Accomplishment Military Knowledge was rated as being more important by those in the command mission category, than by those involved in both non-human resources and human resources management. Similarly, respondents in the command mission category perceived Leadership to be more important in their work than those involved in both human and non-human resources management – which was not surprising as leadership is considered a critical function of command (see chapter six), with the terms often being used interchangeably. Operations Management was perceived to be a more important function by those in non-human resources management than those respondents categorised in the other two mission groups. Training Management was perceived to be a more important function by those in both command and human resources management mission groups than those in non-human resources management mission groups.

The results of the ratings of importance of the Accomplishments shown in Tables 8.10 and 8.11 demonstrate face validity, providing a funnelling-down effect, from generalised work requirements to the more specialised types of work. All respondents, regardless of their particular function in the New Zealand Army, require the Accomplishments of Professional Knowledge and Communication. Most occupy leadership functions and require Military Knowledge for their work. Most functions would also involve some form of Liaison and Organisational Management. Fewer respondents would be involved in Operations, Training, Personnel, Business, Resource, and Financial Management. The New Zealand Army recognised in 1997 that there was a weakness in resources and financial management and that this may be due to a lack of the appropriate training. The results of this research indicate that there is a perception that Financial Management is the least important of all the Accomplishments. The data does not show whether this is due to a lack of interest, understanding, or because the command structure offers the discretion to delegate financial management tasks to the NCO level of command. It may however indicate an attitudinal problem as opposed to being the result of a lack of understanding concerning the intricacies of financial issues.

It appears difficult to conceive how the command mission category can perceive the human interface with such a degree of importance and yet not place such a great deal of relative importance on the Accomplishment Communication. Communication was highly rated by those in the command mission category, but in relation to the other two mission categories, its rating of importance was the lowest.

Viewing the Accomplishments (shown in Table 8.10) as value being added and dispersed throughout the organisation by respondents, the results suggest that the majority of value is added in the domains of professional knowledge and in the ability to communicate, either knowledge, orders, or for completing required tasks. Respondents appear to perceive that they add leadership to the organisation, either overtly by physically leading their subordinates, or in a more subtle but no less important manner, by setting an example or creating orders for subordinates. It could be inferred that while military knowledge is important, it would be utilised as implicit knowledge, being deeply ingrained, and acting more as an almost intuitive set of rules and procedures by which to operate. The composition of these Accomplishments can be identified by viewing their complete patterns of connectivity which include Performances and Abilities.

Significant differences identified within the Accomplishments and the three participating ranks suggest that lieutenants either require more Military Knowledge in their work, or its application may be more novel for them relative to the other two ranks, thus prompting a greater perception of importance. Lieutenants also do not regard Communication or Financial Management to be as important in their work as do the captains and majors. This possibly reflects the different levels of responsibility of the three ranks.

The small number of significant differences identified within the Performances suggests that lieutenants and captains have relatively comparable perceptions of the Performances' importance, but that these perceptions do not always agree with those of majors, as seven out of the eight differences were attributed between one of these two ranks and majors. The perceptions of majors appear to incline toward a greater task orientation.

Part Three - A Hybrid Parallel Distributed Processing (PDP) Analytical Framework

One of MAPA's limitations prior to this research was its inability to furnish a coherent analytical framework for data analysis. Rumelhart, Hinton, and McClelland provide a PDP-specific data analysis framework that has been adapted by this researcher to meet the needs of the MAPA model. Parallel distributed processing (PDP) is discussed in chapters three and four of this study, and Rumelhart, Hinton, and McClelland's model is described in chapter two of Rumelhart and McClelland (1986). The model is adapted as follows. Figure 8.2 illustrates the basic aspects of the adapted PDP approach. Due to the ordinal nature of the data, the median (Md) and the sum ($\sum$) of the values of respondents' ratings of perceived importance are used to calculate the level of perceptual agreement concerning processing units, and their subsequent superposed network representation for a particular conceptual process.

Rumelhart, Hinton, and McClelland (1986, p. 46) describe the major aspects which make up a parallel distributed processing model. Figure 8.2 does not comply with all of the criteria dictated by the authors to qualify as a PDP model. It does however facilitate a hybrid version by its compliance with some of the criteria. These criteria are:

- A set of processing units
- A state of activation
- An output function for each unit
- A pattern of connectivity among units
- An environment in which the system must operate.

Each higher conceptual function is described as a unit (an Accomplishment or Performance). The Accomplishment units, representing higher-level conceptualisations, are relatively abstract but become more clearly defined with the addition of Performances and Abilities – constituting a state of connectivity or activation. Each Accomplishment unit has a state of activation based upon the median statistic of the total ratings for perceived importance, denoted in Figure 8.2 at the top as MdA. The hierarchical order of importance is further developed from the total sum of the ratings ($\sum$R). This state of activation indicates the hierarchy of importance being placed upon connections related to MdA. The result of the state of activation can be viewed as an output function and is described by an architecture illustrating a pattern of connectivity.

Performances and their patterns of connectivity are shown in order of perceived importance, which is again calculated from the median statistic of the ratings of the Performances (MdP) and the sum of the values of the ratings (($\sum$R). It is however possible, and probable according to parallel distributed processing theory, that two or more Performances work in parallel when an Accomplishment resonates. This is supported by Rumelhart, Smolensky, McClelland, and Hinton (cited in McClelland & Rumelhart, 1986, p. 38) where the authors write:

> *The "parallel" in "parallel distributed processing" is intended to indicate that, as a basic architectural design principle, processing is carried out, in so far as possible, in parallel. Parallel algorithms are employed rather then serial ones. At the same time however, the "distributed" in "parallel distributed processing" brings a serial component to PDP systems. Since it is patterns of activations over a set of units that are the relevant representational format and since a set of units can only contain one pattern at a time, there is an enforced seriality in what can be represented.*

Therefore it could be posited that a prototype architecture of an Accomplishment resonates with the connections formed by the four identified Performances. At the same time the architecture may be dominated by one Performance, depending upon the specific situation.

The Abilities are calculated with a different algorithm to that of the Accomplishments and Performances, as frequency rather than importance ratings were used when collecting data, to avoid respondent fatigue (the rationale for this is explained in chapter seven). An Ability's degree of importance is therefore established by the number of times it is mentioned by respondents, as opposed to a given rating of importance by respondents - denoted as $\sum a_n$ in Figure 8.1.

In reality, patterns of connectivity are expected to alter slightly with every accessing or resonation, and representations as depicted by the data therefore only indicate perceived superposed network architectures for one small snapshot in time, similar to an accountant's balance sheet, which is an interpretation of the firm's financial status as at the point in time of the financial accounting. The following describes the complete algorithm for the analysis and construction of MAPA data in the form of an adapted hybrid PDP model.

The activation of a set of processing units (Accomplishments and their lower-level Performances) is determined by the relative importance respondents associate between the components. For example, a mathematical representation of a hypothetical Accomplishment 1 (MdA_1) and its pattern of connectivity, including Performances (MdP_n), and process Abilities ($\sum a_n$), may be written as:

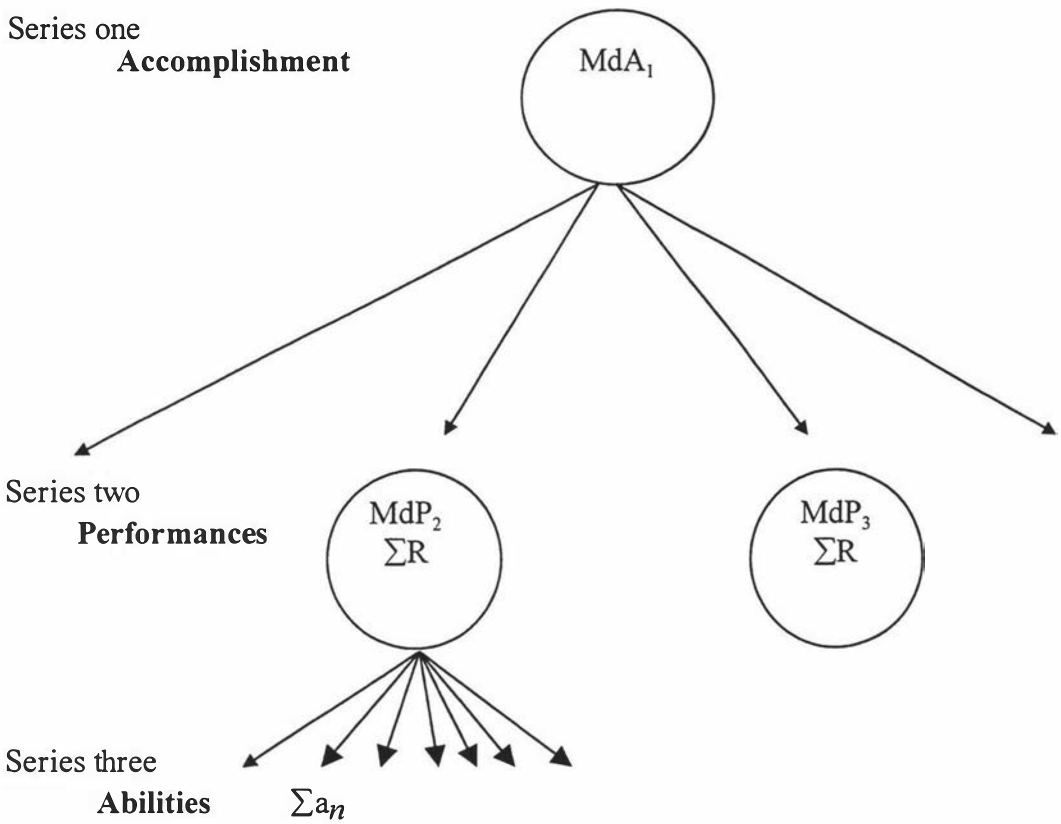
Accomplishment One (MdA_1) = $MdP_n\,(\sum R) + \sum a_n$

Where (MdA_1) = the median statistic of the ratings of importance for Accomplishment One, consisting of...

MdP_n = the median statistic of the ratings of importance of the four Performances for each Accomplishment, in order of importance, hierarchically structured from a combination of the median and then the sum of the rating values ($\sum R$) and...

$\sum a_n$ = the sum of the frequencies of the most important Abilities listed by respondents in order to create a Performance.

Illustrating a model for a pattern of connectivity, Figure 8.2 shows the units and their connections in a top-down manner consistent with the MAPA model. For later models, in order to economise on space, the model will be tilted 90 degrees, providing a side-on perspective (see Exhibits 8.1-12), with the Accomplishments on the left.

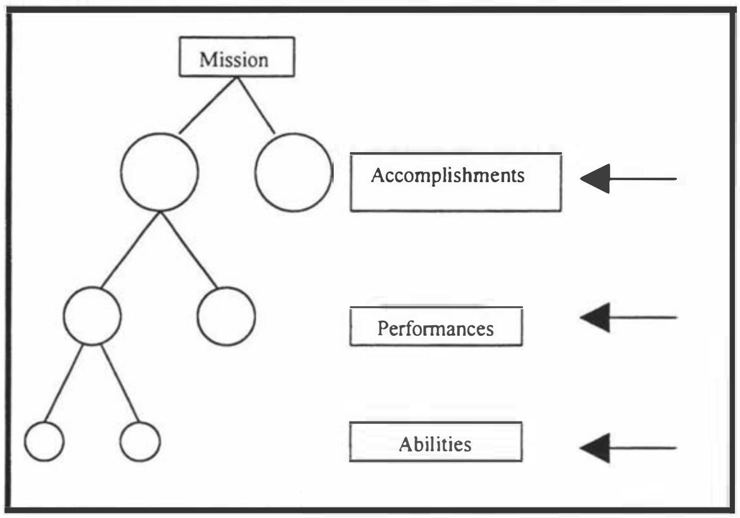


KEY

Series one – median statistic of the respondent Accomplishment ratings = MdA
Series two - median statistic of the respondent Performance ratings in order of importance = $MdP(\sum R)$
Series three - frequency count for Abilities = $\sum a_n$

FIGURE 8.2 **The Basic Components Of The Hybrid Parallel Distributed Processing Analysis To Be Used For Analysing Data From The MAPA Model.**

Process Abilities Value Analysis (PAVA)



By following the algorithm established in the hybrid PDP analytical framework described in Figure 8.2, this analysis aims to identify interactive relationships between Accomplishments, their Performances, and their subsequent process Abilities. The results will illustrate a pattern of connectivity for each Accomplishment, based upon respondent data, and each pattern of connectivity, termed as a PAVA model, illustrates the structure and hierarchy of respondents' process Abilities.

In Exhibits 8.1 – 8.12, each Accomplishment is presented in the left side column titled series 1. The median statistics of the combined ratings of the four Performances making up each Accomplishment (series 2) are then shown in their hierarchical patterns of connectivity. Series 3 illustrates the most critical Abilities comprising each Performance - determined by their frequency of occurrence in the data. The expression $\sum R$ indicates the sum of the ratings given by respondents to calculate the total combined values of perceived importance for each Accomplishment and Performance.

The Series 2 Performances appear in descending order of importance. This is calculated with the median statistic for the most highly rated Performance, thus placing it at the top of the architecture, down to the fourth most highly rated Performance at the bottom of each PAVA model. In cases where two or more Performances have the same median, their order of importance (or their position in the hierarchy) is calculated with the aid of the sum of their given ratings.

Series 3 describes the most integral Abilities indicated by respondents, comprising the four Performances for each Accomplishment. The Abilities are listed in a cluster next to their connected Performance in descending order, according to the number of times they were mentioned by respondents in the context of each particular Accomplishment and connecting Performance. The number indicating how often respondents mentioned a particular Ability is shown in Exhibits 8.1 – 8.12 under *F* (frequency).

On the far right of every PAVA model under **Cf** (cognitive function) is a classification for each Ability according to their cognitive function. These cognitive functions and their purpose will be defined and discussed in more detail in Part Four of this chapter.

PAVA QUICK KEY	
$\sum$R	Sum of the ratings supplied by respondents
Md	Median statistic
Cf	Cognitive function as classified for each Ability
Ef	Expressive function
Rf	Receptive function
T	Thinking function

EXHIBIT 8.1 PAVA Model Of The Accomplishment Personnel Management

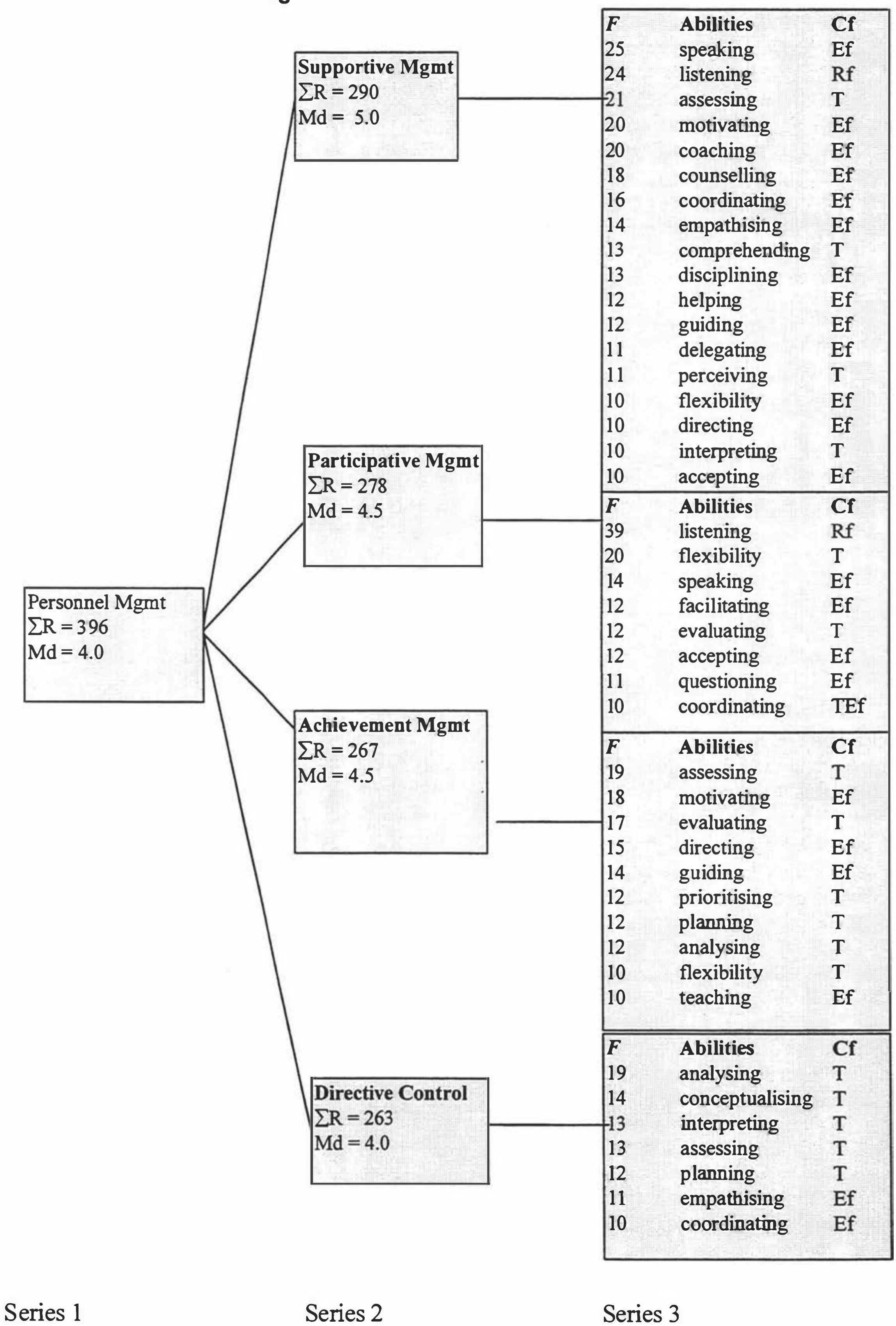


EXHIBIT 8.2 **PAVA Model Of The Accomplishment Organisational Management**

Org. Mgmt
$\sum R = 368$
Md = 4.0

Task Mgmt
$\sum R = 146$
Md = 5.0

F	**Abilities**	**Cf**
15	analysing	T
14	evaluating	T
11	assessing	T
9	coordinating	Ef
9	conceptualising	T
9	planning	T
9	comprehending	T

Directive Control
$\sum R = 122$
Md = 4.0

F	**Abilities**	**Cf**
15	analysing	T
10	conceptualising	T
9	comprehending	T
8	interpreting	T
7	assessing	T
6	implementing	Ef
6	evaluating	T

Achievement Mgmt
$\sum R = 119$
Md = 4.0

F	**Abilities**	**Cf**
6	implementing	Ef
6	assessing	T
5	directing	Ef
5	guiding	Ef
5	listening	Rf

Self Learning
$\sum R = 110$
Md = 3.5

F	**Abilities**	**Cf**
10	reading	Rf
9	analysing	T
8	evaluating	T
6	interpreting	T
5	listening	Rf
5	comprehending	T
5	assessing	T

Series 1 Series 2 Series 3

EXHIBIT 8.3 PAVA Model Of The Accomplishment Military Knowledge

Military Knowledge
$\sum R = 405$
Md = 4.0

Self Learning
$\sum R = 235$
Md = 5.0

F	Abilities	Cf
25	reading	Rf
23	analysing	T
16	questioning	Ef
15	evaluating	T
15	listening	Rf
13	reflecting	T
13	assessing	T
12	solving	T
12	interpreting	T
12	comprehending	T
11	accepting	Ef
11	perceiving	T

Task Mgmt
$\sum R = 205$
Md = 4.0

F	Abilities	Cf
16	analysing	T
14	comprehending	T
14	assessing	T
13	solving	T
12	planning	T
12	evaluating	T
11	prioritising	T
11	implementing	Ef
11	interpreting	T
11	speaking	Ef

Directive Control
$\sum R = 197$
Md = 4.0

F	Abilities	Cf
17	listening	Rf
16	analysing	T
15	interpreting	T
14	assessing	T
11	conceptualising	T
10	planning	T
10	implementing	Ef
8	reading	Rf

Achievement Mgmt
$\sum R = 178$
Md = 4.0

F	Abilities	Cf
10	directing	Ef
10	coaching	Ef
10	speaking	Ef
10	analysing	T
9	prioritising	T
9	motivating	Ef
9	assessing	T

Series 1 Series 2 Series 3

EXHIBIT 8.4 PAVA Model Of The Accomplishment Resource Managing

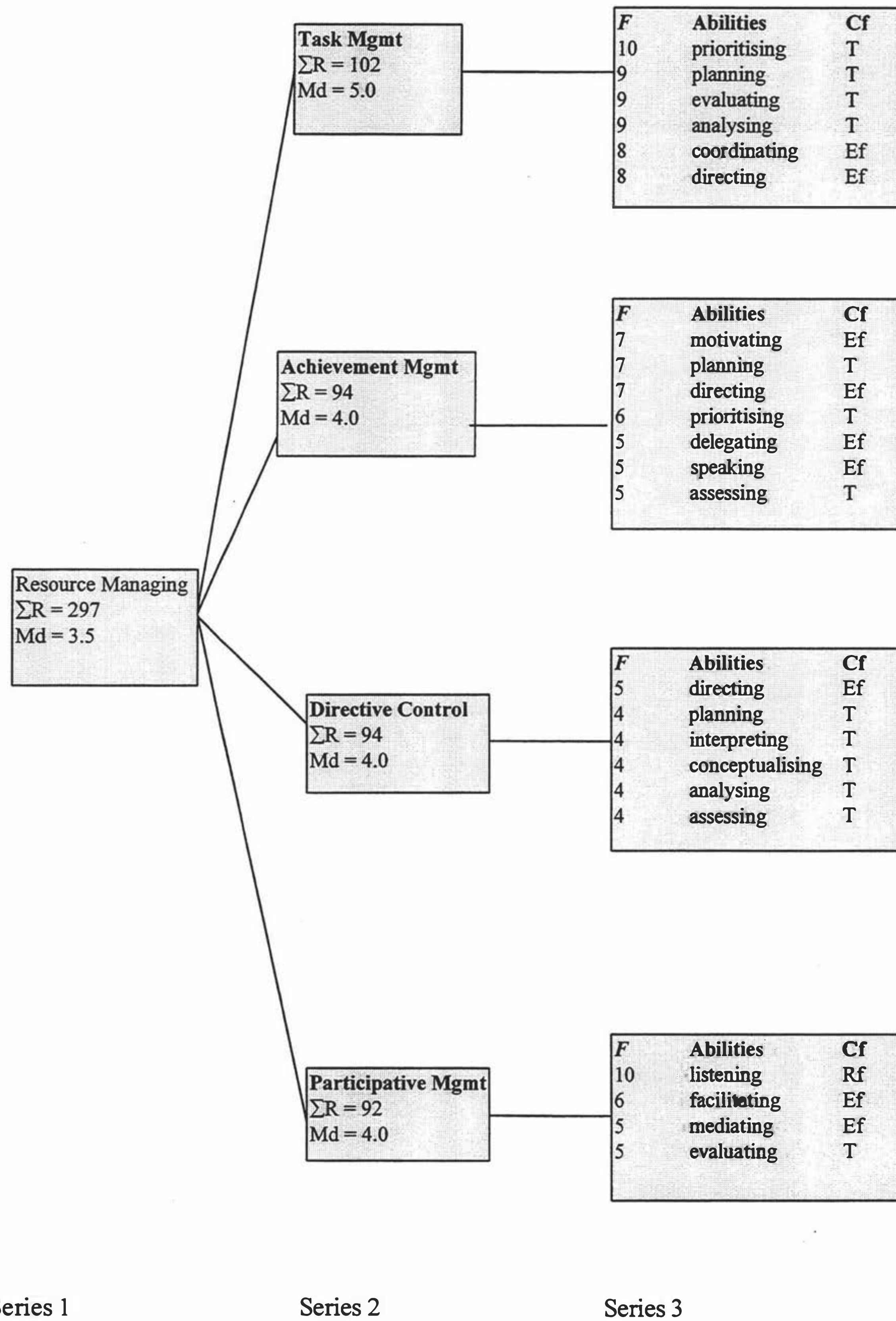


EXHIBIT 8.5 PAVA Model Of The Accomplishment Professional Knowledge

Professional Knowl.
$\sum R = 475$
Md = 5.0

Self Learning
$\sum R = 341$
Md = 5.0

F	**Abilities**	**Cf**
34	reading	Rf
31	listening	Rf
27	questioning	Ef
25	analysing	T
23	evaluating	T
17	comprehending	T
17	interpreting	T
14	achievement motivation via independence	Ef
12	writing	Ef
9	speaking	Ef

Task Mgmt
$\sum R = 287$
Md = 4.0

F	**Abilities**	**Cf**
26	analysing	T
25	comprehending	T
23	evaluating	T
22	assessing	T
18	conceptualising	T
16	reading	Rf
15	coordinating	Ef
14	implementing	Ef
13	planning	T
12	prioritising	T
11	solving	T
11	listening	Rf
11	speaking	Ef

Directive Control
$\sum R = 273$
Md = 4.0

F	**Abilities**	**Cf**
19	analysing	T
18	interpreting	T
18	comprehending	T
17	assessing	T
12	solving	T
11	implementing	Ef
11	listening	Rf
11	conceptualising	T

Achievement Mgmt
$\sum R = 265$
Md = 4.0

F	**Abilities**	**Cf**
14	assessing	T
13	motivating	Ef
12	speaking	Ef
10	achievement motivation via independence	Ef
10	writing	Ef
10	speaking	Ef
10	comprehending	T

Series 1 Series 2 Series 3

EXHIBIT 8.6 **PAVA Model Of The Accomplishment Leadership**

Leadership
$\sum R = 412$
Md = 5.0

Supportive Mgmt
$\sum R = 293$
Md = 5.0

F	**Abilities**	**Cf**
30	listening	Rf
23	motivating	Ef
21	delegating	Ef
18	assessing	T
16	guiding	Ef
14	speaking	Ef
13	mentoring	Ef
13	facilitating	Ef
13	questioning	Ef
13	empathising	Ef
12	evaluating	T
12	perceiving	T
11	directing	Ef
11	helping	Ef
11	counselling	Ef
11	comprehending	T
10	coordinating	Ef
10	coaching	Ef

Achievement Mgmt
$\sum R = 285$
Md = 5.0

F	**Abilities**	**Cf**
18	guiding	Ef
17	motivating	Ef
16	directing	Ef
15	speaking	Ef
13	coordinating	Ef
12	assessing	T
11	planning	T
11	listening	Rf
10	implementing	Ef

Task Mgmt
$\sum R = 279$
Md = 5.0

F	**Abilities**	**Cf**
19	analysing	T
19	assessing	T
18	directing	Ef
16	speaking	Ef
15	questioning	Ef
14	motivating	Ef
14	delegating	Ef
14	evaluating	T
13	planning	T
13	implementing	Ef
12	prioritising	T
11	coordinating	Ef
11	conceptualising	T
10	solving	T

Directive Control
$\sum R = 277$
Md = 5.0

F	**Abilities**	**Cf**
18	analysing	T
15	conceptualising	T
14	interpreting	T
14	assessing	T
13	perceiving	T
13	coaching	Ef
11	delegating	Ef
11	listening	Rf
10	planning	T

Series 1 Series 2

EXHIBIT 8.7 **PAVA Model Of The Accomplishment Operations Management**

Operations Mgmt
$\sum R = 354$
Md = 4.0

Task Mgmt
$\sum R = 156$
Md = 5.0

F	Abilities	Cf
15	assessing	T
14	planning	T
13	analysing	T
10	evaluating	T
9	implementing	Ef
9	interpreting	T
9	writing	Ef

Directive Control
$\sum R = 146$
Md = 5.0

F	Abilities	Cf
12	interpreting	T
10	planning	T
9	evaluating	T
9	analysing	T
8	delegating	Ef
8	comprehending	T
7	implementing	Ef

Achievement Mgmt
$\sum R = 133$
Md = 4.0

F	Abilities	Cf
11	motivating	Ef
10	analysing	T
8	directing	Ef
7	evaluating	T
6	prioritising	T
6	planning	T
6	solving	T
6	assessing	T

Supportive Mgmt
$\sum R = 127$
Md = 4.0

F	Abilities	Cf
13	listening	Rf
6	empathising	Ef
6	perceiving	T
5	guiding	Ef
5	caring	Ef
5	evaluating	T
5	solving	T
5	speaking	Ef
5	assessing	T

Series 1 Series 2 Series 3

EXHIBIT 8.8 PAVA Model Of The Accomplishment Financial Management

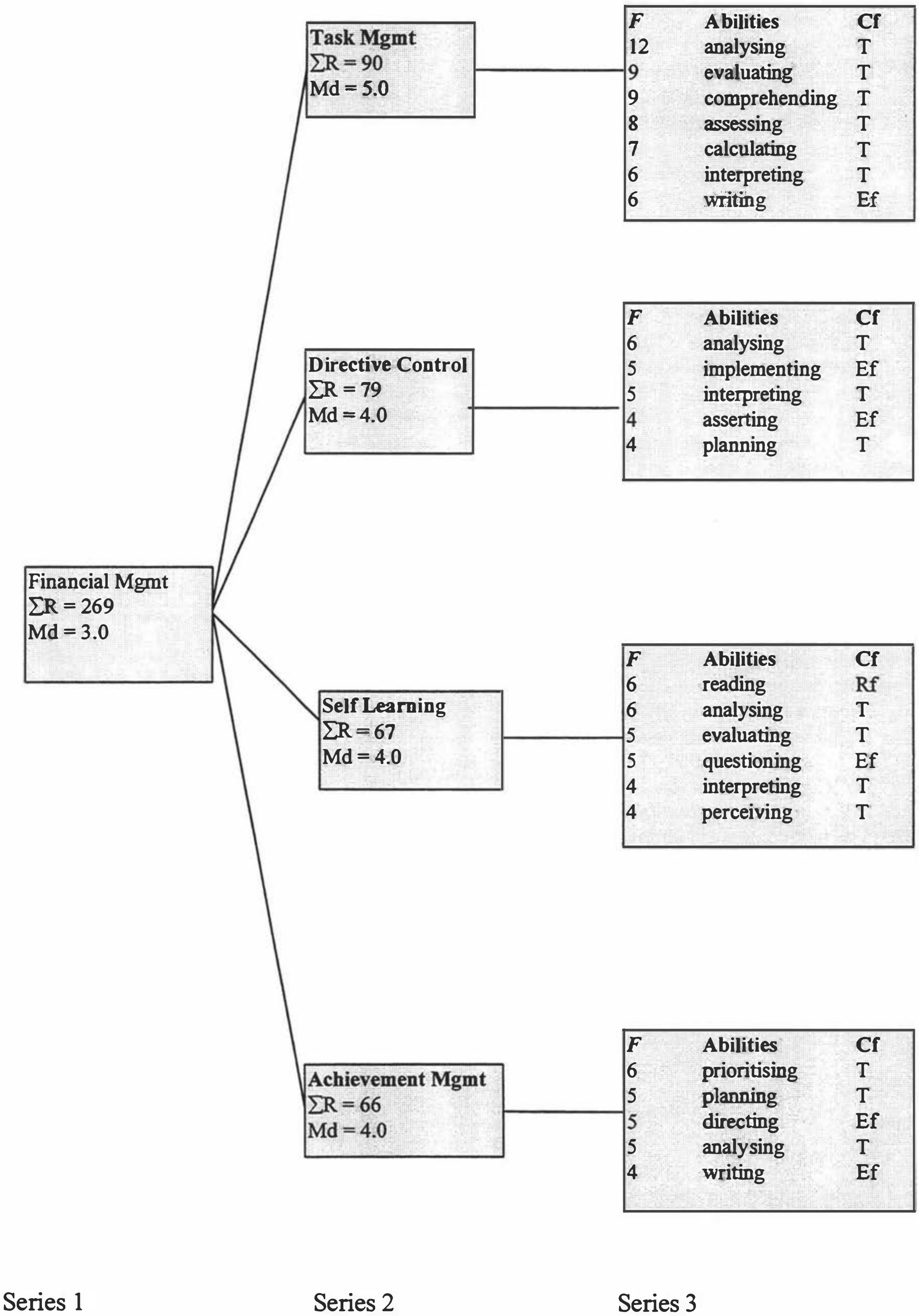


EXHIBIT 8.9 PAVA Model Of The Accomplishment Training Management

Series 1

Training Mgmt
$\sum R = 347$
Md = 4.0

Series 2

Task Mgmt
$\sum R = 178$
Md = 5.0

Series 3

F	**Abilities**	**Cf**
19	analysing	T
17	evaluating	T
15	assessing	T
12	conceptualising	T
11	coordinating	Ef
11	planning	T
11	comprehending	T
10	directing	Ef
10	implementing	Ef

Series 2

Achievement Mgmt
$\sum R = 178$
Md = 5.0

Series 3

F	**Abilities**	**Cf**
11	counselling	Ef
11	evaluating	T
11	assessing	T
9	analysing	T
8	motivating	Ef
7	coordinating	Ef
7	planning	T
7	guiding	Ef
7	coaching	Ef

Series 2

Supportive Mgmt
$\sum R = 161$
Md = 4.0

Series 3

F	**Abilities**	**Cf**
13	coaching	Ef
11	listening	Rf
11	assessing	T
8	planning	T
8	counselling	Ef
7	motivating	Ef
7	helping	Ef

Series 2

Participative Mgmt
$\sum R = 152$
Md = 4.0

Series 3

F	**Abilities**	**Cf**
16	listening	Rf
9	evaluating	T
9	questioning	Ef
8	speaking	Ef
7	facilitating	Ef
7	choosing	T
7	accepting	Ef

Series 1 Series 2 Series 3

EXHIBIT 8.10 PAVA Model Of The Accomplishment Liaison

Series 1

Liaison
$\sum R = 394$
Md = 4.0

Series 2

Supportive Mgmt
$\sum R = 147$
Md = 4.0

Series 3

F	**Abilities**	**Cf**
14	listening	Rf
11	coordinating	Ef
11	speaking	Ef
7	mediating	Ef
7	facilitating	Ef
7	interpreting	T
7	empathising	Ef
7	comprehending	T
7	assessing	T

Participative Mgmt
$\sum R = 144$
Md = 4.0

F	**Abilities**	**Cf**
20	listening	Rf
11	speaking	Ef
10	coordinating	Ef
9	questioning	Ef
8	facilitating	Ef
8	evaluating	T
7	analysing	T
7	assessing	T

Directive Control
$\sum R = 143$
Md = 4.0

F	**Abilities**	**Cf**
13	coordinating	Ef
11	interpreting	T
11	listening	Rf
9	planning	T
9	analysing	T
7	evaluating	T
7	comprehending	T
7	assessing	T

Cultural Mgmt
$\sum R = 138$
Md = 4.0

F	**Abilities**	**Cf**
14	listening	Rf
11	speaking	Ef
9	caring	Ef
8	empathising	Ef
7	questioning	Ef
6	helping	Ef
6	accepting	Ef
5	sociability	Ef
5	evaluating	T
5	comprehending	T

EXHIBIT 8.11 PAVA Model Of The Accomplishment Communication

Communication
$\sum R = 462$
Md = 5.0

Task Mgmt
$\sum R = 294$
Md = 4.0

F	**Abilities**	**Cf**
29	writing	Ef
27	speaking	Ef
24	analysing	T
23	listening	Rf
21	comprehending	T
17	questioning	Ef
16	evaluating	T
16	reading	Rf
14	planning	T
14	interpreting	T
14	conceptualising	T
13	assessing	T
12	implementing	Ef
11	prioritising	T
11	perceiving	T
10	coordinating	Ef

Supportive Mgmt
$\sum R = 285$
Md = 4.0

F	**Abilities**	**Cf**
26	speaking	Ef
25	listening	Rf
12	questioning	Ef
11	evaluating	T
11	interpreting	T
11	writing	Ef
11	assessing	T
10	empathising	Ef
9	coordinating	Ef
9	delegating	Ef

Participative Mgmt
$\sum R = 271$
Md = 4.0

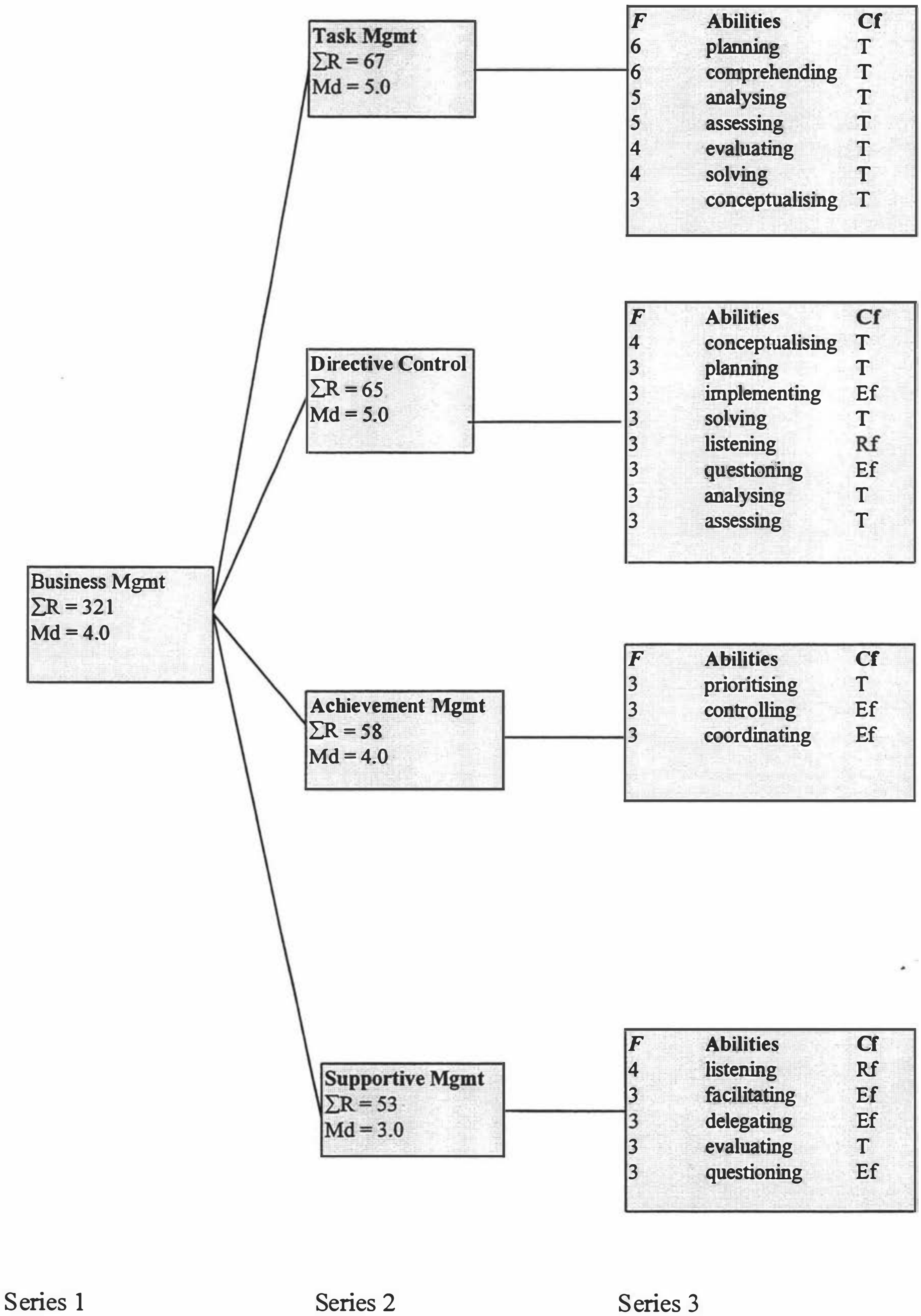
F	**Abilities**	**Cf**
33	listening	Rf
24	speaking	Ef
13	coordinating	Ef
13	evaluating	T
10	facilitating	Ef
9	writing	Ef
9	empathising	Ef
8	accepting	Ef
8	comprehending	T

Directive Control
$\sum R = 268$
Md = 4.0

F	**Abilities**	**Cf**
13	interpreting	T
13	listening	Rf
13	speaking	Ef
12	assessing	T
10	directing	Ef
10	analysing	T
9	evaluating	T
8	implementing	Ef

Series 1 Series 2 Series 3

EXHIBIT 8.12 PAVA Model Of The Accomplishment Business Management



Summary of Part Three - PAVA Results

According to information processing theory, arrangement of respondent details into hierarchical process levels, facilitates a clearer understanding of respondents' cognitive processes (Matlin, 1994), and their patterns of connectivity (Rumelhart & McClelland, 1986). All twelve of the identified Accomplishments have been classified by respondents as being either *quite important, important*, or *very important* (rated from 3-5 on the rating scale). Utilising both the median statistic of the ratings of importance, and the total number of the ratings describing the perceived importance of each Accomplishment and Performance, the PAVA models in Exhibits 8.1 – 8.12 illustrate the combined respondents' perceptions of their knowledge structures.

Each Pava model varies in its degree of descriptive detail, with some, such as Exhibit 8.8, describing the Accomplishment Financial Management, having only a few Abilities in evidence, and relatively low numbers to support each Ability. In contrast, exhibit 8.6, describing the Accomplishment Leadership, has more than twice as many Abilities, and far higher respondent numbers supporting these Abilities. Accomplishments rated by relatively fewer respondents also had correspondingly less data from which to construct PAVA models.

The Performance Directive Control appears in all but one PAVA model, which is the Accomplishment Training Management. Its omission in this Accomplishment may be due the use of templates and standard operating procedures in the army training function, perhaps leaving little room for personal interpretation. Respondents working in training functions may therefore perceive that they have no use for Directive Control. The Abilities identified in the Performance Task Management have a very similar appearance to those usually found under Directive Control. In light of this, it could be posited that problem solving and decision making Abilities are important for those employed in training functions, but that they may have less perceived freedom in the interpretation of their orders.

In the remaining eleven Accomplishments, the Performance Directive Control is constructed in a similar manner, with the Abilities being largely of a problem solving, decision-making, and assessing nature (see Appendix 1, p. 19). There is no supporting evidence to indicate the presence of creative decision-making Abilities. Not in one instance did a respondent add words to the instrument implying the use of Abilities which could be interpreted to refer to the use of creativity or personal initiative in his or her work.

While the Performance Directive Control occurs most often of all the Performances (cited eleven out of twelve times), Task Management is cited ten out of twelve times, and in seven of the PAVA models appears as the most highly rated Performance (see Table 8.15). Achievement Management is similarly cited ten times but is not rated as highly as Task Management.

TABLE 8.15 Analysis Of Performances Appearing In The PAVA Models

Performance	∑R*	Mean of the Ratings	No. Occurrences in Models
1. Task Mgmt	1804	4.29	10
2. Supportive Mgmt	1356	4.1	6
3. Participative Mgmt	937	3.8	6
4. Achievement Mgmt	1643	3.8	10
5. Directive Control	1927	3.93	11
6. Self Learning	753	3.92	4
7. Cultural Mgmt	138	3.5	1

* refers to the total sum of all the ratings for each Performance given by the respondents as shown in the twelve PAVA models.

The Performance Self Learning was rated as the most important Performance for both Professional Knowledge and Military Knowledge Accomplishments. The identity and hierarchical order of the four Performances for both Accomplishments are exactly the same, although the Abilities differ (see Exhibits 8.3 and 8.5). This may in part be due to the higher rating of importance for Professional Knowledge (of the two Accomplishments), with more descriptive data being in evidence.

Respondents supplied the most comprehensive description for the Accomplishment Leadership, suggesting that respondents felt most comfortable in describing this Accomplishment's constituent parts in such relatively comprehensive detail, perhaps due to perceptions of familiarity with this Accomplishment.

Table 8.15 shows the sum of the ratings ($\sum R$) for each Performance, indicating the total rating number. It shows the total means of the ratings, and the number of times each Performance appeared in one of the twelve PAVA models. The Performances can be listed in descending order of occurrences, according to the total sum of their ratings:

1. Directive Control
2. Task Management
3. Achievement Management
4. Supportive Management
5. Participative Management
6. Self Learning
7. Cultural Management

This order of the Performances may suggest that the Accomplishments are completed by firstly, tapping into the command philosophy of directive control and thereby determining what is required, secondly, evaluating the task and how it should be done and thirdly, motivating and directing self and/or subordinates to achieve the task. Supportive and participative functions are used if and when required, but only after the task approach and its parameters have been established. Supportive and participative Performances do not appear to be involved in the initial decision-making processes when interpreting tasks and the approach that should be used.

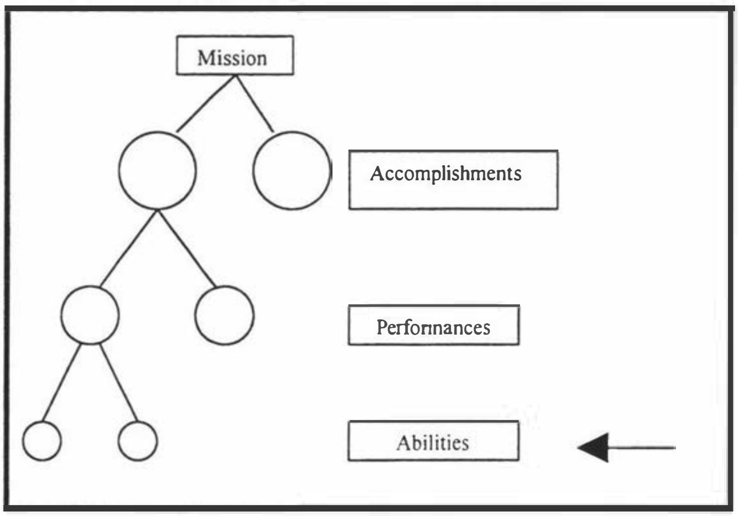
When rating the perceived importance of the Performances by their total means (see Table 8.15), the descending order varies from that mentioned above:

1. Task Management

2. Supportive Management
3. Directive Control
4. Self Learning
5. = Participative Management & Achievement Management
6. Cultural Management

Task Management remains in the most important grouping while Directive Control moves down the list, with greater emphasis being placed upon Participative Management. Achievement Management is also demoted in perceived importance. Both interpretations establish a perception that the task is central and foremost when performing Accomplishments.

Part Four - Classifying Cognitive Functions At The Abilities Level



Exhibits 8.1 – 8.12 show the classifications of the Abilities into their cognitive functions (Cf). Such classifications help to describe each Ability and its cognitive purpose. These classifications have been established from the work of Lezak (1995). Lezak (Ibid) classifies cognitive functions into four major classes:

1. *Receptive functions* involve the abilities to select, acquire, classify, and integrate information.
2. *Memory and learning* refer to information storage and retrieval.
3. *Thinking* concerns the mental organisation and reorganisation of information.
4. *Expressive functions* are the means through which information is communicated or acted upon.

Lezak explains that although each function constitutes a distinct class of behaviours, normally they work in close, interdependent concert and are inextricably bound together - different facets of the same activity (Lezak, 1995, p. 22). Classification and interpretation of the process Abilities therefore requires a note of caution. While it would be neat and tidy to categorise each listed Ability into one of Lezak's four cognitive functions, research by Damasio, Tranel, and Damasio (1989) has reinforced the recognition that, as more is learned about information processing, it becomes increasingly more difficult to make theoretically acceptable distinctions between the different information processing functions.

In an attempt to recognise patterns in the data it has however been considered useful to attempt some type of classification process. It was tempting to categorise some functions in two classes i.e. *questioning* could be classed as both thinking and as an expressive function, *accepting* could be classed as a receptive function, a thinking function, and as an expressive function - all three cognitive functions are involved in *accepting*. Such overlaps were minimised by identifying the contexts in which respondents used these Abilities and then placing them in the most appropriate class (see Table 8.16). The author and two psychologists independently classified every Ability into what each considered to be an appropriate class of cognitive functions. The subsequent comparison of the three classifications resulted in a one hundred percent agreement. The classifications are shown in Table 8.16.

In order to describe what each cognitive function means, Lezak's (1995) paraphrased descriptions of the four classes of cognitive functions are given:

Receptive Functions [Rf]

Entry of information into the central processing system proceeding from sensory stimulation i.e. sensation through perception, which concerns the integration of sensory impressions into psychologically meaningful data, into memory. Most sensory data enter neurobehavioural systems as perceptions already endowed with previously learned meanings. The perceptual functions include such activities as awareness, recognition, discrimination, patterning, and orientation.

Memory and Learning [M & L]

Lezak (Ibid) explains that the capacity for memory and learning are central to all cognitive functions and to all that is characteristically human in a person's behaviour. According to her, that memory is subdivided into one of three kinds: two are succeeding stages of short-term storage and the third is long-term storage. She quotes Goldman-

Rakic (1993) claiming that the functions of working memory [short-term storage] are to hold information in mind, to internalise information, and to use that information to guide behaviour without the aid of or in the absence of reliable external cues. Long-term memory storage is described as involving a number of processes occurring at the cellular level. These include neurochemical alterations in the neuron, neurochemical alterations of the synapse, and elaboration of the dendritic structures of the neuron to increase the number of contacts made with other cells. The path of physical changes to the brain described above result in the creation of a memory.

With the aid of neurotransmitters such as glutamate, acetylcholine, norepinephrine, serotonin, and dopamine, and hormones such as ACTH and vasopressin which improve the ability to focus, the learning process is instigated and embedded (Kalat, 1995) (this is a very concise and inexhaustive overview of the learning process which is predominantly from a biological perspective).

Thinking [T]

Lezak (1995, p. 34) defines thinking as any mental operation that relates two or more bits of information explicitly or implicitly. In this research, the term thinking (T) subsumes a host of discrete cognitive functions such as computation, reasoning and judgement, concept formation, abstracting and generalising, ordering, organising, planning, and problem solving.

Expressive Functions [Ef]

These include speaking, drawing, or writing, manipulating, physical gestures, facial expressions, or actions and movements. Mental activity is inferred from the presence and/or occurrence of these functions.

Categorising And Rating Process Abilities

A summary of Abilities is shown in Table 8.16 in descending order by their frequency of occurrences over the twelve Accomplishments in the PAVA models. Table 8.16 also illustrates the cognitive function classifications of the Abilities. The most frequently cited Abilities appear to be ubiquitous across all or most of the occupational categories represented by the respondents.

TABLE 8.16 Cognitive Function Classifications Of Abilities

Ability	Order	Frequency	% of Total	Cognitive Classification
Listening	1	410	10.2	Rf
Analysing	2	403	10.02	T
Assessing	3	393	9.7	T
Evaluating	4	320	7.9	T
Speaking	5	270	6.7	Ef
Interpreting	6	200	4.9	T
Comprehending	7	195	4.8	T
Planning	8	186	4.6	T
Co-ordinating	9	169	4.2	Ef
Questioning	10=	147	3.6	Ef
Motivating	10=	147	3.6	Ef
Conceptualising	11	119	2.9	T
Directing	12	119	2.9	Ef
Reading	13	115	2.8	Rf
Implementing	14	82	2.0	Ef
Writing	15	79	1.9	Ef
Empathising	16	78	1.9	Ef
Guiding	17=	66	1.6	Ef
Prioritising	17=	66	1.6	T
Coaching	18	64	1.5	Ef
Delegating	19	63	1.5	Ef
Facilitating	20	58	1.4	Ef
Accepting	21	53	1.3	Ef
Perceiving	22	47	1.1	T
Solving	23	46	1.1	T
Counselling	24	38	.09	Ef
Flexibility	25	31	.07	T
Helping	26	15	.03	Ef
Caring	27	14	.03	Ef
Mentoring	28=	13	.03	Ef
Reflecting	28=	13	.03	T

There are no memory and learning function categories shown in Table 8.16. No Abilities were explicitly cited by respondents that could be interpreted to mean *memorising* or *learning* functions, but neither were these provided on the given list of Abilities in the MAPA instrument (Appendix 1, p. 19). It could be surmised that as Self Learning was indicated as a Performance, many of the above Abilities are in fact components of the learning and memorising process. Learning did not feature prominently amongst the Performances although it did receive a relatively high mean rating by respondents, suggesting that while it did not appear frequently, it was still considered important.

Listening, the most commonly-cited receptive function [Rf], shows the perceived importance of speech perception in respondents' daily work lives. It cannot be assumed from this however, that the auditory function is the dominant receptive function amongst respondents. The MAPA instrument's repertoire of receptive functions was not exhaustive in the Abilities list given to respondents (although they were free to add such if they felt it was warranted). As an example, visual receptive functions were not on the list given to respondents. Implications of the perceived importance of the listening Ability will be discussed in later chapters.

Listening is the most frequently-cited Ability (Table 8.16). This is followed by three Abilities which fit into the assessing/problem solving categories. Speech, the next most frequently-cited Ability, is followed by more problem solving Abilities (these have all been placed in the *thinking* classification of cognitive functions, except for speech which is an expressive function). Some authors (Wills, 1994; Calvin, 1996; Stringer & McKie, 1996) point out that speech (whether inner of outer speech) could be regarded as part of the thinking process, as articulation of a thought is often instrumental in either developing, reinforcing or altering ones perception of something. Vygotsky (1987, p. 251) stated that *Speech does not merely serve as the expression of developed thought. Thought is restructured as it is transformed into speech. It is not expressed but completed in the word.* This order of frequencies could also be suggestive of the order of information processing as portrayed in Wickens and Flach's (1988, p. 112) model where information is received (through receptive cognitive functions), then it is identified and clarified (thinking cognitive functions), and finally, through a decision making process, acted upon (through further thinking or expressive cognitive functions).

Further down the list of Abilities in Table 8.16 are the thinking cognitive functions of *conceptualising, prioritising, perceiving, solving, flexibility*, and *reflecting*. Expressive functions could be interpreted to be predominantly task-focused. Concern for people only appears to surface with Abilities such as *empathising,* a lowly 16th position (although listening, speaking and motivating could possibly also be involved in concern for people-type considerations). This suggests that more effort is expended in task completion than in demonstrating concern for people, as Abilities related to the showing of concern for people were mentioned less often by respondents.

The low frequency rating of the Ability Motivating in Table 8.16 may underrate it's actual usage. Research by Adams, Prince, Instone, and Rice (1984), briefly referred to in chapter six, identified the importance of the perceived ability to motivate, inspire, and encourage. PAVA Exhibit 8.1 - Personnel Management, Exhibit 8.4 - Resource Managing, and particularly Exhibit 8.6 - Leadership, all show that motivating is a frequently occurring Ability, thus supporting Adams, et al. and their research conclusions. Therefore, although motivating is only 10th equal in the frequency count portrayed in Table 8.16, this may be due to the presence of a number of Accomplishments not involved in commanding or managing people. It could also be that a great deal of the motivational function of command is delegated to the NCO's.

The Ability *innovating* which was listed on the Abilities page of the MAPA instrument, has not appeared at all in Table 8.16. Respondents indicated no other terms that could be construed as being even distantly synonymous with the term innovating. Therefore, it is suggested that, although directive control featured prominently amongst the Performances, respondents indicated (by exclusion) that it is totally devoid of anything even closely resembling the use or application of creative or innovative abilities. This possibly suggests a predominance of template-type techniques of problem solving and decision making and an apparent lack of the application of the much vaunted intuitive-type problem solving or analysis.

Accomplishments Expressed In Terms Of Their Cognitive Functions

All of the Accomplishments shown in the PAVA models (see Exhibits 8.1-8.12) bar one show that the command doctrine of directive control has a high impact on work methods. Respondent data indicates that the Performance Directive Control consists largely of thinking functions (T). At one level, the prevalence of directive control in most respondents' architectures signifies that the Army has achieved its goal of promulgating its command doctrine. Analysis of the more specific Abilities for each architecture suggest however that directive control, as perceived within the New Zealand Army by respondents, lacks the desirable qualities of creativity, initiative, and the use of intuition. The process Ability possibly most closely resembling creativity may be Flexibility which was 25th in the frequencies (Table 8.16) - never once occurring in any clusters describing Directive Control. It appears most predominantly in the architecture describing Personnel Management. Why is it that respondents who gave the Accomplishment Personnel Management a high rating of importance, perceived such a high need for flexibility, while not indicating a need for this Ability in any of the other Accomplishments? One answer may be the need for rapid adjustment and learning because of the changes in regulations concerning human resource management, another possibility may be that a degree of flexibility is required when dealing with the personal needs of individuals.

After Directive Control, Task Management and Achievement Management were the next most pervasive Performances utilised by respondents to describe their perceived Accomplishments. Task Management is consistently described with terms suggesting a predominance of thinking (T) cognitive functions. Achievement Management has a greater predominance of expressive functions (Ef). This may be interpreted to mean that respondents perceive the task analysis to be dependent upon their own knowledge and intellectual abilities, while achievement of the task may be perceived to be an outward expression resulting from their analysis.

Supportive Management and Participative Management respectively follow after Achievement Management. Expressive functions predominate for these Performances (as would be expected).

The following pie charts (Figure 8.3 - 8.14) perhaps most easily illustrate at a glance, each Accomplishment's constituent cognitive functions. The process undertaken to achieve this is described as follows: Accomplishments consist of the constituent Abilities of Performance 1 through to 7. Respondents were asked to identify the Abilities for the four most important Performances for each Accomplishment. These Abilities can be categorised into one of three cognitive functions: receptive functions, thinking functions, or expressive functions. The percentages of the three cognitive functions are shown for each Accomplishment.

The percentage of receptive functions appear very small in comparison with the other two cognitive functions, implying that receptive functions are not frequently used. This would be an incorrect assumption. Nine out of the twelve Accomplishments show receptive functions of more than five percent, indicating that receptive functions make a significant contribution. The three Accomplishments with less than five percent occurrence of receptive functions are Resource Managing, Operations Management, and Financial Management, possibly all areas where the level of expertise and type of work require little in the way of receptive communication. PAVA models in Exhibits 8.4 and 8.7 show that the former two Accomplishments require the Performance of Supportive Management, however, suggesting that respondents using these Accomplishments do not work in isolation from other people.

Receptive functions appear less frequently used, possibly because there were fewer Abilities on the given list describing receptive functions, of which there will always be fewer than thinking functions for example, but this should not demean the importance of the receptive functions. Of all the Abilities, *Listening* was the most often-mentioned Ability by respondents.

The following pie charts show ratios of cognitive functions purely on a frequency basis, which is useful for viewing the percentage of functions for the Accomplishments. Excluding the receptive functions which make up a small but not insignificant percentage of the total, the Accomplishments can firstly be categorised into two groups (see Table 8.17):

Group 1: Accomplishments with a majority of thinking functions.

Group 2: Accomplishments with a majority of expressive functions.

The above grouping of the cognitive functions can be seen in Table 8.17:

TABLE 8.17 Categorising Abilities into Cognitive Functions

Group 1 - Thinking functions		**Group 2 - Expressive functions**	
Military Knowledge	63%	Leadership	57%
Organisation Mgmt	69%	Personnel Mgmt	50%
Resource Managing	57%	Liaison	46%
Professional Knowl.	56%	Communication	44%
Ops Mgmt	62%		
Financial Mgmt	70%		
Business Mgmt	61%		
Training Mgmt	47%	Training Mgmt	47%

Training Management is equally distributed between expressive and thinking functions. Organisation Management, the two knowledge Accomplishments, Communication, and Liaison have the highest percentage of receptive functions, perhaps suggesting that these Accomplishments rely greatly on the ability to communicate, and particularly for the two latter Accomplishments, the ability to listen.

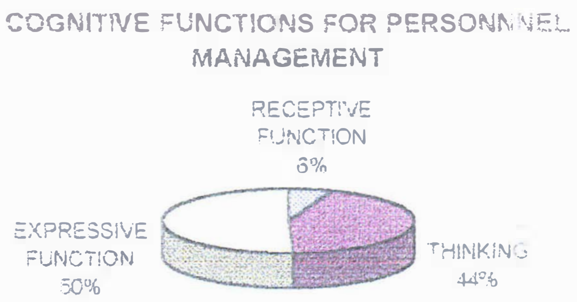


FIGURE 8.3 Personnel Management

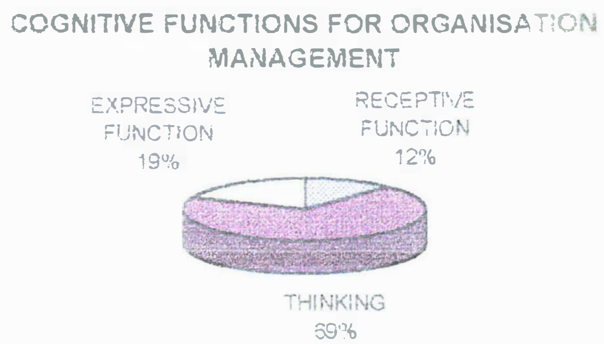


FIGURE 8.4 Organisation Management

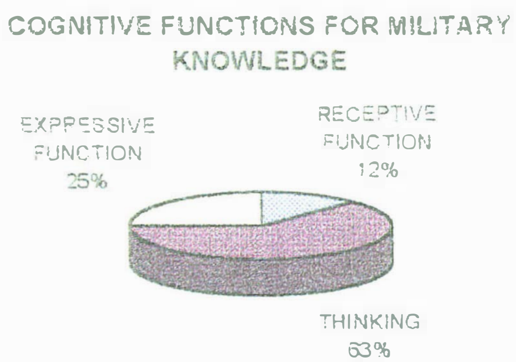


FIGURE 8.5 Military Knowledge

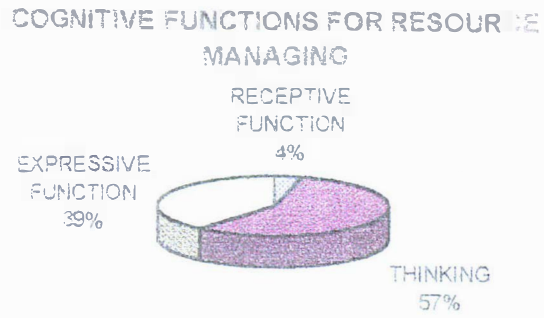


FIGURE 8.6 Resource Managing

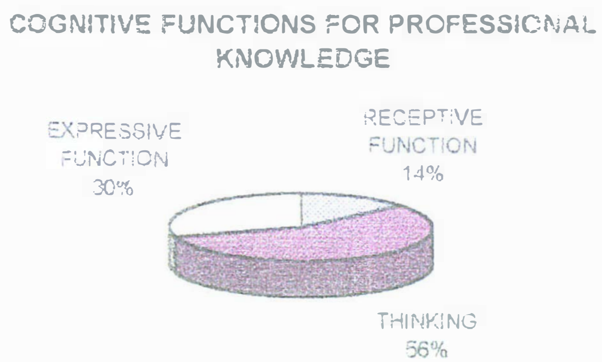


FIGURE 8.7 Professional Knowledge

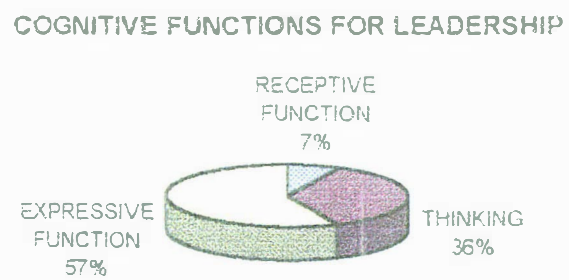


FIGURE 8.8 Leadership

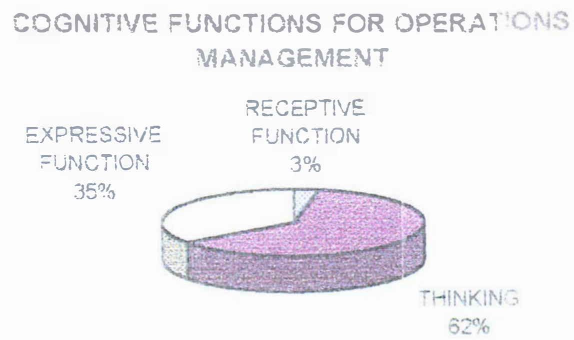


FIGURE 8.9 Operations Management

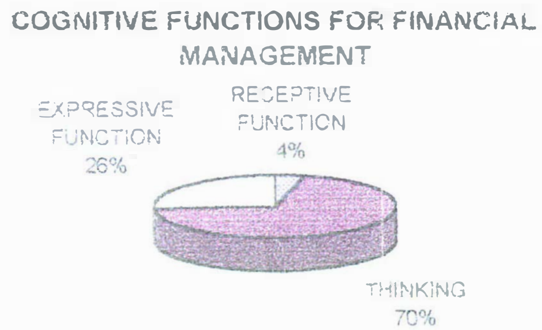


FIGURE 8.10 Financial Management

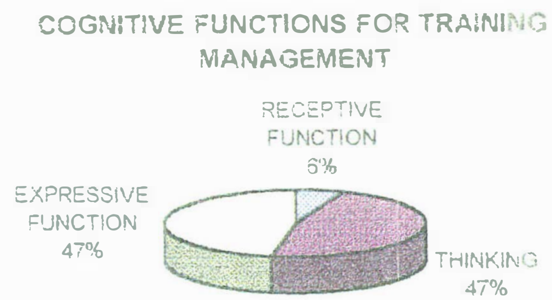


FIGURE 8.11 Training Management

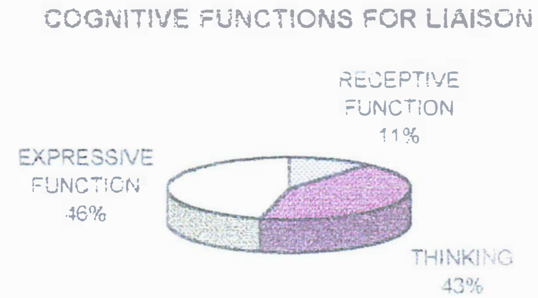


FIGURE 8.12 Liaison

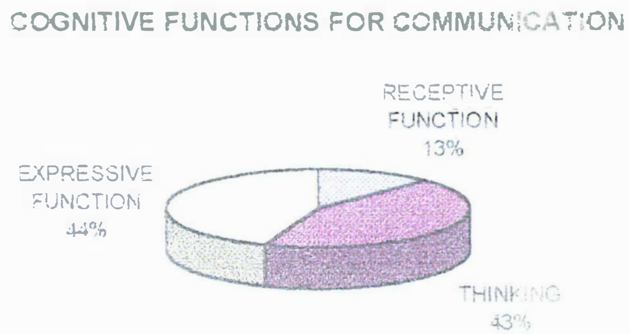


FIGURE 8.13 Communication

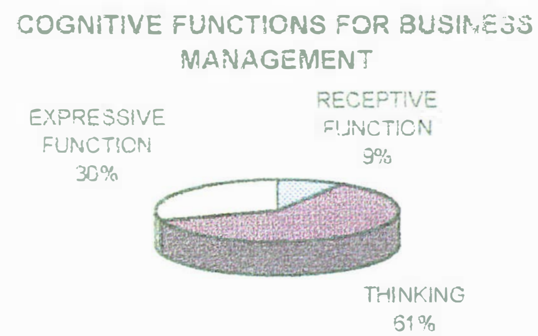


FIGURE 8.14 Business Management

Figures 8.3-8.14 show the relative percentage differences between each cognitive function for the twelve Accomplishments. While the number of receptive functions appear relatively little-used in proportion to the other two cognitive functions, Table 8.18 clearly highlights a perceived order of usage of receptive functions across the twelve Accomplishments.

TABLE 8.18 Receptive Cognitive Functions

Accomplishments arranged in descending order in terms of the number of receptive cognitive functions used.
1. Professional Knowledge 2. Communication 3. Military Knowledge 4. Organisation Management 5. Liaison 6. Business Management 7. Leadership 8. Personnel Management 9= Training Management 9= Resource Management 9= Financial Management 10. Operations Management

The data suggests that Professional Knowledge, Communication, and Military Knowledge use the greatest number of receptive functions. This could be due to the constant training and education requirements demanded of officers seeking promotion. The importance of the two knowledge Accomplishments highlight the amount of continuing learning associated with being an officer. The three Accomplishments listed at the bottom of Table 8.18 are Resource Management, Financial Management, and Operations Management. As these Accomplishments deal largely in the management of *things* as opposed to the management of people, their low perceived need for receptive functions is not surprising.

TABLE 8.19 Thinking Cognitive Functions

Accomplishments in descending order in terms of the number of thinking cognitive functions used.
1. Financial Management 2. Organisation Management 3. Military Knowledge 4. Operations Management 5. Business Management 6. Resource Managing 7. Professional Knowledge 8. Training Management 9. Personnel Management 10. Communication 11. Liaison 12. Leadership

There are no surprises in the order of the thinking functions (see Table 8.19), although the difference between Military Knowledge and Professional Knowledge is quite marked. Such a difference may suggest that more thinking effort is required in order to fulfil the military requirements of the job than is required for the specific functions in which respondents are employed. Perhaps this requires further explanation. While the Performance Military Knowledge is required for warfare/combat exercises, the majority of most officers' time is spent performing administrative/managerial functions, generally far removed from any warfare/combat exercises. Respondents may perceive a greater need for thinking functions when applying Military Knowledge because of the intermittent nature of its use. Changes and upgrades in the technology being applied may also demand constant learning and rethinking. Thinking functions appear to be lowest for the Accomplishments dealing with the command/management of people.

TABLE 8.20 Expressive Cognitive Functions

Accomplishments arranged in descending order in terms of the number of expressive cognitive functions used.
1. Leadership 2. Personnel Management 3. Training Management 4. Liaison 5. Communication 6. Resource Managing 7. Operations Management 8.= Professional Knowledge 8.= Business Management 9. Financial Management 10 .Military Knowledge 11. Organisation Management

The order of the contents of Table 8.20 suggest that the knowledge and task-oriented Accomplishments have the least application for expressive functions and the people-oriented Accomplishments score the highest. This order clearly polarises the two groups into task and people orientations, with Leadership, Personnel Management, Training Management, Liaison, and Communication, being people-oriented, and Operations Management, Professional Knowledge, Business Management, Financial Management, Military Knowledge, and Organisation Management being more task oriented. Communication is 5^{th} in the order of usage of expressive functions, which appears to contradict intuitive perceptions of this Accomplishment. A look at its Abilities suggest however, that Communication consists of several receptive functions. This could imply that the Accomplishment Communication, is more concerned with the reception of information, than its expression – or passing onwards of information.

Wilks' Lambda Discriminant Analysis

The Wilks' Lambda statistic is a discriminant analysis for predicting group membership for the Performances for each Accomplishment (respondents were given a choice of seven Performances from which they could choose four for their most important Accomplishments). Wilks' Lambda, also known as the *U* statistic or *maximum likelihood criterion*, is the ratio of the within-groups sum of squares to the total sum of squares. A lambda of 1 indicates that all observed group means are equal. Values close to 0 occur when within-groups variability is small compared to the total variability, that is, when most of the total variability is attributable to differences between the means of the groups. Large values of lambda indicate that group means do not appear to be different, while small values indicate that group means do appear to be different.

Wilks' Lambda discriminant analysis was used by Hunt and Kinross for differentiating competencies for top-level health executives. The authors write that this type of analysis discriminates the data utilising the discriminant coefficient, differentiating the data in terms of their *frequency* and *potency*. *Frequency* refers to the strength of observations cited by respondents, and *potency* refers to the magnitude of the discriminant coefficients for each observation in relation to other observations (Hunt & Kinross, 1988, pp. 20-21). The authors claim that the use of discriminant analysis in this manner has provided an important advance in curriculum design. They argue that this procedure facilitates the ability to distinguish between those Performances that are mentioned most frequently by respondents and those identified less frequently but which are nevertheless important in adding depth (potency) to the patterning. They write that frequency counts or ranked sum results alone may not provide an accurate picture of true Performances. Lockett-Kay (1992) used the same procedure for her research with forensic psychiatrists.

The Wilks' Lambda discriminant analysis was unsuccessful with the current MAPA data in an attempt to differentiate *frequently* occurring responses from Hunt and Kinross' (1988) *potent* responses. There was little agreement between the results identified in the PAVA models and the discriminant analysis. While Hunt and Kinross (1988) and Lockett-Kay (1992) sampled groupings of people with similar occupations (therefore increasing each sample's homogeneity with regard to their instrument responses), the current sample group hold a wide variety of occupations, including assistants to the Governor General, educators, infantry commanders, tactical instructors, careers managers, and so forth. Such wide occupational variety has translated into data showing less uniformity than in Hunt and Kinross' and Lockett-Kay's samples. Wilks' Lambda discriminant analysis has difficulty predicting group membership if the data lacks a particular threshold of consistency.

As only a few Performances could be differentiated into frequently occurring or potent responses, no further use was made of the Wilks' Lambda discriminant analysis. Those Performances which did appear to be potent were sometimes cited by fewer than five respondents. However, the similarity of the responses (a high mean, indicating that the Performance was perceived to be very important) was interpreted as indicating relatively low respondent variability and therefore a high percentage of agreement. The results identified some potent Performances but these were not supported by large numbers of respondents.

The Question Concerning Work's Greatest Challenge

Respondents were asked as a concluding question to describe the greatest challenge or difficulty faced during their army career. The responses have been content analysed and placed into the following table (Table 8.21) (some respondents fit into more than one category by giving multiple responses to this question, or by answering with comprehensive responses that could be placed into more than one category):

TABLE 8.21 Greatest Challenges As Described By Respondents

Challenge or Difficulty	Grouping
• frustration with level of influence	2
• demands from high amount of training	3
• solving others' problems	2
• frustration with lack of recognition	1
• problems related to guiding of subordinates	3
• deciding whether to continue with career	1
• meeting both army and family needs	1
• frustration with poor people management	1&2
• working through an adverse report	1
• maintaining morale versus cynicism	1
• frustration with army bureaucracy	1&2
• no facility for adding creative influence into work	1&2
• being absent from family	1
• balancing family and work	1
• culture shock	1
• fighting poor attitude towards women	1
• continually having to prove myself	1
• lack of compensation for army life demands	1
• poor career planning/lack of concern for career planning	1&2
• implementing army goals and policy	3
• living with regimental system and regulations	1
• personality clashes	1
• operational reality	1&3
• redundant training	3
• training others	3
• Officer Cadet School	3
• Commanding NCO's	1
• Learning	3
• Lack of funding and technical redundancy	1
• motivating soldiers	1
• paper work	1

The above responses shown in Table 8.21, largely fall into one of three generic groupings:

1. morale,
2. organisational, management, structural problems,
3. learning/training-related perceptions.

The results of a content analysis of these statements made by respondents can be seen in Table 8.22, showing a frequency distribution of the three army ranks and the numbers of respondents stating an identification with the three challenge groupings.

The term *greatest challenge* was carefully selected to encourage a wide range of responses. It was not intended that respondents dwell upon negative aspects of their jobs or the organisation as a whole, although the majority of responses appear to have done so.

TABLE 8.22 Frequency Distributions Of Army Rank And Greatest Challenge

Challenge grouping	Lieutenant	Captain	Major	Total
Morale	17	10	17	**44**
Org. Structural Problems	18	11	21	**50**
Learning/Training-Related	20	3	5	**28**
Total	**55**	**24**	**43**	**122**
Total number of respondents	42	25	36	103

By far the largest challenge grouping concerns organisational, management, and structural issues. It could also be implied that many of the morale concerns stem from perceived problems with the organisation, management, or structure of the New Zealand Army.

For lieutenants, the greatest challenge was perceived to be learning and training-related. The challenges described above are perhaps indicative of the rank and level of influence experienced by respondents. For lieutenants, the experiences of Officer Cadet School (OCS) would still be fresh in their memories, along with the training courses they must attend, ranging from specialist courses, to the mandatory administration, military law, communications, and other such courses. They also indicated that army life did not meet the expectations created during their time at OCS. Captains find themselves with a growing amount of responsibility and are no longer tolerant of the attitudes displayed towards young officers, particularly by senior NCO's. Some of these attitudinal problems have been described as reluctance to take orders from young officers, condescension, and constant testing of knowledge and boundaries of physical endurance. Majors indicated that they receive more respect from soldiers than captains and lieutenants, but their overall view of the organisation also enlarges, apparently having a detrimental effect, as demonstrated by their level of frustration with the organisation structure and management.

Reflecting On The Data – A Summary

This chapter has described several forms of data analysis, showing the following:

- The majority of respondents are men aged 25-39.
- The sample can be broken into three ranks consisting of approximately 41% lieutenants, 24% captains, and 35% majors.
- Respondents' careers within the New Zealand Army can be divided into three occupational categories: 27% served the majority of their time in training functions, 18 % in staff functions, and 62% served the majority of their time in regimental functions.
- Content analysis of individual mission statements show that the majority of the respondents were, at the time of completing the questionnaire, occupied in work, which could be differentiated into one of three broad, but distinctive mission categories:
    - management and development of non-human resources,
    - command, or
    - management, development, and support of human resources.
- Several significant differences between mission categories and Accomplishments have been identified. Of the three mission categories, those respondents identifying with the mission category *command* appear to have the highest number of differences between Accomplishments.
- The data suggests that there are only a few perceptual dissimilarities between the three ranks concerning critical competencies, knowledge, skills, and abilities required to complete work requirements.
- Respondents perceive that their most important work contributions include knowledge, leadership, and communication.
- Financial and resources management functions are regarded to be of lesser importance relative to the other Accomplishments.

- The process Abilities used in this research has been divided into three categories of cognitive functions: receptive functions, thinking functions, and expressive functions. The receptive function *listening* is the most often-cited Ability. While the majority of Abilities given to respondents (see Appendix One, p. 19 and Table 8.16) fall into the expressive function category, the most often-cited Abilities are those categorised as thinking functions, suggesting that officers' work has a high degree of assessing, problem-solving, and decision-making content.
- The frequency distribution of the Abilities suggests that respondents receive and analyse a great deal of information. This may show that the positions held by respondents are designed to act as relays for tasks. They appear to receive information and, after it is filtered and analysed, the information, or its implications/applications are passed on to the appropriate recipients. Respondents appear to be employed largely for the purpose of receiving information and to solve the problems associated with that information and its distribution.
- The Wilks' Lambda statistic interpreted by previous researchers to differentiate between frequent and potent variables has proven to be inappropriate as an analytical tool for this particular research. The explanation given for this is based on the high degree of variability between respondents' occupations. The wide range of occupational groups within this sample population has resulted in data describing cognitive functions for numerous army jobs, as opposed to only one job as was the case for Hunt and Kinross (1988) and Lockett-Kay (1992).
- Respondent data indicates a state of activation favouring knowledge-based and analytically oriented cognitive processes. It also shows an underlying doctrine of directive control permeating the majority of the identified cognitive architectures. This pattern of connectivity does not however fit with the ideals espoused by the literature concerning directive control. The prototype patterns of connectivity representing respondents' cognitive processes for Directive Control suggest the presence of assessing/decision-making/problem solving processes, but show no evidence of cognitive processes resembling creativity or innovation.
- The complete PAVA models illustrate the recurrent utilisation of a few knowledge and activity clusters for the achievement of the organisational mission. From the

results, it could be suggested that the respondents' most important work achievements can be defined across twelve Accomplishments, an alternating combination of seven Performances, and various permutations of less than fifty Abilities.

- The architectures of the two knowledge Accomplishments share the greatest number of similarities of all the Accomplishments, differing only slightly in the content and configuration of their Abilities. Professional Knowledge was rated as being more important than Military Knowledge.
- Leadership was rated as very important, and Liaison, and Personnel Management were both rated as important. The process Abilities activated within these three Accomplishments suggest a high usage of expressive functions for these people-oriented Accomplishments, particularly in the supportive and participative Performances. The exercising of these people-oriented cognitive functions never occur without the presence of the Performance of Directive Control. Such patterns of connectivity may imply deliberate cognitive strategies on the part of respondents in order to cope with work demands and the work environment. For example, they may prefer to motivate subordinates through supportive behaviours, as opposed to using behaviours with a high task orientation.
- People-oriented Accomplishments such as Leadership and Personnel Management, show the greatest proportion of expressive functions. Task-oriented Accomplishments such as Financial Management and Business Management, show a greater proportion of thinking functions. No Accomplishments are however solely constructed of only one type of cognitive function.
- The recurrent application of a few Performances suggests that the *pattern of connectivity* for respondents has significant impact on the cognitive process. This could be interpreted to indicate the presence of both serial and parallel distributed processing. Processing is serial in that Accomplishments are followed by specific Performances consisting of specific Abilities. Processing is in parallel however, as wide patterns of activation and their architectures influence the completion of an Accomplishment. No Performances appear in isolation as they resonate in co-operation with other Performances.

- The respondents' perceptions concerning their greatest challenge while employed with the New Zealand Army (Tables 8.21 and 8.22), hint at a sense of dissatisfaction with their careers. From the more detailed explanations provided by respondents, it is apparent that the army has difficulty implementing its goals and policies, and that there may be some ambiguity concerning those goals. Respondents express dissatisfaction with some of the decisions being made higher up the chain of command, particularly as the decision-maker's reasoning is rarely included. It is perceived that the judgement abilities of officers ranked below major, is not respected outside the limits of their jobs (and in some cases also within the limits of their jobs). There appears to be a perception that there is a great deal of image building at the senior rank levels, resulting in conflict and an atmosphere of unhealthy competition and turf jealousies. This, it is claimed, stifles co-operation and results in a climate of distrust. Respondents report that there is very little acceptance of risk, and innovation is only tolerated at the highest levels of the command chain (it is tolerated from lieutenant-colonel and upward). All this suggests that the command climate within the New Zealand Army is not congruent with doctrinal ideals. These perceptions could not be shown or expanded upon in a format such as Tables 8.21 and 8.22. These findings are reported from the respondents' explanations for the greatest challenge question provided in the MAPA questionnaire.

Chapter Nine. Discussion

Introduction

The following discussion synthesises the literature review with the data analyses and results. Firstly the utility and efficacy of the research instrument are reviewed and examined. Respondents' perceptions of their cognitively-based competencies and how these add value to their work organisation are discussed within the framework provided by the complete PAVA models. Learning implications are viewed in light of the identified need for generative learning Finally, implications for artificial intelligence (AI), intelligence augmentation (IA), and leadership theory are woven into the contextual fabric provided by the data.

The Research Instrument

Use of the MAPA model facilitated the identification of successive levels of the knowledge hierarchy, through an architecture describing Accomplishments, Performances, and their Process Abilities. The research results show the frequency and importance respondents placed upon cognitive tasks, functions, and processes, suggesting:

1. how respondents occupy their time and energy and
2. the priority they place on particular tasks, functions, and processes.

The MAPA and PAVA models have together proven to be complex but useful instruments for the identification and analysis of cognitively-based competencies for high-level work positions.

The analytical and statistical tools found to be most useful for the analysis, consisted predominantly of frequency counts and ratings of perceived importance by respondents. The Wilks' Lambda discriminant statistic used by Hunt and Kinross (1988) and Locket-Kay (1992) was found to be inappropriate for this particular application of the MAPA instrument. This can be explained by the variability of the occupations of the sample population. The sample was found to be representative of numerous occupational groups within the New Zealand Army and the Wilks' Lambda discriminant analysis was not suited to such a degree of data variability. The respondents sampled by Hunt and Kinross (1988) and Locket-Kay (1992) were more specialised in their occupational fields, therefore facilitating the use of more rigorous statistical methods.

The complex mathematical tools used in PDP models, involving linear and/or matrix algebra were also not appropriate for this particular data analysis. Such complex analytical tools would be appropriate however, if the MAPA instrument were to be expanded upon to include connectivity weightings and inferential relations *between* Accomplishments.

This research has crossed several traditional boundaries including military history, behavioural, educational, and cognitive psychology, philosophy, and management studies. It is argued that this research has maintained ecological validity throughout. It has not meandered into the realms of the esoteric laboratory-bound research of which Wickens and Flach (1988) are so scathing, as reported in chapter one of this study.

Missions

Respondents were asked to describe their occupational missions. The resulting mission statements were grouped into three main mission categories:

1. Management and development of non-human resources,
2. Command,
3. Management, development, and support of human resources.

Officers whose responses more closely identified with the definition of mission type 2, were more likely to perceive a higher rating of importance for such Accomplishments as Personnel Management, Military Knowledge, Resource Managing, Leadership, and Training Management, than those who were more closely identified with the definitions of mission types 1 and 3. This suggests that those who perceive they have a command mission are the least narrowly focused, dealing in a wider range of issues stretching across and encompassing the old boundaries defined as either showing concern for the task or the people.

The three mission types concur with the model in chapter six (Figure 6.1) describing command as overlapping subsets of the management of *things* and the leadership of *people*. It is possible however, with the results of this research, to create a more definitive version of such a model. This will be discussed later in the chapter.

The Value Being Added

In chapter six, command was described in terms of technical, managerial, and leadership functions. Peace time conditions currently being experienced within the New Zealand Army are thought to favour the managerial role over technical and leadership functions, with the command emphasis being efficiency oriented, often stressing budgetary criteria over actual capability. This is not however reflected in the Accomplishments as respondents, from lieutenant to major, consistently agreed on the greater importance of leadership and people management over resources and financial management. Whether comparing frequency counts or ratings of importance, the results remain the same, indicating that respondents spend less of their time undertaking resource and financial management tasks, and that they do not consider these tasks to be as important as the gaining of knowledge (suggesting a career/promotion orientation) and the management of people.

The results of this research indicate that the functions with which officers are occupied are complex and varied. They operate in environments requiring specialised knowledge across a great diversity of circumstances and situations. The results suggest that officers are largely dependent upon their ability to communicate. This is defined by their ability to comprehend the task to be completed, and their ability at organising and communicating this to subordinates in terms that both inform and motivate.

The Accomplishments of Professional Knowledge and Communication are perceived to be the most important value-added functions for lieutenants, captains, and majors of the New Zealand Army. Respondents were selected to take part in this research from courses viewed to be intensive and difficult (Grades II and III officer promotional courses, and the Master of Philosophy degree programme residential courses). It is possible that the amount of importance being placed upon Professional Knowledge was influenced to some extent by the particular course in which respondents' found themselves at the time of the research instrument's administration. However, in support of the Accomplishment Professional Knowledge's high rating of importance by respondents, it should be pointed out that the New Zealand Army occupies a great deal of its officers' time with training and learning, especially at the ranks of lieutenant, captain, and major. The importance of Professional Knowledge as an Accomplishment may also be indicative of promotional career aspirations. Continued learning and satisfactory attendance at promotional courses will enhance officers' career potential. The high rating of importance for Professional Knowledge by respondents may therefore be an indicator of ambition.

Respondents perceive the following twelve Accomplishments, shown in Panel 9.1, to be most important in their work. These Accomplishments are listed in decreasing order of perceived importance:

Accomplishment	Description
Professional Knowledge	Pertaining to knowledge specific to work
Communication	Writing, talking, presenting, listening...
Leadership	Providing guidance, inspiration, setting an example
Military Knowledge	Technical and military knowledge
Liaison	Go-between, cooperating, implementing, negotiating
Organisation Mgmt	Managing the army's goals and acting accordingly
Operations Mgmt	Managing operations, movements, projects
Training Mgmt	Organising and/or managing training
Personnel Management	All aspects of people management
Business Management	Administering, negotiating
Resource Managing	Managing stores, items, machinery, software.
Financial Management	Dealing with accounts, finances, budgets.

PANEL 9.1 **Respondent Perceptions Of Importance Of Accomplishments**

Leadership was found to have the widest pattern of connectivity, with the highest number of identified process Abilities making up its constituent parts. Of all the Accomplishment architectures, respondents were able to provide the greatest amount of detail describing Leadership.

According to definitions of value-added approaches to leadership provided by Farkas, De Backer, and Sheppard (1995), one interpretation of the ordering of importance of Accomplishments fits into a combination of the *Human Assets Approach* and the *Expertise Approach.* These approaches combine concern for people; demonstrated by Leadership and Personnel Management Accomplishments displaying Abilities such as motivation, coaching, and guiding; with organisational or specialist expertise, demonstrated by the importance placed upon the knowledge Accomplishments. In chapter six it was suggested that the army resembled Farkas et al's box organisation. The research evidence indicates that officers play little or no part in the perceived control and financial emphasis indicative of the box organisation. It is possible however, that such control measures are imposed from higher command levels and that participating officers have learned to function within the given parameters established by their budgets. Another explanation for the lower rating of importance for the Accomplishment Financial Management, is that officers perceive this to be an NCO function.

Hays and Thomas (1967) refer to leaders having either a task or social orientation. The Ohio State Leadership Studies (Yukl, 1994) represent leader behaviours on a continuum from *initiating structure*, which is largely a task orientation, to those who are high on *consideration* or display relationship behaviour. The placing of importance on knowledge and people-oriented Accomplishments suggests that respondents perceive socially oriented work, consisting largely of relationship behaviour, to be amongst their most important contributions to the New Zealand Army.

The above appears to be verified by the Performance data describing the people-oriented Accomplishments, with the greatest importance being placed on supportive functions. The Ohio State researchers, according to Yukl (1994, p. 54), define task behaviours as *the extent to which the leader engages in spelling out the duties and responsibilities of an individual or group*. It includes telling people what to do, and how to do it, where to do it, and who is to do it. Relationship behaviour refers to *the extent to which the leader engages in two-way communication, including listening, facilitating, and supportive behaviour*. The high ratings of importance of the two Performances of Supportive and Participative Management imply the perceived importance of supportive functions. This relationship/supportive bias concurs with the literature on directive control in its employment of facilitative as opposed to autocratic behaviours.

The Accomplishments rated as being most important, appear to be predominantly people-oriented functions such as Communication, Leadership, Liaison, and for many, Personnel Management. Delving further into the architectures of these Accomplishments at the Performance level, every one of the above Accomplishments has a highly rated Supportive Management Performance, with Abilities such as counselling, listening, and coaching. This draws attention to the perceived importance of supportive behaviour, as opposed to authoritarian, task-dominated behaviour amongst respondents. All but two Accomplishments include the Performance Task Management in their patterns of connectivity (only the Accomplishments of Personnel Management and Liaison do not). This suggests a balance between the task and the people that is perhaps not made clear in some of the theories which often polarise these two orientations.

Task Management's pervasive presence in most architectures could also be inferred to mean that completion of the task is important for most respondents and that they are therefore task oriented. Such results are supported by Hogg's (1993) research involving six European telecommunications companies, where most managers judged task-focused competencies to be most important, and problem-solving and analysis were the competencies endorsed most frequently, by 62 percent of the sample. Similarly, the Abilities indicate that Task Management is predominantly defined by thinking functions such as assessing, planning, analysing, and evaluating. Task Management should therefore not necessarily be seen to infer a task orientation or task behaviours as per the task orientation models, such as The Ohio State Leadership Studies. It is more apparent from the Abilities that Task Management refers to problem-solving or decision-making functions. Facilitative and support behaviours represented by the presence of Supportive and Participative Management Performances may also indicate a counterbalancing of any solely task oriented inferences that could be drawn from the term Task Management.

Complete Cognitive Architectures And Their Implications

The presence of a large number of thinking cognitive functions in each architecture indicates that respondents perceive their work to be largely of an assessing, problem-solving nature. Figure 6.2 of chapter six is an interpretation of the changes in the skills required at different levels of command. It describes an increasing demand for conceptual skills and a decreasing demand for technical skills, as people rise up the level of command from junior to senior positions. The research findings suggest that officers from lieutenant to major have very similar cognitive architectures and that it may be overly simplistic to refer to skills and their distribution in the manner depicted in Figure 6.2.

It may be more accurate to describe the changes needed as people rise in seniority by referring to the context in which they operate. As officers rise from junior to middle to senior command positions, the contexts in which they work change. Instead of increasing in conceptual skills and decreasing by an equal amount in technical skills, it would be more likely that officers build upon existing cognitive architectures by increasing their patterns of connectivity to encompass cognitive tools for coping with their new enlarged circumstances.

Yukl's (1994) classification of managerial skills into one of the three categories of *technical skills, interpersonal skills*, and *conceptual skills* in chapter six, is also not clearly reflected by the shape and contents of the cognitive architectures. Undertaking any one of the Accomplishments requires all three of Yukl's classifications to be operating at any one time. As an example, Exhibit 8.4 (in chapter eight) shows the cognitive architecture for Resource Managing. It shows the presence of similarly rated Performances describing all three of Yukl's classifications to achieve this one Accomplishment. This could suggest a need for a more accurate classification system which more closely resembles reality. Many models portraying individual work functions in distinct categories may be too simplistic. The knowledge, skills, attitudes, and abilities required to perform an Accomplishment, as suggested by the complexity of the PAVA models, are too wide ranging to be categorised using only one single descriptive term.

By viewing all of the PAVA models, it is possible to appreciate the complexity and diversity of respondents' duties. These models also act as cognitive blue prints, revealing the unique and adaptive qualities implicit within a group's information processing strategies. As was discussed in chapter eight, respondents appear to favour cognitive strategies employing assessing and decision-making/problem solving Abilities in the context of a people orientation, to achieve their tasks. Their cognitive architectures therefore resemble a *receiver-decoder-transmitter* model of operation. This conflicts with the expectations of directive control, requiring an architecture designed to *observe-decide-act-review.* This is supported by the profile of an officer portrayed in Figure 6.3 where directive control and task achievement dominate the patterns of connectivity. In contrast, this research has identified patterns of connectivity that are dominated by both supportive and task functions but without the necessary parallel input from creative functions, as would be expected when operating under a doctrine of directive control.

A group of ten majors who had no previous exposure to this research, were shown the semi-completed PAVA models in August of 1997. They unanimously agreed that the models represented behaviour that appeared consistent with their perceptions of their work requirements in a 'collective' manner. The shape of the Leadership Accomplishment model, illustrated in Exhibit 8.6 (chapter eight), was greeted with surprise however. They were astonished that Supportive and Achievement Management should be the most highly-rated Performances. They expressed the view that a cognitive architecture illustrating leadership should have Directive Control as its most important

Performance, followed by Task Management, then Achievement Management, and finally Supportive Management. In essence they thought that the architecture illustrated in Exhibit 8.6 was an exact inversion of the way it should be constructed in the context of manoeuvre theory and directive control. Explanations range from the way directive control has been managed by the New Zealand Army, to the long-term impact of peace.

The findings could be dubbed as the collective mental representations and information processing models of the superorganism[55]. In this case the superorganism is the body from which the research respondents were drawn – the New Zealand Army. If viewed from this evolutionary biological perspective, each respondent is a member and contributor to the larger superorganism and his or her pooled effort helps it to move on its path through life (or its existence). Each contributor works toward the overall purpose of the greater organism of which s/he is a part. The Darwinian concept of natural selection could be said to occur within this superorganism as it struggles for existence and incurs a form of heredity with each of its offspring, resembling former or older members. Williams (1996, p. 23), describing Darwin's theory of evolution, claims that *each generation of offspring will have a biased representation of the unique variations found in the preceding one.* Whatever helped their struggle for existence will be more abundantly represented in the surviving offspring. In a metaphorical sense, within a superorganism such as may be represented by the New Zealand Army, particular traits, behaviours, traditions, and thoughts/beliefs which helped it to win the struggle for survival, may be perpetuated from generation to generation, providing the environment in which it lives/functions remains relatively constant. Hence, a great deal of prevailing tactical training has its roots in the Vietnam War, rather than in a hypothetical conflict based on premonitions and speculation concerning the future. Changes in the environment or the introduction of hitherto unknown competitors, technology, tactics, and/or strategies will require a revision of previous success factors. A failure to adapt may bring about the demise or extinction of the superorganism. The

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[55] Referred to by Wilson (1971) to describe the collective functions and specialisations found within insect societies. Bloom (1995, p. 59) describes human behaviour in terms of our need for and support of the greater human clump, which he refers to as the superorganism.

implications of this evolutionary biological perspective will become clearer in the ensuing discussion.

Command In A Context Of Conflict

The shape of the cognitive architectures for the twelve Accomplishments (shown in Exhibits 8.1-8.12) demonstrate that a relatively small number of *apparently* generic Performances are used to accomplish a wide variety of tasks and functions. Seven Performances, in clusters of four, describe how twelve Accomplishments, in various permutations and patterns of connectivity, are completed. It soon becomes apparent however, that the Performances, for example Task Management and Directive Control, which are important within most patterns of connectivity, are rarely constructed of exactly the same number and types of Abilities. This suggests that the Performances are an integral component for describing how Accomplishments are completed, but that their patterns of connectivity at the Abilities level, alter with the contexts (or environments) in which they are used. Context is therefore seen to be a crucial influence in the construction and use of a cognitive architecture.

The importance of context is supported by Clark (1997) when he argues that cognitive representations cannot be studied in isolation, without including the larger dynamics of the environment. Clark uses the example of a person attempting to complete a jigsaw puzzle. *The person picks up the pieces, rotates them to check for potential spatial matches, and then trying them out, are all parts of the problem-solving activity* (Ibid, p. 63). An interplay between the environment, the problem, the cognitive process, and the subsequent action-feedback-action is required in order to achieve a satisfactory result. Similarly, when studying the patterns of connectivity for each Accomplishment, the dynamics of the environment in which the Accomplishment is applied should not be excluded. The following section discusses cognitive architectures in the context of conflict circumstances.

In chapter eight, the Abilities identified from the MAPA research were listed in order of frequency (see Table 8.16), with the most frequently occurring Ability being shown to be *listening,* a receptive cognitive function (Rf). A grouping of Abilities next down the list are those classed as thinking cognitive functions (T) - *analysing, assessing, evaluating.* This hints at the possible presence of Slavin's (1997) interpretation of generative learning, where incoming information is continually being checked against old rules and being revised or transformed where these rules no longer apply. Cognitive architectures supporting generative learning possibly facilitate strategies for coping with rapidly changing situations as would be expected when operating under conditions of manoeuvre warfare.

Under conditions of manoeuvre warfare, the emphasis is on anticipating the unexpected moves of an opponent and to then respond by even more unexpected means to throw the opponent totally off balance. This requires a commander with cognitive abilities able to receive and analyse enough information to rapidly facilitate informed decision making, while checking intelligence against existing rules and knowledge. The commander must be able to weigh up the opponent's action against personal objectives and then devise a countering strategy which not only nullifies the opponent's action but follows through to throw him/her of balance. The ability to anticipate responses and behaviour would be of great advantage (only one respondent added the word *anticipate* to the list of Abilities). Such cognitive ability may fall into the common definition of intuitive knowledge (Armour, 1994).

The decision making model in Figure 9.1 attempts to predict some of the process Abilities required in a manoeuvre warfare context. The model illustrates the context for generative learning as pressure from time and lack of, over abundance of, or incorrect/false information forces the decision making process to exceed tolerance limits, and thereby influence the rational, logical, analytical mind. The mind which, if reliant on well-learned principles and rules taught for dealing with only one context, may fail to cope, or at best, be too slow to gain the upper hand. Such a mind may have an inflexible architecture which lacks the ability to facilitate a rapid transfer of learning.

In a conflict situation the decision maker may be coping with anxiety, perhaps sleep deprivation and/or hunger, some measure of fear of failure and its implications (portrayed in italics in Figure 9.1). In contrast to these negative influences the commander will also be motivated to succeed, perhaps elated/stimulated to be pitting his/her wits against an opponent, interspersed with alternating feelings of confidence and inadequacy until knowledge of the action either confirms success or failure.

The literature consistently identifies good command requiring *both* experience and intelligence. Having only the one factor is not generally regarded to be enough even in a non-military environment (Cox & Cooper, 1988, p. 174). Klein (1989) argues that previous experience or the ability to transfer lessons learnt from previous experience will enhance decision-making ability. Fiedler's (1986) Cognitive Resources Theory proposes that stress (stress is assumed to be high in times of conflict) moderates the relationship between leader experience and performance by having the commander deal with task problems by reverting to previously learned behaviour, rather than by treating them as new problems. It can be argued that experience on its own is therefore inadequate unless it is accompanied by an openness to the use of a mix of Abilities (using MAPA terminology) appropriate to the context.

A decision-making model such as is represented in Figure 9.1 emphasises the need for thinking (T) cognitive functions in order to interpret and assess information before taking any action. Ideally, in a manoeuvre warfare-type situation, it could be posited that the cognitive architecture would be similar to that which was expressed by the group of ten majors. With Performances in descending order of importance, Directive Control would be at the top of the architecture, followed by Task Management, then Achievement Management, and finally Supportive Management. This is the exact opposite of the PAVA model illustrating the Accomplishment Leadership (Exhibit 8.6).

While the architecture for Leadership was built from respondents operating in peace-time, it raises two questions concerning the importance of the dominant order of the Performances. Is the order of importance placed upon Performances an accurate representation of a particularly influential aspect of the neural circuitry, and if it is, can officers be trained/educated to switch from one pattern of connectivity to another, as is speculated to be the case when changing from a peace-time context to a context involving conflict/war? This study cannot answer such questions as there is a scarcity of published research on this subject, except to quote Lang (1965, p. 857) where he states that *creative innovation and initiative* are *necessary for effectiveness in war*, with similar sentiments expressed by Van Fleet (1976), Taylor and Rosenbach (1984), and Hooker (1993). Van Fleet and Yukl (1986, p. 55) claim that leaders in combat situations are confronted with a much more dynamic, uncertain, and hostile environment, requiring effective planning and problem solving skills. Abilities representing planning and problem solving appear in the Leadership cognitive architecture as illustrated in Exhibit 8.6, but are less frequently cited relative to many other Abilities. Creativity and innovation are not represented at all.

It could therefore be theorised that in times of war, an officer may be required to switch his/her pattern of connectivity, and will also be required to implement extra, and possibly new skills. Nowowiejski (1995) argues that the qualities required for battle command are rarely inherent and that they must be developed by training, self study and experience. These qualities describe a person who can interpret a situation, formulate solutions where none are readily apparent, and adapt to a changing environment. They also describe a person with flexible intellectual capacity (Ibid, p. 71). The level of difficulty associated with the switching of a pattern of connectivity is not known, but with the added requirement for an implementation of new skills, the officer will be required to perform in a manner to which s/he is not accustomed in times of peace. The application of generative learning has been suggested as a possible preparatory method to help officers when confronted with new situations and circumstances.

Time Elapsed

Receive intelligence (perceive, interpret, comprehend, analyse, anticipate, reflect)

Informational noise, fear, deprivations

Review intelligence against existing knowledge and plans (remembering, recognising)

Bias and subjectivity, memory imperfections, ego

Do existing rules still apply? (remembering, questioning, anticipating, evaluating, assessing, creating)

Experience, understanding

Consult with personal objectives for situation (interpreting, questioning, prioritising, analysing, solving) and develop plan (conceptualising, creating, planning, co-ordinating,)

Knowledge, experience, and ability

Act (implementing, motivating, initiating, directing, delegating, guiding, reflect)

Receive intelligence (interpret, comprehend, analyse, anticipate)…

FIGURE 9.1 Decision Making Model In Response To Opponent's Action

The high incidence of thinking cognitive functions amongst the process Abilities does not necessarily reflect the presence of generative learning. It does however suggest that respondents' occupations require them to be flexible and able to demonstrate a diverse repertoire of knowledge, skills, and abilities. While the use of such Abilities could be inferred to reflect generative learning, there is a clear omission of anything resembling creative-type Abilities present from the results of this research, and a measure of frustration with this state is verified in responses from the greatest *challenge* question at the conclusion of the MAPA instrument. Decision-making Abilities are vital as portrayed in Figure 9.1, with numerous stages requiring problem-solving and decision-making cognitive Abilities. Creative process Abilities and an organisational structure facilitating initiative are also critical for manoeuvre theory to succeed. The clear lack of these features as suggested by respondents is indicative of two factors within the New Zealand Army which mitigate against the implementation of the desired doctrines of manoeuvre theory and directive control:

1. officers are not able or required to use creative process Abilities and,
2. the structure of the organisation fails to facilitate or encourage the application of creativity and initiative.

That creativity and initiative are important cannot be stressed enough. Liddel Hart, restating one of Sun Tzu's principles claimed, *For the profoundest truth of war is that the issue of battles is usually decided in the minds of the opposing commanders, not in the bodies of their men* (Liddell Hart, 1970, p. 80). The implication is that a great deal of responsibility for the outcome of conflicts rests with only a few decision makers and their ability to be creative and unpredictable.

Figure 9.1 illustrates the need for both intellectual ability (as defined by decision-making success) and experience. Intellectual ability can be assumed to reside predominantly with the process Abilities categorised as thinking cognitive functions. It has been established however that increased knowledge and understanding is most beneficial if combined with experience. In combination, according to Lezak (1995) this stimulates neuronal activation, which in turn stimulates nerve cell growth and elaboration with corresponding synaptic proliferation - the process known as learning. Learning which encourages transfer across situations further increases synaptic potential by enlarging the pattern of connectivity. It is suggested however, that without the elements of initiative and creativity such potential remains significantly left-brain oriented. Such learning potentially serves to improve the logical, analytical, critical processes assumed to reside in the left hemisphere of the brain (Springer & Deutsch, 1993; Trevarthen cited in Gregory, 1987), but it also encourages predictability by possibly limiting the mind to routine computational architectures.

Supporting Whole-Brain Learning

Springer and Deutsch (1993) point out that *the left brain hemisphere's strategy for dealing with incoming information is best characterised as analytic, whereas the right hemisphere appears to process information in a holistic manner* (p. 52). The authors warn that not enough is known concerning the two hemispheres and that *attempts at the design of education along hemispheric lines is questionable*. They recommend instead that, since the delineation between each hemisphere remains uncertain, it would be better to *design education encompassing both hemispheres simultaneously* (Ibid, p. 283). The authors quote the words of the astronomer-biologist Carl Sagan who speculated how the two hemispheres were required to work together. Sagan described the right hemisphere as a pattern recogniser that finds patterns, sometimes real and sometimes imagined, in the behaviour of people as well as in natural events. Sagan believed that the right hemisphere has a suspicious emotional tone, seeing conspiracies where they do not exist as well as where they do. He believed that it needs the left hemisphere to analyse critically the patterns it generates in order to test their reality. Springer and Deutsch (Ibid, pp. 286-287) continue by quoting Sagan from *The Dragons of Eden* (1977):

> *There is no way to tell the patterns extracted by the right hemisphere are real or imagined without subjecting them to left-hemisphere scrutiny. On the other hand, mere critical thinking, without creative and intuitive insights, without the search for new patterns, is sterile and doomed. To solve complex problems in changing circumstances requires the activity of both cerebral hemispheres: the path to the future lies through the corpus callosum.*

Implications of Sagan's thoughts include the avoidance of learning content supposedly designed specifically for one hemisphere. While such programmes exist, not enough is as yet known about hemisphere-specific learning to support the claims of their designers, except perhaps at the most rudimentary of levels. Another more specific implication for this research, is that the desire for creative and innovative thinking will not be actualised when learning strategies and the organisation in which the learner resides fail to deliberately develop such abilities.

Education and training according to Springer and Deutsch (1993), should encompass both hemispheres by stimulating critical and systematic analysis, while encouraging larger pattern recognition and the application of unusual or intuitive solutions to varieties of problems and hypothetical situations and scenarios. Education and training designed to stimulate and develop whole-brain learning will fail to achieve its maximum potential however, if the New Zealand Army fails to encourage, facilitate and incorporate new and creative approaches and solutions to problems and uncertainty. New or unique solutions and approaches to problem-solving will simply not be accepted by the system or assimilated into the workplace.

Implications For Artificial Intelligence (AI) And Intelligence Augmentation (IA)

Biocca (1996) describes a perspective of human cognitive improvement which has been termed Intelligence Augmentation or IA. He differentiates artificial intelligence (AI) from intelligence augmentation (IA) by claiming that the latter is more concerned with the artificial amplification of the human mind and/or some of its functions/processes (Ibid, p. 61). He contrasts the two by explaining that AI and IA are mirror images of one another in more ways than is immediately obvious. AI is concerned with silicon and electricity, while IA is concerned with augmentation of the human mind. The results illustrated by the PAVA models are perhaps of greater use for intelligence augmentation (IA) than for the development of artificial intelligence.

Functions particularly sympathetic to replacement or enhancement by artificial intelligence (AI) and intelligence augmentation (IA) will be those categorised as thinking functions and receptive functions. Purely speculative applications could include:

- Replacement of humans with AI/IA in functions highly susceptible to human error. Human error or human factors are the cause of the majority of aeroplane accidents.

- Tanks, planes, and other forms of transportation could be piloted by means of AI/IA, either entirely or in part, from a remote location or on site through the application of the learning function within AI/IA. Errors may be reduced and human life would be spared in case of accidents or high risk missions. This could also be applied to the space research programme as AI could far exceed the durability and capability of human astronauts.
- Various approaches utilising AI and particularly IA could facilitate higher human endeavour by increasing cognitive ability. Although possibly highly controversial and with numerous dangerous implications (and applications), the human brain could be improved upon with the application of IA technology to increase memory and analytical abilities via the insertion of organic computer chip-like boosters. Alternately, artificial application of glutamate and acetylcholine neurotransmitters (or chemicals that enhance or retain the effects of these neurotransmitters - preferably minus the side effects as produced with the use of physostigmine[56]) at appropriate synapses to improve learning and memory. Or the application of neurotransmitters such as norepinephrine, dopamine, and serotonin or drugs which stimulate their receptors to improve memory and learning. Hormones such as ACTH and vasopressin have also been found to enhance memory (Kalat, 1995).

Without becoming too involved in further speculation, numerous options and possibilities exist for the enhancement of human endeavours through greater knowledge of the mind/brain functions.

Figure 9.2 shows the approximate ratios of the three cognitive functions identified for each Accomplishment. Artificial intelligence and intelligence augmentation are becoming increasingly important in the potential they offer as decision making aids and in facilitating better communication and retention of knowledge. The research suggests that some of the Accomplishments are more readily receptive to IA due to the predominance of thinking functions (T) and receptive functions (Rf) within these

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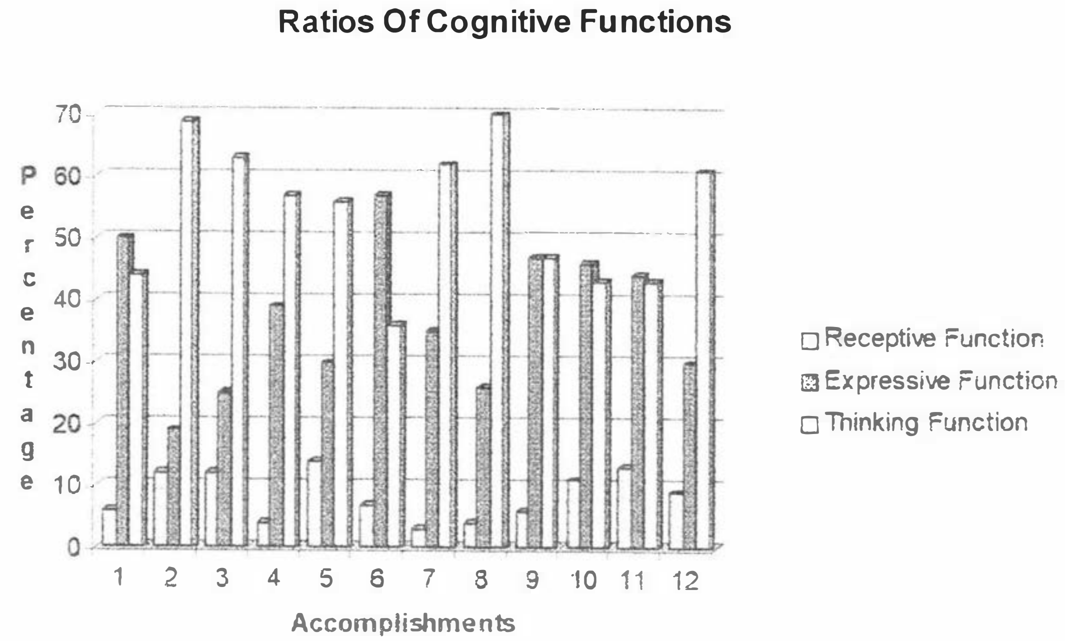
[56] Bartus, Dean, Beer, and Lippa (1982) report that while physostigmine prolongs memory it also has unwelcome side effects such as restlessness, sweating, diarrhoea, and excessive salivation.

Accomplishments. Thinking and receptive functions more readily lend themselves to augmentation than would be possible or necessary with expressive functions.



KEY

1 Personnel Management
2 Organisational Management
3 Military Knowledge
4 Resource Managing
5 Professional Knowledge
6 Leadership
7 Operations Management
8 Financial Management
9 Training Management
10 Liaison
11 Communication
12 Business Management

FIGURE 9.2 Accomplishments And Their Cognitive Functions

The digitised battlefield programme in the USA has identified several problems both of a technological and human nature. In Figure 9.2 it can be seen that the Accomplishment Leadership has the lowest percentage of thinking functions of all the Accomplishments. This may be more of an indication that a great many more expressive functions are required for the Accomplishment Leadership to occur, as opposed to the absence of actual thinking functions. Thinking functions are by their very nature sympathetic to artificial decision aids. Much of the effort in the digitised battlefield programme has been expended in attempts at improving the leadership function of battle command, and yet it is apparent that only a narrow relative bandwidth of thinking functions exist within the Leadership Accomplishment. It is suggested that for the enhancement of Leadership, AI or IA be concentrated on functions related to knowledge acquisition and storage, and facilitation of communication, particularly the improvement of the listening/auditory process.

Identification of Accomplishments with a proportionally high percentage of thinking functions is critical in high risk occupations or tasks (such as piloting an aeroplane). AI and IA can potentially reduce the incidence of errors by managing, enhancing, or improving the decision process.

The research suggests that the predominantly people-oriented Accomplishments are proportionally higher in expressive functions than the more task and knowledge-oriented Accomplishments. Difficulties may arise with some officers who prefer one operating mode over another and who find it difficult to change from a thinking function-dominated occupation to an expressive function-dominated occupation. Some occupations may even require officers to switch operating modes several times per day as they work on various Accomplishments across the day. Lack of flexibility resulting in an incongruent matching between work and preferred operating style will increase the officer's stress levels and reduce effectiveness.

The Verbal Media

The receptive function of Listening appears to dominate all cognitive functions for frequency of occurrences. Billings (1981) examined a sample of more than 12000 incident reports submitted to NASA's ASRS (Aviation Safety Reporting System), and found that more than 73% of all reports submitted contain evidence of a problem in the transfer of information within the aviation system. Approximately 85% of these involved aural information transfer, and only 15% involved visual problems. Jensen (1995) reinforces these findings, claiming that *One of the greatest reasons for cockpit communication failures is the fact that no one was listening* (p. 128). There is no reason to believe that the aural transfer of information would be any less flawed or potentially problematic within army systems, particularly in times of war and conflict. This is obviously a crucial receptive function (if not *the* most crucial receptive function) and efforts should be made to ensure that this function's integrity is preserved at all times.

The significance of the listening function for management is verified by Mintzberg (Mintzberg, Quinn, & Voyer, 1995) *managers strongly favour the verbal media* (p. 35). He found that American chief executives spend 78% of their time in verbal (oral) communication. He also cites two British studies by Stewart (1967) and Burns (1954) where managers spent 66% and 80% of their time in verbal communication. The two British studies were undertaken before the ubiquitous desk-top computer became common-place in every office. It is possible that computerised communication may impact on the use of verbal communication. The results of the MAPA research are not able to provide an indication of the amount of time spent in verbal communication, only that it still appears to be an extremely important form of knowledge acquisition and communication.

Mintzberg (Mintzberg, Quinn, & Voyer, 1995, p. 36) raises two important points concerning the emphasis on verbal media which may be extrapolated across to military officers:

1. Verbal information is stored in the brains of people and research indicates that this is not often written down once received. This implies that a significant portion of the strategic data bank of the organisation is stored in the minds of its managers/officers. The rapid posting cycle within the New Zealand Army must cause a great deal of information to be lost as its significance loses value when the bearer moves into another position. This does however mean that the information remains within the organisation, although perhaps not where it is most urgently required or of the greatest consequence.
2. The managers'/officers' extensive use of verbal media helps to explain why there may be reluctance to delegate a number of the more complex tasks. If most of the managers'/officers' information is stored in their heads, it is understandable that they

are reluctant to delegate as this would require a laborious 'mind download' as opposed to getting the subordinate to simply read the relevant file. This may be further exacerbated with the amount of knowledge required to serve as an officer as already identified by the high amount of importance placed by respondents on the Accomplishment Professional Knowledge. The greater the knowledge, the more difficult it becomes to delegate important and/or complex tasks.

The above points and their implications help to explain the existence of the rank structure by ensuring that each rank holds its level of knowledge and responsibility closely to itself, with the bulk of the strategic level decision-making remaining with the highest ranks, due to their capture and monopoly of the relevant information. Such behaviour further serves to undermine the introduction of directive control however as a valid operating philosophy within current circumstances. Perhaps a reduction of the number of ranks may be warranted, particularly as the research findings appear to be suggesting that lieutenants, captains, and majors are all concerned with activities requiring similar cognitive functions. These findings do not however measure changes in responsibility or a possibly increasingly greater need for experience at the higher decision making levels.

Expressive Functions

Expressive functions are predominant in Accomplishments dealing with people. It has been established that people skills are a criterion for effective directive control as command by influence is the preferred style by which to manage staff when operating under directive control conditions (Czerwinski, 1996). This becomes particularly obvious when viewing the pattern of connectivity for the Accomplishment Leadership. Expressive functions for Leadership are more numerous than for any other Accomplishment. As Leadership is also one of the most highly rated Accomplishments, the need for officers who are competently able to use expressive functions can be assumed to be critical to the accomplishment of the job.

As officers of the New Zealand Army are posted on a three year cycle it becomes imperative that potential officers be screened for cognitive flexibility. The other alternatives are to:

1. ensure that officers are only posted to functions and duties matching their cognitive disposition, or
2. they be trained/educated to encourage and facilitate a greater ability to rapidly and easily switch cognitive modes. A combination of the above would probably be most realistic.

The Absence Of Creativity

This research has implied an absence of creativity amongst respondents in their daily work. The New Zealand Army selection process identifies and values creativity in officer candidates. The replies from the Greatest Challenge question posed to each respondent, indicate that creativity is not valued by the system at the lieutenant to major ranks. Therefore selecting officer candidates who display creative behaviour, only to have it stifled for the next ten to twenty years of their careers, may create frustration and tension and which may also result in cognitive dissonance for many officers.

Creativity and the demonstration of initiative are seen to be key criteria for achieving success in manoeuvre theory-based warfare. Examples of manoeuvre theory provided in the literature endlessly reinforce the application of unique, unconventional, and unusual solutions. Chapter five provides numerous examples of instructions and directions emphasising the importance of creativity and the ability to demonstrate the use of initiative and originality of thought. Unless the Army system becomes more tolerant of displays of creativity, it may be in danger of stifling all existing creativity within young officers, possibly leaving them with feelings of frustration while impeding a critical developmental learning phase. Having creative abilities stifled for many years may make such abilities more difficult to activate in times of urgent need, such as in times of war. These officers will however function perfectly well in a system created to perpetuate standard operating procedures, efficiency, and rigidity of both thought and action.

Some evolutionary biologists have a view that there is a natural selection amongst organisms for those traits and behaviours which have a history of bringing success to previous generations, thereby reinforcing those same traits and behaviours (Wright, 1994). A change in the environment in which the superorganism (the New Zealand Army) operates, will see the development of adaptive responses and necessary changes, but until this is deemed to be essential for survival, such changes will be resisted. One example of such resistance may be seen in organisational learning strategies that attempt to predict and instil responses to various possible scenarios which the organisation may potentially face. Unless such scenarios are deemed to represent realistic threats by the learner, lessons will not be taken seriously, especially if it is contradictory to previously learned doctrine, as may be the case in the philosophical changes represented by the shift from attritional warfare to manoeuvre warfare.

Saul (1993, p. 27), discussing the effects of an over-emphasis on *efficiency* within society, complains that the rational and logical approach to thought and procedural systems may have *removed democracy's single greatest strength - the ability to act in an unconventional manner*. Society also may, as a consequence have lost its ability to accept or tolerate unconventional behaviour. The research results reflect an element of this, as respondent replies are totally devoid of any terms describing anything even remotely alluding to creative activity in the New Zealand Army work place. The bureaucratic functionary within New Zealand Defence appears to be perpetuated at all levels. Lieutenant to major ranks demonstrate this in their MAPA responses, and it can be inferred that higher ranking officers tolerate and perpetuate this as they are the perpetuators if not the architects of the system in which everyone operates. This may not be a problem for an organisation functioning in a stable environment, with a guaranteed financial source of supply to maintain itself, but such is not the case according to the raison d'être of a military establishment and this also contradicts the philosophical operating beliefs underpinning many military organisations, including the New Zealand Army. Under such an operating regime the New Zealand Army may have become a prisoner of conventional solutions - the antithesis of directive control and manoeuvre theory. To fully utilise advances in learning designed to encourage generative and creative learning, it is argued that the organisation must make changes reflecting encouragement and tolerance of creativity from within. This also means tolerating and forgiving mistakes (within reasonable limits). Fear of making mistakes stifles any desire to explore new or alternative approaches to problem solving.

Leadership Theory Implications And A More Detailed Model Of Command

This research has emphasised the need for an holistic approach to education stressing both left and right brain learning - preferably simultaneously. It has indicated a need for flexibility utilising both task and people orientations - depending on the particular work being undertaken, and it has promoted the need for an ability to switch across various modes of cognitive functions. This suggests that many command/management/leadership models currently in existence are too simplistic. Yukl (1994) expresses similar sentiments when he writes that *the long fixation on consideration and initiating structure appears to be ended, and most researchers now realise that it is necessary to examine more specific types of behaviours to understand leadership effectiveness* (p. 71). He adds that *it is likely that specific behaviours interact in complex ways, and that leadership effectiveness cannot be understood unless these interactions are studied* (Ibid, p. 72). Many leadership theories appear to disregard the complexity of actual work environments and work demands. They are often static in nature as opposed to reflecting dynamic reality. They often attempt to categorise people by placing them on a bipolar scale. These models appear to disregard the numerous and diverse contexts in which people are expected to function. Static models of performance fail to illustrate human flexibility and adaptability. Hierarchical models of knowledge processing add a dynamic perspective to existing models, building detail upon existing skeletal foundations, and thereby providing the substance for further learning and improvement. Such models illustrate some of the complexity of the interactions between behaviours and underlying cognitive processes. Figure 9.3 attempts to portray leadership on a macro cognitive level, while also depicting the importance of the context in which it is used.

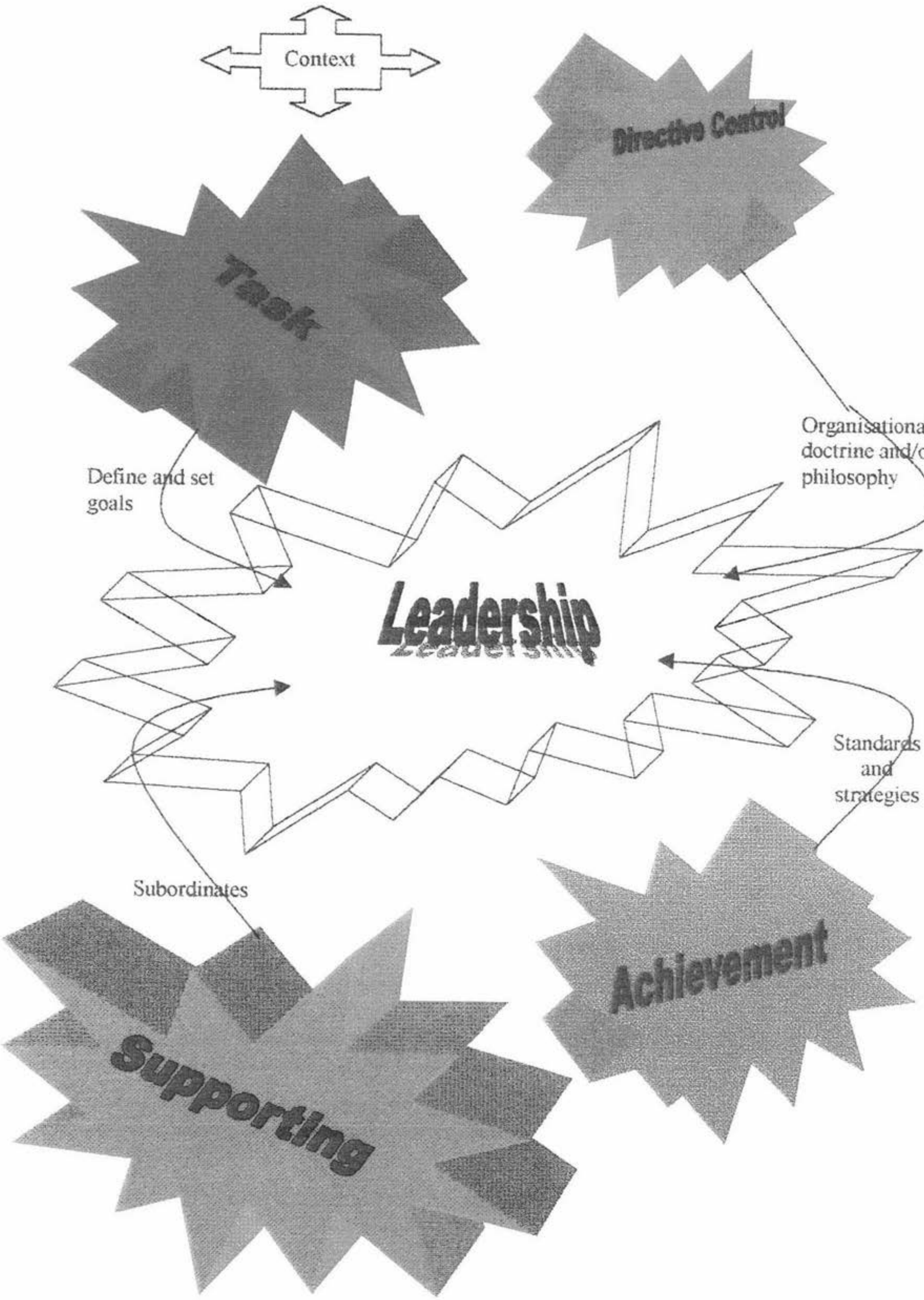


FIGURE 9.3 **Leadership Portrayed At A Macro Cognitive Level**

Figure 9.3 attempts to show the Leadership knowledge structures and hierarchies, and their interactions. These details have been identified from the MAPA process. The model illustrates the dynamics of the various influences by showing each Performance as an explosion bursting out in waves and resonating. The knowledge, attitudes, skills, and abilities underpinning each Performance are not neatly and clearly defined, as the dynamics of the cognitive process constantly alter and change the controlling rules and knowledge boundaries. This nebulous nature of the model is largely due to changes in the context in which leadership is applied. The results of this research suggest that the governing force controlling the shape of the model may be context, depicted by the quad arrow callout in the upper left quadrant of the model.

Each Performance is represented to resonate at different strengths, with the New Zealand Army doctrine of directive control in the background. Tasks and goals resonate in close proximity, while the standards and strategies needed to achieve such tasks are more to the foreground as the individual may have more control over this Performance than the latter two. Supportive Management is the largest, most dominant Performance, as it announces the mode of behaviour chosen by the leader, in order to lead his/her subordinates. Frank's (1993) observation that the most common element in the leadership literature appears to be that leadership is a group process involving interaction in pursuit of a goal, is confirmed by the close proximity and interaction of the Performances as illustrated in Figure 9.3.

The central portion of the model depicting the word *leadership* is transparent. This is deliberate in order to emphasise the nebulous nature of the schemas generally employed to describe leadership. The literature on leadership, as has been explained, is immense, and yet leadership theory is still largely indeterminate. It requires the study of traits and behaviours, the environment, circumstances, and/or context. The concept of leadership can be described as a higher-order idea involving top-down processing which paints an ill-defined picture with few exact details. This study has shown however that leadership *can* be defined in detail, as demonstrated by the shaded portions of the model in Figure 9.3. Adding the Abilities shown in Exhibit 8.6 will result in a very complete cognitive architecture (Figure 10.2 in the next chapter captures this).

The Cognitive Resource Theory (CRT) developed by Fiedler (Fiedler, 1986) deals with the cognitive abilities of leaders. The theory assumes that a non-directive (participative) leader is more effective than a directive (autocratic) leader for a complex task and that intelligent leaders devise better plans and action strategies for complex tasks than non-intelligent leaders. In evaluating Fiedler's theory, Vecchio (1990) claims that the theory would be improved by identifying specific aspects of intellectual ability relevant to the task. The PAVA models possibly meet the requirements of Vecchio's comment by indicating in relatively detailed language how officers specifically undertake their tasks at a cognitive level. To some degree, this is what Figure 9.3 has attempted to do. Fiedler's attempts to link his CRT to his Least Preferred Co-worker (LPC) model are not explored in this study.

The Leadership Accomplishment is rated as the third most important value-added function by respondents. Leadership (refer to Exhibit 8.6) consists predominantly of expressive cognitive functions (57%), thinking functions (36%), and receptive functions (7%). It has the highest proportion of expressive functions of all the Accomplishments. The Performances are firstly Supportive Management, requiring the ability to motivate, encourage, and guide. Achievement Management is next. Its architecture appears very similar to that of Supportive Management. Task Management follows and again it varies little from previous Performances in its process Abilities. The last Performance is Directive control featuring the most T (thinking) functions of all the Performances for this Accomplishment, indicating that Directive Control is largely a state of mind requiring a high percentage of analytical/decisional ability. Leadership's architecture indicates a people orientation but with an emphasis upon supportive behaviours for the purpose of facilitating achievement of the task.

In the first chapter of this study, Rauch and Behling's (1984) concerns were described, that there appeared to be little of additive value emerging from the growing amount of leadership literature. Perhaps leadership cannot and should not be studied in isolation. This research has identified the importance of context in relation to the thinking process. It has pointed out that a relatively small number of functions (Accomplishments) can describe the domain of command[57]. The actual unbundling process needed to view the entire cognitive architecture is more complex, but it is important to include the context in which the pattern of connectivity resonates. It is posited that leadership for the New Zealand Army should be viewed in this holistic context, not as an isolated function. In a command context, leadership can be seen to interact with all aspects encompassing the domain of command. Leadership is perhaps the major medium by which officers achieve the mission of the army.

Figure 9.4 changes the structure of the command system model shown in chapter six (Figure 6.1). It is designed to illustrate command in a New Zealand Army context. It is not the ideal model of command, but reflects command as represented by the officers taking part in this research. The model's shape is largely drawn from the three mission statement categories identified in chapter eight (refer to Table 8.8), and the differences identified between these mission categories (refer to Table 8.9). The Accomplishments physically located at the left of the model in Figure 9.4 indicate those values rated most important by respondents identifying with a work mission managing non-human resources. The two Accomplishments in the middle of the model were most highly rated by respondents identifying with a work mission managing and developing human resources. The Accomplishments at the extreme right of the model were rated most important by respondents identifying with the work mission of command.

Functions appearing under the *management* heading appear to be larger in number than those under *command*. McNamara and Moss (1993) undertook a study of 600 soldiers enrolled in the British Junior Army in order to investigate their perceptions of leadership skills in general and their own leadership qualities both before and after experiencing a leadership course. While such a course was seen to improve the self-perception of personal leadership skills and qualities of all types, the course, according to the authors, failed to emphasise the overall importance of interpersonal skills and managerial skills. The MAPA research results confirm that managerial functions constitute an important

[57] This is supported by Stogdill (1974) when he concluded that leadership was best described by using a few generalisations, as opposed to using a long list of functions, factors, and variables.

proportion of an officer's career – at least within the New Zealand Army. Managerial skills should therefore not be viewed as being inferior to those skills more commonly associated with the function of command.

Management and command are shown as two distinctive domains overlapping in a "grey" area, which may be largely influenced by the context in which the officers work. It is important that the model be viewed using the definitions of the Accomplishments as identified in each PAVA model. As was discussed in chapter eight, this model cannot be viewed while maintaining the usual stereotypes associated with the terminology in use. For example, the Accomplishment Personnel Management was perceived to be more important by those identified with *command* mission statements than by those working in the *management and development of human resources*, which seems paradoxical. It could be argued that officers working in the latter mission category would view Personnel Management as being one of their most important functions. Apparently it is not.

Unfortunately, the complexity of any one of the functions illustrated in Figure 9.4 is lost in the simplicity of the model. Such cognitive complexity and dynamism is difficult to represent on the flat surface of a page and can perhaps best be modelled using a three-dimensional computer image. Chapter ten draws this study to a close with an attempt to illustrate the complexity and dynamism of one small but important part of the cognitive architecture of command. This study concludes with an attempt at representing the Accomplishment of Leadership in all of its detail.

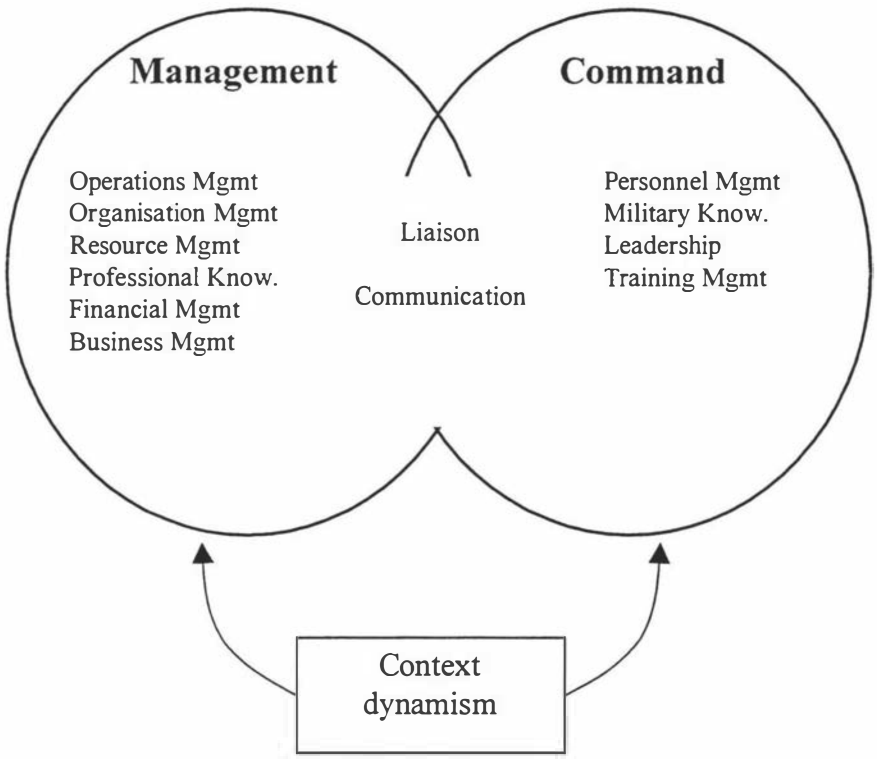


FIGURE 9.4 **The New Zealand Command System: An Alternative Model Based On The MAPA Findings**

Chapter Ten. Conclusions

Introduction

The MAPA model has been examined in its capacity as a tool for creating a window into the numerous and complex multi-procedural mind/brain functions. The results of this study have demonstrated that the model has the ability to facilitate greater understanding of the complexity of mind.

This study has included a detailed examination of the New Zealand Army's operating philosophy, its command climate, and the future of warfare relative to the topic area. Inclusion of such environmental variables and influences support the ecological validity of this research. Some discrepancies have been identified between New Zealand Army doctrine and practice, between what the Army claims to want and what it actually produces. The conclusions of this research concentrate and expand upon the following three areas:

- The New Zealand Army doctrines of manoeuvre theory and directive control appear to conform with the doctrines and philosophies of New Zealand's allies, but it is suggested that the heavily bureaucratic organisational structure, ponderous decision making processes, and the traditional command system do not support, facilitate, or encourage implementation and application of the stated doctrines.
- That MAPA's efficacy can be increased by focusing more narrowly on fewer Accomplishments. This should solve the paradoxical need for simplification in MAPA's use, while at the same time gathering more information describing such details as the nature and patterns of connectivity of inferential relations.
- That the Accomplishment for Leadership has the most clearly-defined and complete cognitive architecture of the twelve identified Accomplishments, providing a detailed and comprehensive, and hitherto unseen, window into the inner workings of the mind of the leader. Such knowledge provides a prototype cognitive architecture useful for the design of curriculum and for studying the function of leadership.

Conclusions

1. Twelve Accomplishments have been rated *quite important* to *very important* by a select sample of respondents. These twelve Accomplishments describe what are believed to be the most important cognitively-based managerial/command competencies necessary for the work of lieutenants, captains, and majors of the New Zealand Army (see Figure 10.1).

2. Work-related knowledge used by the sample of officers has been divided into two distinct types: Professional Knowledge and Military Knowledge. The most highly rated Accomplishment focuses on the acquisition and use of Professional Knowledge. The findings suggest that this value-added knowledge is gained largely through personal motivation and learning, and its acquisition consumes a high proportion of Army officers' career time and effort. While Military Knowledge was rated fourth out of twelve down the scale of importance for Accomplishments, it can be argued that a combination of these two knowledge Accomplishments constitute a sizeable part of work-related long term memory, and provide the knowledge domains from which the other ten Accomplishments draw their schematic basis. It can be further argued that addition and/or augmentation of the knowledge Accomplishments would impact on all the Accomplishments through a cascading learning effect. Practical implications of this relationship suggest that learning may be more effective across all the Accomplishments for officers, if designed and managed in a manner consistent with (or challenging) existing knowledge schemas.

3. The findings suggest that the New Zealand Army ranks of lieutenant, captain, and major predominantly serve to interpret and relay information. They receive their orders, interpreting and assessing their higher commanders' intent in accordance with organisational rules and standards. They then design and communicate plans of action in terms which delegate requirements and authority, and motivate and guide subordinates to achieve the set tasks. All three ranks are predominantly in agreement concerning most of the ratings of importance for the Accomplishments and Performances. While a cursory glance at the prototype architectures suggests a predominant task orientation, closer examination of the process Abilities shows that

task-related behaviours in this study consist predominantly of thinking functions. This implies that what appears to be a behavioural task orientation, is largely an analytical cognitive activity, and should therefore not be interpreted in a negative manner, as so often occurs with many theories applying the term *task orientation.*

4. The majority of the prototype architectures are constructed from generic process Abilities that generally differ only in their patterns of activation and nearest associations, in accordance with the demands of accomplishing each cognitively-based competency.

5. The cognitive architectures are consistent with current understanding of the mind/brain function concerning the distribution of information across hierarchies and numerous connections. Each PAVA architecture is a snapshot in time. In reality however, such an architecture is not simply a stored file of information, but a dynamic and fluid pattern of connectivity, changing and spreading with every resonation.

6. The MAPA process has demonstrated utility for the New Zealand Army, revealing cognitively-based competencies valued by the system. The data has also revealed details that may be valuable to the organisation for different reasons. Use of the MAPA model has resulted in the exposure of perceptions of employees which are inconsistent with the greater organisation's explicit goals, ideals, and beliefs. An example concerns perceptions of the function of Financial Management, which is not perceived to be as important as the more people-oriented Accomplishments. Another example is the apparent lack and/or intolerance for initiative and creativity within the organisation. This will be elaborated upon in points 8 and 11. The PAVA models provide details and prompts for the design and development of learning curriculum. The Accomplishments represent the higher-order conceptualisations for which the lower-order Performances and subsequent Abilities are the constituent parts. It is suggested that this information processing hierarchy be reflected in the design of curriculum, with the learning of Abilities in their appropriate Accomplishment contexts. An example is provided at the end of this chapter.

7. It is clear that learning for officers should not initially be independent of context in order to acquire the appropriate connectivity. It is subsequently desirable, in order to stimulate generative learning, to apply lessons across a variety of circumstances, in preparation for more creative applications of the lessons learnt. This encourages the ability to transfer lessons across different settings and situations. Learners can then become accustomed to decision making in unique and dynamic situations faced in the course of their careers, particularly in warfare/conflict situations.

8. It has been established that generative learning is advantageous for army officers in a manoeuvre theory-dominated environment. The design of curriculum facilitating and encouraging generative learning will be largely a wasted effort however, unless there is congruity between the organisation, the system, and the learner. All three must accept and encourage learning and its transfer from the 'classroom' to the work face. At the time of writing, the formal New Zealand Army system has a low tolerance for mistakes and has little apparent use for creative or unique displays of behaviour below the highest levels of command. Instead, its culture emphasises conformity and standardisation. The rigid organisational structure confines its members to conventional solutions, regardless of their training and education. It has been argued that doctrines of manoeuvre warfare and directive control are optimised in a culture more accepting of risk. The encouragement of risk may result in occasional mistakes, which should be regarded as learning experiences, not grounds for court-martials. Simplification of the organisational structure will facilitate more rapid decision-making. A re-engineering approach to the multitudes of rules, traditions, laws, and regulations will help change the organisation from being risk-averse to risk-accepting. In evolutionary biological terms, the New Zealand Army is a superorganism, having adapted over the years of generally peaceful conditions into a large bureaucratic organisation. This has occurred by a process of natural selection, favouring traits and behaviours suited to the environment occupied by the superorganism. Such specialised adaptation amongst its members may ultimately speed it to extinction as opposed to success, should the environment in which it operates change. It must be remembered that the nature of war is to inflict rapid change.

9. Future iterations of the MAPA model should incorporate mechanisms to record and reveal the presence and influence of both excitatory and inhibitory inferential relations at all levels of the cognitive process. Ultimately, attempts should also be made to incorporate emotional components. The inclusion of these additions will result in an increasingly comprehensive, accurate and biologically plausible representation of cognitively-based competencies. These competencies however, are in reality so complex, fluid, and dynamic, with elements of randomness, that they may possibly never be captured in their entirety.

10. The conclusions drawn from this research can enhance current knowledge concerning artificial intelligence/intelligence augmentation (AI/IA) and the human interface. Functions particularly sympathetic to replacement or enhancement by AI/IA may be those categorised as thinking functions (T) and receptive functions (Rf). *Listening* featured most prominently amongst all the Abilities, demonstrating its significance for those in command positions. Research of air accidents identified human factors as the most common cause of accidents and auditory/interpretational and associated incidents featured most prominently amongst the identified human errors. The enhancement or maintenance of this receptive function (Rf) and associated communication techniques, particularly in times of conflict, battle, and other high stress situations is critical. The findings suggest that further research in this area would be of value. It also supports the view that large portions of important organisational information are stored in the brain as opposed to being stored in written or electronic form. This personal 'holding' of information obstructs information dispersal which is critical in an environment supporting directive control as its operating philosophy. Communication of knowledge should be encouraged in order to achieve a greater degree of knowledge dispersal and understanding throughout the organisation.

11. The MAPA research has provided an incisive view of the constituent functions representing command at a cognitive level for officers of the New Zealand Army at the ranks of lieutenant, captain, and major. It has removed the obscure and indistinct nature implicit in most models of command by specifying the meaning of command for the respondents. The complexity of the resultant cognitive

architectures suggest that many management and leadership theories are too simplistic in their *either or* approach to describing what are generally portrayed as diametrically opposing behaviours. The PAVA models indicate that a multiplicity of knowledge and critical behaviours are required to function successfully through the duration of a career with the army. It is apparent that most patterns of connectivity include a directive control philosophy, largely constructed of assessing/decision-making or problem solving Abilities. While the existence of this command doctrine may satisfy its implementers, there is no evidence of anything, even remotely, resembling cognitive functions resulting in creativity, or as some have termed it, right brain creative thinking amongst respondents. In the absence of the application of such cognitive abilities or a system encouraging the application of such abilities, the New Zealand Army's aspirations of implementing manoeuvre theory, as it has been interpreted in the course of this research, is unlikely to be successful.

12. It was stated in chapter six that the research data and subsequent findings would provide a New Zealand-specific definition of the function *command*. By integrating the literature with details illustrated in the PAVA models, command could be defined by the following:

> *Command is a critical factor for successfully completing the mission of the New Zealand Army through the intelligent application of leadership, management, and communication skills. It integrates highly specialised knowledge - accumulated over a period of time through both deliberate and experience-based learning - with people and task oriented skills, utilised in a variety of circumstances for the purpose of effectively and efficiently accomplishing the group's mission while also facilitating staff support and development.*

The above definition makes no reference to the application of initiative, as its presence was not reflected in the findings. It must be stressed however that initiative is a most desirable attribute to be cultivated and developed at all levels within the New Zealand Army. Command, as described from the mission statements written by respondents, was demonstrated to be a distinctly separate function from those writing mission statements of a managerial nature. It was considered judicious however to include managerial functions in the definition of command, as the findings suggest that both command and management abilities are critical for the career development of New Zealand Army officers.

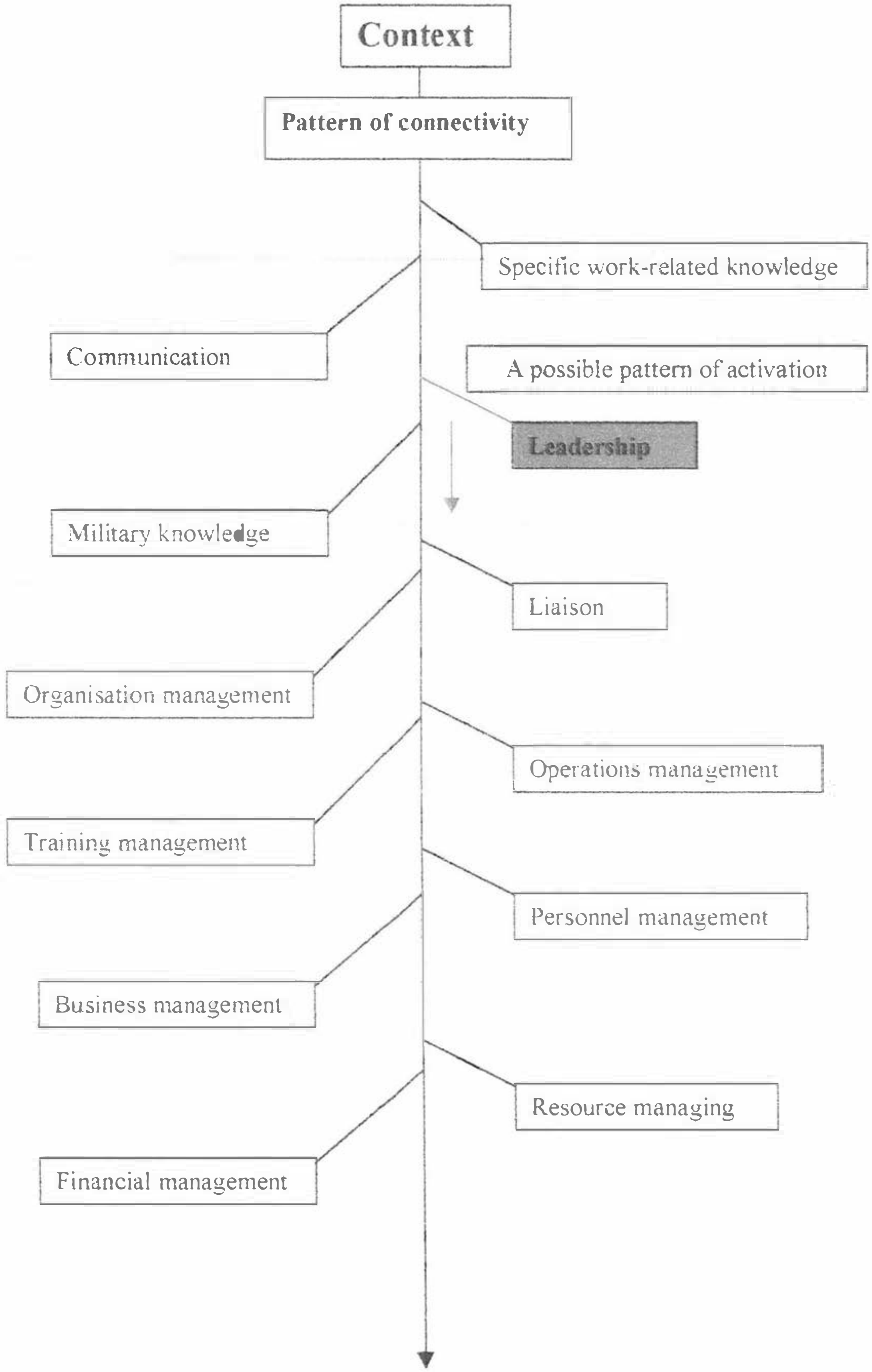


FIGURE 10.1 The Cognitive Architecture – Pattern Of Activation for Leadership

13. This research stresses the importance of *context* and its interaction with the learning process. Without an awareness of the appropriate context, curriculum designers rely on an element of chance for the new knowledge to be integrated into the learner's requisite pattern of connectivity. The prototype cognitive architectures identified from this research indicate a possible format for curriculum design. Each PAVA model must be viewed as just one small pattern of connectivity within the larger cognitive architecture. The complete architecture illustrates possible knowledge structures required to accomplish respondents' work demands over the duration of their careers. The cognitive architecture at the Accomplishment level, can be illustrated in hierarchical format in Figure 10.1, with Accomplishments perceived to be most important placed at the top of the architecture. This is intended to show that most cognitively-based competencies undertaken by respondents resonate from a schema based upon both knowledge and experience, therefore influencing everything respondents do. Figure 10.1 illustrates the overall respondents' prototypical pattern of connectivity identified from the research. This illustrates the Accomplishments and their order of perceived importance. To accomplish a task or function, the officer will consult his/her schema recognition filter and context perception, developed from the knowledge and memories stored at the top of the architecture. A pattern of activation will resonate and the relevant process Abilities will facilitate task completion. Figure 10.1 shows a possible pattern of activation at the higher Leadership Accomplishment level. While there is no evidence to support such a pattern of activation, it is proposed that the function of army Leadership could draw upon military and work-specific knowledge and communication skills in order to be most effective. The actual constituent parts of the Leadership Accomplishment are shown in Figure 10.2.

It is suggested that when designing learning content for these officers, the curriculum be integrated into the officers' *context awareness.* By doing this, the new knowledge overlays or replaces existing knowledge, building upon or altering existing architectures. The learning process will activate and embed new knowledge, developing and enlarging with each resonation.

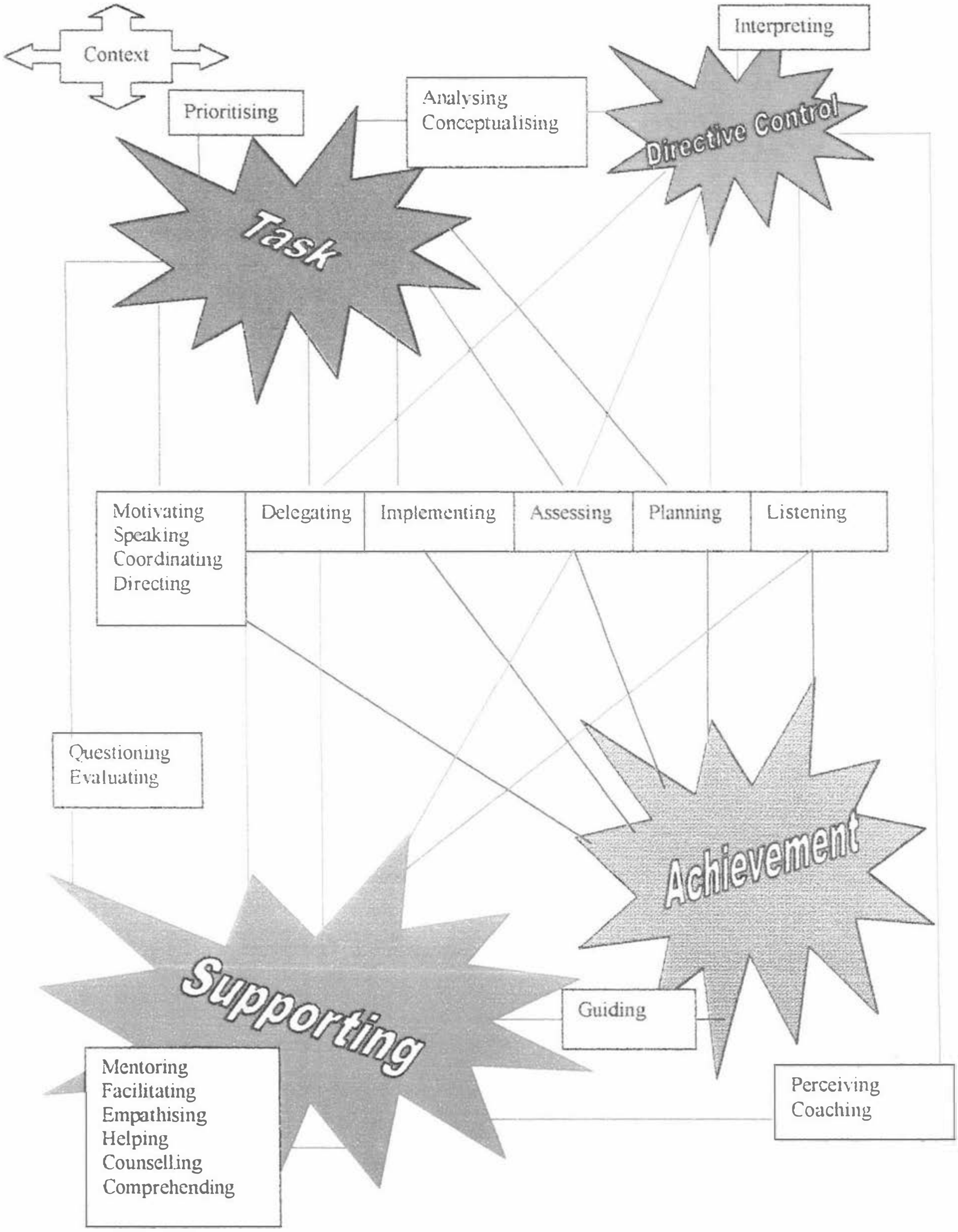


FIGURE 10.2 A Cognitive Architecture Of The Accomplishment Leadership: The Complete Pattern Of Connectivity

Figure 10.2 magnifies the Accomplishment Leadership. Performances and their connecting Abilities have been shaded in individual colours to identify the various patterns of connectivity. While a hierarchy of use and importance has been identified, this does not necessarily demonstrate the order of activation. Some patterns will be activated in parallel while others may prefer a sequential mode. The model shows how some Abilities are exclusive to one Performance, with Supporting have the greatest number of such exclusive Abilities, while others are common to two or more Abilities. *Assessing* is the only Ability common to all of the Performances for the Leadership Accomplishment. Figure 10.2 illustrates the patterns of connectivity between the various Performances. For example, the Performances of Supporting and Directive Control have in common the Abilities *perceiving, coaching, delegating, assessing,* and *listening*. It is suggested that knowledge of these Ability overlaps can simplify curriculum design.

The following is an example describing how the information provided by a cognitive architecture, such as is shown in Figure 10.2, can be integrated into the design of curriculum dealing with leadership. Such an approach in no way claims to comprehensively describe an officer's leadership education. It does however facilitate the early development of a prototypical cognitive architecture which is in keeping with critical work requirements and organisationally-acceptable work achievements. Gagné and Glaser (1987, p.73) explain that *Discovering the models that people use to understand a situation can assist in effecting a change to conceptual models appropriate for proficient performance*. These authors continue on the use of models of mind for purposes of guiding and building upon instruction, *By understanding a student's current state of knowledge, teachers can specify what can be called pedagogical theories. These models that differ from, but are still relatively consistent with, the learner's current model of understanding and serve to guide interrogation, instantiation, or falsification of the learner's model, helping to organize new knowledge into more proficient models of understanding.*

Aspects of leadership curriculum can be designed in blocks of individual Performances and their immediate patterns of connectivity. Therefore, following the patterns of connectivity illustrated in Figure 10.2, the concept of directive control could be taught by starting with the ability to *interpret* orders and needs, incorporating the skills of *analysing* and *conceptualising*, in order to understand and achieve the mission or task. Officers would be instructed in ways of *delegating*, *assessing,* and *listening*, all of which would be taught in a context of supporting subordinates (which also helps in achieving the task). In order to emphasise high standards and goal achievement, the learner would be encouraged to *perceive* the needs and problems encountered by subordinates, instigate relevant *coaching* as and when required, and learn how to listen to subordinates as well as superiors.

Once these aspects of directive control have been satisfied, the curriculum could concentrate on the Performance of Supportive Management, firstly by learning how to *empathise*, *mentoring* of subordinates, *comprehending, helping* and *counselling*, and *facilitating* subsequently-needed actions. To ensure that the task is also accomplished, officers are taught to *plan* and *prioritise* and to *speak* in such a way as to communicate needs, priorities, and methods effectively. They must learn to understand and apply *motivational* techniques, and they will learn how to *delegate, coordinate*, and *facilitate*, while continually *questioning, evaluating and assessing.* Standards are maintained and goals achieved by *guiding* subordinates in a manner reflecting the spirit of directive control.

The above example implies a direction for curriculum content and design which is not ideal, but which reflects workplace perceptions of what is important in the New Zealand Army. To meet the needs of directive control and manoeuvre theory as proposed by the literature, it has been suggested that elements of creativity be inserted into the learning experience (and that both its positive and negative consequences be respectively encouraged and tolerated in the workplace). Creativity can be applied at numerous nodes and associations described in Figure 10.2. Innovative approaches to analysis and conceptualisation can be encouraged. The subsequent planning and implementation stages can also be infused with innovative approaches. Methods of motivating, delegating, guiding, and coaching can be tailored in such a manner that they demonstrate elements of creativity as well.

Curriculum for further education can be designed from the completed cognitive architectures. Knowledge and skills perceived to be important can be checked off and improved or added to if found lacking. Planning skills can be seen to impact the Performances of Directive Control, Task Management, and Achievement Management. For a further course in planning, for example, these Performances provide context, and their associations can be incorporated into the curriculum.

It is suggested that the use of cognitive architectures will add value to the organisation and improve the effectiveness and efficiency of the learning process by:

1. having a transparent and scientifically rigorous methodology for establishing and designing curriculum for initial and further education, training, and development,
2. advancing and supporting knowledge and teaching skills which have proven utility for the organisation,
3. improving performance in areas perceived to be important by those currently performing lower to middle management functions and duties,
4. facilitating curriculum design which has additive value, in that it can be built upon in a logical manner, with reduced risk of learning redundancy, in preparation for a lengthy career within the organisation,
5. reducing learning time through the exclusion of non-essential curriculum and focusing on the essential elements needed for a long career in the organisation,
6. justifying the expenditure of all resources for curriculum design and teaching/learning, and
7. establishing and building common schemas for all learners to facilitate greater acceptance of the learning organisation.

Point number seven can be explained in the context of growth and acceptance of change within organisations. It has been pointed out that both learning and decision-making speed should be increased as a strategy for coping with the increasing complexity of technology and its human interface. Knowledge of the schemas held by organisation members should simplify further learning design and the acceptance of continuous technological adjustments as this can be synthesised with existing knowledge and skills.

Gagné and Glaser (1987, p. 74) provide support for this when they observe that *The more knowledge one has about a certain domain, the more inferences can be drawn and used to construct models, elaborate new information, enhance retrieval, and foster learning. Hence, the acquisition and exercise of well-developed knowledge structures, containing easily accessible knowledge, is a critical goal for instruction.*

The Research Instrument – Some Limitations

The MAPA instrument for this research required over a year of piloting before satisfying the needs of this study. It is recommended that future versions should include the following additional considerations which have become apparent only in retrospect:

1. The MAPA model as used for this research, has no function for identifying the connections and inferential relations *between* Accomplishments which are assumed to exist. This means that excitatory and/or inhibitory inferential relations between Accomplishments cannot be recognised. It is suggested that Accomplishments do not exist and function in isolation, operating only as feed-forward networks (see chapter four) to their respective Performances and Abilities. It is suggested that they are more likely to resemble recurrent networks. For example, the Accomplishment Communication may be influenced by the Accomplishment Military Knowledge as an understanding of correct procedure is crucial when dealing with chains of command and protocol.
2. The MAPA instrument demands a great deal of information from respondents, resulting in fatigue and irritation, and yet, even more information would be desirable, particularly for describing the process Abilities in greater detail as some of these are still vague in their descriptions.
3. Point 1 above requires more details from respondents while point 2 expresses concern at the amount of information already required from respondents. Future research may need to focus on fewer aspects of respondents' work while digging more deeply and identifying lateral connections. This will require a careful balancing act between eliciting the necessary information without exceeding respondent tolerance levels, thus identifying the marginal rate of tolerance over

detail. One solution could be to have a series of administrations of the instrument as opposed to relying on one administration.

4. The MAPA instrument's data collection method uses the process of *recognition* as opposed to relying solely on respondent memory. This is a strength attributed to the model but it is also potentially its greatest weakness, by imposing limitations upon respondent replies through the imposition of boundaries. Respondents rarely bothered to add or create descriptive terms to existing lists. The author of the instrument therefore becomes responsible for setting its content parameters. Future iterations of the MAPA model should attempt to minimise the negative impact of recognition-based approaches to data gathering, by encouraging respondents to add their own ideas and terms, perhaps by including brainstorming sessions at each level of the knowledge hierarchy. This will however be more time-consuming.

5. Future iterations of the MAPA model may benefit at the analytical level by changing from the use of an ordinal scale to an interval scale. Reid (1987, p. 37) claims that *the only relationship between ordinal data is one of order, not of quantity.* This prohibits the use of complex and more powerful analytical methods such as analysis of variance (ANOVA), multivariate analysis of variance (MANOVA), and regression analysis.

Further Research

This study has profited from the strengths and weaknesses identified in earlier iterations of the MAPA model. The model could be further improved by future research in the following areas:

- Identifying the connectivity and influences between Accomplishments and changing the attitude scale from ordinal to interval.
- By focusing on fewer Accomplishments, further research should achieve greater penetration into the cognitive architecture. This may reveal the existence of a subordinate and more clearly circumscribed stage in the cognitive hierarchy below that of Abilities.

- Continuing this research by designing curriculum for officers based upon the PAVA prototype cognitive architectures.
- Undertaking further research on the significance of *listening* as a dominant receptive function and identifying ways of enhancing and maintaining this Ability, particularly under conditions of high stress. Taking the opposite perspective, research could be undertaken in order to identify ways of confusing (military) opponents by disrupting their ability to listen. As a great deal of importance has been placed upon this Ability, interference with auditory acuity, comprehension, and/or processing capacity, could potentially paralyse an opponent.
- This study has expressed numerous concerns regarding the structure, doctrine, command and control, and approaches to learning employed by the New Zealand Army. Further research could be directed towards the design of an organisational structure and an organisational culture which, when combined, are more amenable to the current doctrine of manoeuvre theory. The development of such a complementary structure and culture should be integrated with recruitment, promotion, learning needs, and curriculum design. Combining and developing these critical components will result in a seamless interface facilitating optimum performance of the organisation.
- Possibly having respondents complete the MAPA instrument while undergoing a PET (positron-emission tomography) scan. This could allow researchers to visualise and record brain metabolism as glucose radioisotopes emit decay signals, their quantity indicating the level and location of brain activity relative to each Accomplishment. Such information may provide the physical neurological location for each pattern of activation. Conversely, it may be argued that thinking, for example, about the Accomplishment Leadership, is not the same as actually being a leader. Therefore a PET scan may not reveal the actual localised information on leadership. It may simply show where the memories of the relevant cognitive functions are activated/resonating.

Summary

Difficulties associated with the articulation of implicit knowledge and schemas have been taken into consideration when choosing the instrument for this research. It has been established that cognitive processes do not occur in isolation, but interact with and respond to the environment in which people operate, thereby providing and reacting to a context. The cognitive architectures resulting from this research provide a momentary window into the in-the-head functions of officers of the New Zealand Army in their daily interactions with their environment. Identification of cognitive architectures unique to the individual organisation – or superorganism - will potentially add value to its members. Organisational discrepancies can be identified, curriculum can be designed and imparted in a systematic and customised manner, and the human/technology interface can be better understood and improved upon.

This research has been particularly valuable in its analysis of the conflict that exists between the New Zealand Army's articulated warfare and command doctrines, and the need for officers to demonstrate creativity and initiative. It has been pointed out that the absence of creativity amongst officers and the army's failure to appreciate its value, may result in an inability to successfully implement manoeuvre theory and directive control in times of war. The cognitive architectures resulting from this research also provide detailed maps of the knowledge structures of army officers, which may be used to foster more effective and efficient learning. All expenditure derived from the construction of MAPA-based learning can be easily justified and the learners will immediately recognise the appropriateness of their curriculum content. The resultant training and education should be efficient as learning will be more relevant, thus minimising the possibility of inappropriate or unnecessary training or training redundancy.

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Glossary

Abilities A term given to describe the specific knowledge, skill, ability, or attitudinal capacity which is a necessary part of a more complex Performance. Such cognitive, psychomotor, affective, or attribute skills can be taught, shaped, or enhanced through training and education. Also referred to in this thesis as **process Abilities**.

Accomplishment A term given for describing the broadest capabilities and knowledge required to achieve a mission statement.

Achievement management A Performance dealing with the setting of goals, having and setting standards and expectations, working to improve subordinate performance, implementing strategies and objectives.

Business management An Accomplishment dealing with administrative and business dealings in an Army context.

Command Command and control of human and non-human resources through the application of technical expertise, leadership, and management.

Communication An Accomplishment referring to writing, talking, presenting, listening.

Competencies The skills, knowledge, attitudes, motivation, and abilities required to perform a task or function successfully – some may add – with excellence. The requisite value-adding process to any function.

Cultural management A Performance describing the need for empathy, diplomacy, understanding of values and beliefs of people from other cultures.

Digitization, digitized warfare, digitized battlefield Work being undertaken, predominantly by the United States military for the purpose of enhancing warfare capability through the use of computerisation and artificial intelligence.

Directive control (1) New Zealand Army doctrine at the time of writing. It implies the devolution of authority and decision making to its lowest possible levels of command. Also known as *auftragstaktik*, directive control works in collaboration with the doctrine of **manoeuvre theory**.

Directive control (2) A Performance describing the ability to analyse a superior's intent, anticipating and taking the initiative, calculating requirements and implementing, taking responsibility for action.

Financial management An Accomplishment dealing with accounts, finances, budgets, financial planning.

General list officer Officers employed by the New Zealand Army who will over the duration of their careers hold numerous command positions across a variety of functional areas. This is done in order to equip such officers with the ability to command in higher rank positions with oversight of many and varied functions. General list officers are different from specialist officers who are employed to provide one specific service or area of expertise. Specialist officers are rarely found in positions higher than lieutenant colonel.

Generative learning/Transfer of learning Purposeful learning and changing in order to enhance the ability to anticipate what might happen.

Implicit knowledge Knowledge which is difficult to state, either because it cannot be articulated, is so well-learned that it has evolved into automaticity of thought, or it is based upon feelings, etc. not readily available to conscious thought.

Knowledge process hierarchy A method of identifying both declarative and procedural knowledge and to categorise such knowledge in information processing terms through several levels of processing, from initial higher-order conceptualisation down to the more detailed and specific constituent parts (see MAPA).

Kruskal-Wallis test Considered to be the nonparametric counterpart of the one-way analysis of variance (ANOVA). This test does not assume that the underlined populations are normally distributed or that equal variances are shared by each group. For this test, all the cases from the three groups are combined and ranked. Average ranks are assigned in the case of ties. For each group, the ranks are summed, and the Kruskal-Wallis H statistic is computed from these sums. The H statistic has approximately a Chi-square distribution under the hypothesis that the three groups have the same distribution (Norusis, 1992, p. 373).

Information processing A term used to describe mental processes which follow a series of stages from the initial reception of the data, through to the resulting decision making process, or any part thereof. While tracing the flows of information, models utilising this approach may also observe the interplay between the information, the organism, and the environment.

Knowledge structure The organisation of knowledge into hierarchies. It is thought that experts have well organised and carefully learned knowledge structures, which determine the quality, completeness, and coherence of the internal representation, which in turn determines the efficiency of further thinking.

Leadership An Accomplishment related to providing guidance, influencing people, providing inspiration, setting an example.

Liaison An Accomplishment involving negotiation, acting as a go-between, cooperating, implementing.

Manoeuvre theory (warfare) Manoeuvre theory is a philosophical form of warfighting utilised by the New Zealand Army at the time of writing. The manoeuvre warfare doctrine relies on the application of intelligence, swift manoeuvre and action, to generate havoc and confusion amongst the enemy in order to destroy their cohesion. This is diametrically opposed to the former paradigm which saw strength pitted against strength in an attritional form of warfare.

MAPA An acronym for the model utilised in this research to identify respondents' Mission, Accomplishments, Performances, and Abilities. In this manner respondents' levels of processing can be articulated to facilitate the exposure their cognitive architectures.

Military knowledge An Accomplishment describing technical and military knowledge/expertise.

Mission The greater organisational purpose to which all the work-related activities are directed.

Ordinal data The respondents in this research were asked to rate their perceptions of importance on a scale for which ordinal values were assigned. *Very Important* on such a scale rates more highly than *Important*, but it cannot be known by how much. The type of scale used in research determines the form of the statistical analysis. An ordinal scale provides data that may be rank-ordered from lowest to highest. Therefore observations may be associated with a percentile rank such as the median.

Organisation management An Accomplishment managing the Army's goals and taking steps to implement goals.

Operations management An Accomplishment describing the management of operations, movements, projects.

Parallel distributed processing (PDP) A perspective on cognition which relates the thought process to a number of neural activities occurring in parallel across various parts of the brain. The resulting models are thought to have an element of biological plausibility as opposed to models utilising the computer metaphor for mind which generally view the mind as a sequential or serial processor of information. The PDP approach is also known as **connectionism** as its proponents believe that knowledge and information are distributed across numerous connections. A powerful argument in support of this theory is demonstrated through the cognitive ability of piecing together faulty or limited data to come to the correct conclusions.

Participative management A Performance describing consultation with subordinates, collective decision making, taking advice. Participative management implies sharing of decisions and responsibility with two or more subordinates as opposed to an autocratic management style.

Pattern of activation A representation of the brain's complex computational architecture highlighting only those connections utilised to perform a particular task or function.

Pattern of connectivity A representation of the brain's complex computational architecture illustrating all information locations and neural pathways.

PAVA An acronym describing Process Abilities' Value Analysis, which incorporates the results of the MAPA model to describe how respondents add value to their work by utilising particular process Abilities.

Performance A term given to identify the constituent parts of an Accomplishment which summarise *knowing how* to do part of the job.

Personnel management An Accomplishment dealing with people management.

Procedural Knowledge Knowledge of how to do things. Knowing how to apply a concept in a practical sense.

Prototype Identifying a number of important, common representations and utilising this information to design a *prototype* cognitive architecture being representative of the research population.

Receptive cognitive function Cognitive functions involving the abilities to select, acquire, classify, and integrate information. Such functions enable the organism to maintain a dialogue with the outside world.

Relationship behaviours According to The Ohio State Studies, relationship behaviours, or **consideration**, refers to the extent to which a leader shows concern for people and engages in two-way communication, including listening, facilitating, and supportive behaviours.

Resonation McClelland and Rumelhart prefer to describe *accessing* of a representation as being re-created or evoked and that each time the representation is evoked, it *resonates* between the connections.

Resource managing An Accomplishment describing the management of stores, items, machinery, software, projects.

Schema An organised set of knowledge retrieved from long-term memory.

Schema theory Concerning the images and representations held about familiar and recurring events and which are stored in memory – generally regarded to be of a subjective nature.

Schematic processing A top-down form of processing in that activation of the higher-order idea occurs first and constrains thinking about the details of the situation.

Self learning A Performance describing the skills needed to define and solve problems, learning from mistakes, changing assumptions and ways of thinking, keeping up to date with education and training needs, initiating continued learning.

Semantic memory Semantic memory is knowledge of the world that is at that point in time independent of specific experiences.

Superorganism A term used to compare the organisation (in this case the New Zealand Army) with a living entity which is self regulating, sensitive to the environment, and responsive to evolutionary forces, causing it to select for various behaviours, traits, and characteristics critical to its survival.

Superposed The manner in which a representation is spread across an entire network which in turn is derived from previous experience, but which is also dynamic in that the network will alter with added experience or even simply through further *accessing* (see **evoked** and **resonation**).

Supportive management A Performance establishing relationships and team building, identifying needs of peers, superiors and subordinates, sharing workloads amongst subordinates, fulfilling responsibilities, delegating.

Task behaviours Described by The Ohio State Leadership Studies as *initiating structure*, task behaviours refer to the extent to which a leader engages in spelling out the duties and responsibilities of an individual or group. It includes telling people what to do, how to do it, where to do it, and who is to do it.

Task management A Performance describing the ability to comprehend tasks and situations, clarifying goals and objectives, critiquing alternatives, prioritising alternatives, adapting plans and strategies, creative thinking, analytical thinking and problem solving.

Thinking cognitive functions These are concerned with the mental organisation and reorganisation of information.

Training management An Accomplishment organising and/or managing training.

Training needs analysis Identification of something lacking in the workforce or in an individual or group of individuals which can be rectified by training and/or education.

Value The addition of an organisationally desirable quality, service, benefit, success factor, or function added by the respondent and which is requisite to the organisation's ability to achieve its mission.

Whole-brain learning In the context of this study, the term whole-brain learning describes learning designed to stimulate both brain hemispheres by appealing to the critical, logical, analytical left hemisphere, as well as appealing to the pattern-seeking, and more intuitive right hemisphere. This is in order to encourage the development of **generative learning**.

Appendices

Appendix One – The MAPA Research Instrument

Questionnaire For Describing COMMAND

CONFIDENTIAL

Richard J. Pech

Consent Form

I agree to take part in Richard Pech's research concerning my perceptions of the requirements for army command. I have no objection to answering the questions in this questionnaire and understand that I can withdraw at any time. I also understand that I am not obliged to answer every question.

Signature ______________________________

Date ______________________

What this questionnaire is all about...

This is an attempt to discover your perceptions of the competencies required for command. You are the person most qualified to know what your work entails. The results of this research will identify knowledge, skills, and abilities required for command and the order in which they should be taught to those aspiring to be in command positions.

While the completed results of this research may be published, your personal contribution will remain confidential and anonymous. Only the researcher will see your written responses.

This questionnaire is relatively demanding as it asks you to:

1. articulate your perceptions of the ideal competencies required to do your job, and

2. describe your competencies in such a manner that there is no doubt or dispute concerning their composition.

This questionnaire has been designed to guide your thinking and provide a standardised structure for your responses. Lists of descriptive terms have been provided only to serve as prompts. You may add your own words or terms if you consider the given terms to be inadequate. There are no right or wrong answers.

If you have any further enquiries concerning this research you can contact me at:

Headquarters Military Studies Institute
Army Training Group
Private Bag
Waiouru
Telephone 06 3876 111 x 7842
Fax 06 3876 039

MISSION

The New Zealand Army's Mission...

The mission statement for the New Zealand Army is:

"An operationally oriented team of integrated Regulars and Territorials - supported by Civilians - who are deployable and light infantry oriented, with structural and operational capabilities which are credible, affordable and sustainable, which have a ready, balanced and fixed utility and which are able to interoperate with our Navy and Air Force, and our friends and allies."

Write your mission statement as it relates to your particular work:

This mission statement should be referred to when completing the remainder of this questionnaire.

ACCOMPLISHMENTS

Mission statements are designed to be broad and all-encompassing. The phrase *Accomplishment* has been given to the terms describing the broadest capabilities required to achieve your mission statement.

DIRECTIONS: Some possible Accomplishments and their meanings are presented below. Read each Accomplishment and then circle the number to the right of the description to indicate your perception of its importance in achieving your work mission. There are no right or wrong answers. You may add your own Accomplishments if the given terms do not adequately describe your work.

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

ACCOMPLISHMENT **EXPLANATION** **RATING**

1. **Personnel management/HRM**...People management__________ 0 1 2 3 4 5

2. **Organisational management**...Manage the Army's goals and act accordingly__________ 0 1 2 3 4 5

3. **Military knowledge**...Technical and military knowledge__________ 0 1 2 3 4 5

4. **Resource managing**...Managing stores, items, machinery, software__________ 0 1 2 3 4 5

5. **Professional knowledge**...Knowledge specific to your work__________ 0 1 2 3 4 5

6. **Leadership**...Providing guidance, inspiration, being an example__________ 0 1 2 3 4 5

7. **Operations management**...Managing operations, movements, projects__________ 0 1 2 3 4 5

8. **Financial management**...Dealing with accounts, finances, budgets__________ 0 1 2 3 4 5

9. **Training management**...Organising and/or managing training__________ 0 1 2 3 4 5

10. **Liaison**...Go-between, cooperating, implementing, negotiating__________ 0 1 2 3 4 5

11. **Communication**...Writing, talking, presenting, listening__________ 0 1 2 3 4 5

12. **Business management**...Administrating, negotiating__________ 0 1 2 3 4 5

13. ____________________ 0 1 2 3 4 5

14. ____________________ 0 1 2 3 4 5

15. ____________________ 0 1 2 3 4 5

PERFORMANCES

Performance is the phrase used to describe an aspect of an Accomplishment. It is a more descriptive and specific term used to identify the constituent parts of an Accomplishment. We express as many Performances as required to adequately describe what each Accomplishment entails.

DIRECTIONS: The following are some possible Performances for describing your Accomplishments. You may add your own if the given terms are deemed inadequate. For up to six of the most critical Accomplishments listed on the previous page (ie. those you consider to be critical for your work) complete a page of Performances describing the importance of each performance for that Accomplishment. There are six pages - one for each Accomplishment. Circle the number beside each Performance which best indicates your perception of the importance of that Performance for your particular Accomplishment from the previous page.

PERFORMANCES FOR ACCOMPLISHMENT 1 ______________________________

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

How important are the following for achieving this Accomplishment?

1. Task management **0 1 2 3 4 5**
- comprehend task situation
- clarify goals & objectives
- critique alternative
- prioritize alternatives
- adapt plans and strategies
- creative thinking
- analytical thinking & problem solving

2. Supportive management **0 1 2 3 4 5**
- establish relationships and team building programmes
- identify needs of peers, superiors, and subordinates
- share workloads amongst subordinates
- reflect on subordinates' actions and act accordingly
- fulfil your responsibilities
- delegate

3. Participative management **0 1 2 3 4 5**
- consult with subordinates
- require collective decision-making when appropriate
- take advice

4. Achievement management **0 1 2 3 4 5**
- establish challenging goals
- have high expectations and standards
- work to improve subordinate performance
- emphasise personal responsibility for success
- implement strategies and objectives to support vision

5. Directive control **0 1 2 3 4 5**
- analyse your superior's intent
- anticipate and take initiative
- calculate requirements and implement
- take responsibility for action

6. Self learning **0 1 2 3 4 5**
- defining & solving problems & learning from mistakes
- change your assumptions and ways of thinking
- keep up to date with education and training needs
- initiate continuing learning

7. Cultural management **0 1 2 3 4 5**
- empathy, diplomacy, understanding values, beliefs & attitudes of people from other cultures & backgrounds

8. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-
-

9. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

10. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

Please ignore these lined pages until you get to page 19...

Performances	Abilities needed for each Performance

PERFORMANCES FOR ACCOMPLISHMENT 2 ______________________________

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

How important are the following for achieving this Accomplishment?

1. Task management **0 1 2 3 4 5**
- comprehend task situation
- clarify goals & objectives
- critique alternative
- prioritize alternatives
- adapt plans and strategies
- creative thinking
- analytical thinking & problem solving

2. Supportive management **0 1 2 3 4 5**
- establish relationships and team building programmes
- identify needs of peers, superiors, and subordinates
- share workloads amongst subordinates
- reflect on subordinates' actions and act accordingly
- fulfil your responsibilities
- delegate

3. Participative management **0 1 2 3 4 5**
- consult with subordinates
- require collective decision-making when appropriate
- take advice

4. Achievement management **0 1 2 3 4 5**
- establish challenging goals
- have high expectations and standards
- work to improve subordinate performance
- emphasise personal responsibility for success
- implement strategies and objectives to support vision

5. Directive control **0 1 2 3 4 5**
- analyse your superior's intent
- anticipate and take initiative
- calculate requirements and implement
- take responsibility for action

6. Self learning **0 1 2 3 4 5**
- defining & solving problems & learning from mistakes
- change your assumptions and ways of thinking
- keep up to date with education and training needs
- initiate continuing learning

7. Cultural management **0 1 2 3 4 5**
- empathy, diplomacy, understanding values, beliefs & attitudes of people from other cultures & backgrounds

8. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-
-

9. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

10. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

Performances	Abilities needed for each Performance

PERFORMANCES FOR ACCOMPLISHMENT 3 ______________________________

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

How important are the following for achieving this Accomplishment?

1. Task management **0 1 2 3 4 5**
- comprehend task situation
- clarify goals & objectives
- critique alternative
- prioritize alternatives
- adapt plans and strategies
- creative thinking
- analytical thinking & problem solving

2. Supportive management **0 1 2 3 4 5**
- establish relationships and team building programmes
- identify needs of peers, superiors, and subordinates
- share workloads amongst subordinates
- reflect on subordinates' actions and act accordingly
- fulfil your responsibilities
- delegate

3. Participative management **0 1 2 3 4 5**
- consult with subordinates
- require collective decision-making when appropriate
- take advice

4. Achievement management **0 1 2 3 4 5**
- establish challenging goals
- have high expectations and standards
- work to improve subordinate performance
- emphasise personal responsibility for success
- implement strategies and objectives to support vision

5. Directive control **0 1 2 3 4 5**
- analyse your superior's intent
- anticipate and take initiative
- calculate requirements and implement
- take responsibility for action

6. Self learning **0 1 2 3 4 5**
- defining & solving problems & learning from mistakes
- change your assumptions and ways of thinking
- keep up to date with education and training needs
- initiate continuing learning

7. Cultural management **0 1 2 3 4 5**
- empathy, diplomacy, understanding values, beliefs & attitudes of people from other cultures & backgrounds

8. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-
-

9. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

10. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

Performances	Abilities needed for each Performance

PERFORMANCES FOR ACCOMPLISHMENT 4 ______________________________

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

How important are the following for achieving this Accomplishment?

1. Task management **0 1 2 3 4 5**
- comprehend task situation
- clarify goals & objectives
- critique alternative
- prioritize alternatives
- adapt plans and strategies
- creative thinking
- analytical thinking & problem solving

2. Supportive management **0 1 2 3 4 5**
- establish relationships and team building programmes
- identify needs of peers, superiors, and subordinates
- share workloads amongst subordinates
- reflect on subordinates' actions and act accordingly
- fulfil your responsibilities
- delegate

3. Participative management **0 1 2 3 4 5**
- consult with subordinates
- require collective decision-making when appropriate
- take advice

4. Achievement management **0 1 2 3 4 5**
- establish challenging goals
- have high expectations and standards
- work to improve subordinate performance
- emphasise personal responsibility for success
- implement strategies and objectives to support vision

5. Directive control **0 1 2 3 4 5**
- analyse your superior's intent
- anticipate and take initiative
- calculate requirements and implement
- take responsibility for action

6. Self learning **0 1 2 3 4 5**
- defining & solving problems & learning from mistakes
- change your assumptions and ways of thinking
- keep up to date with education and training needs
- initiate continuing learning

7. Cultural management **0 1 2 3 4 5**
- empathy, diplomacy, understanding values, beliefs & attitudes of people from other cultures & backgrounds

8. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-
-

9. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

10. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

Performances	Abilities needed for each Performance

PERFORMANCES FOR ACCOMPLISHMENT 5 ______________________

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

How important are the following for achieving this Accomplishment?

1. Task management **0 1 2 3 4 5**
- comprehend task situation
- clarify goals & objectives
- critique alternative
- prioritize alternatives
- adapt plans and strategies
- creative thinking
- analytical thinking & problem solving

2. Supportive management **0 1 2 3 4 5**
- establish relationships and team building programmes
- identify needs of peers, superiors, and subordinates
- share workloads amongst subordinates
- reflect on subordinates' actions and act accordingly
- fulfil your responsibilities
- delegate

3. Participative management **0 1 2 3 4 5**
- consult with subordinates
- require collective decision-making when appropriate
- take advice

4. Achievement management **0 1 2 3 4 5**
- establish challenging goals
- have high expectations and standards
- work to improve subordinate performance
- emphasise personal responsibility for success
- implement strategies and objectives to support vision

5. Directive control **0 1 2 3 4 5**
- analyse your superior's intent
- anticipate and take initiative
- calculate requirements and implement
- take responsibility for action

6. Self learning **0 1 2 3 4 5**
- defining & solving problems & learning from mistakes
- change your assumptions and ways of thinking
- keep up to date with education and training needs
- initiate continuing learning

7. Cultural management **0 1 2 3 4 5**
- empathy, diplomacy, understanding values, beliefs & attitudes of people from other cultures & backgrounds

8. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-
-

9. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

10. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)

Performances	Abilities needed for each Performance

PERFORMANCES FOR ACCOMPLISHMENT 6 ______________________________

0 - Not applicable	**3 - Quite important**
1 - Not important	**4 - Important**
2 - Slightly important	**5 - Very important**

How important are the following for achieving this Accomplishment?

1. Task management **0 1 2 3 4 5**
- comprehend task situation
- clarify goals & objectives
- critique alternative
- prioritize alternatives
- adapt plans and strategies
- creative thinking
- analytical thinking & problem solving

2. Supportive management **0 1 2 3 4 5**
- establish relationships and team building programmes
- identify needs of peers, superiors, and subordinates
- share workloads amongst subordinates
- reflect on subordinates' actions and act accordingly
- fulfil your responsibilities
- delegate

3. Participative management **0 1 2 3 4 5**
- consult with subordinates
- require collective decision-making when appropriate
- take advice

4. Achievement management **0 1 2 3 4 5**
- establish challenging goals
- have high expectations and standards
- work to improve subordinate performance
- emphasise personal responsibility for success
- implement strategies and objectives to support vision

5. Directive control **0 1 2 3 4 5**
- analyse your superior's intent
- anticipate and take initiative
- calculate requirements and implement
- take responsibility for action

6. Self learning **0 1 2 3 4 5**
- defining & solving problems & learning from mistakes
- change your assumptions and ways of thinking
- keep up to date with education and training needs
- initiate continuing learning

7. Cultural management **0 1 2 3 4 5**
- empathy, diplomacy, understanding values, beliefs & attitudes of people from other cultures & backgrounds

8. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-
-

9. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

10. *(other Performance)* **0 1 2 3 4 5**
- (what it includes)
-

Performances	Abilities needed for each Performance

ABILITIES

Your Accomplishments have been defined by Performances. It is now time to define each Performance. This is the final and most definitive stage in the identification of your command competencies. An Ability is a specific knowledge, skill, or attitudinal capacity which is a necessary part of a more complex performance. The following section is designed to identify each Ability required to undertake the Performances which you have already identified as being important.

DIRECTIONS: Place the loose copy of page 19 beside page 6. On the accompanying page write the number of every Performance where you have indicated a 3 - Quite Important or higher - write the numbers of the Abilities required to undertake that Performance. To simplify the process it is advised that you do not do this for more than four Performances for each Accomplishment. If you feel strongly that more than four Performances are important to complete an Accomplishment, you may describe the Abilities for the extra Performance/s.

POSSIBLE ABILITIES FOR DESCRIBING YOUR PERFORMANCES

Assessing abilities
(1) assessing (2) calculating (3) comprehending (4) analysing

Reflective abilities
(5) perceiving (6) contemplating (7) reflecting (8) conceptualising

Attitudinal abilities
(9) accepting (10) rejecting (11) empathising

Communication abilities
(12) speaking (13) writing (14) reading (15) questioning (16) listening

Problem solving/Decision-making abilities
(17) interpreting (18) discriminating (19) solving (20) choosing (21) evaluating
(22) implementing

Interpersonal abilities
(23) coaching (24) collaborating (25) counselling (26) delegating
(27) caring (28) facilitating (29) mediating (30) mentoring
(31) guiding (32) disciplining (33) humouring (34) helping
(35) teaching

Management abilities
(36) directing (37) planning (38) coordinating (39) controlling
(40) innovating (41) motivating (42) prioritizing

Attribute abilities
(43) achievement motivation via independence
(44) achievement motivation via conformance
(45) flexibility (46) sociability (47) dominating (48) asserting
(49) machismo

Invent and add additional abilities which you consider important...

(50) ______________________________ (51) ______________________________

(52) ______________________________ (53) ______________________________

(54) ______________________________ (55) ______________________________

(56) ______________________________ (57) ______________________________

GREATEST CHALLENGE

Please describe what you would consider the greatest challenge or difficulty in your army career ...

BIOGRAPHICAL DATA

DIRECTIONS: Please complete the following biographical data. Your answers will remain confidential.

1. How old are you?

[ ] 15-19 years
[ ] 20-24 years
[ ] 25-29 years
[ ] 30-34 years
[ ] 35-39 years
[ ] 40-44 years
[ ]45-49 years
[ ] 50-54 years
[ ] 55-59 years
[ ] 60-64 years
[ ] 65 years and over

2. What is your gender?

[ ] male

[ ] female

3. What is your nationality?

[ ] New Zealander
[ ] Australian
[ ] Malaysian
[ ] Fijian
[ ] Philipine
[ ] British
[ ] American
[ ] Pacific Islander
[ ] Brunei
[ ] Singapore
[ ] other.......please state ______________________

4. What corp are you in?

____

5. What is your current employment?

[ ] General List Officer
[ ] Specialist Officer
[ ] Territorial

6. What is your current rank?

[ ] 2nd Lt
[ ] Lt
[ ] Capt
[ ] Maj
[ ] Lt Col
[ ] Col
[ ] Brig
[ ] Other (please state) ______________________

7. Have you been deployed in an operational deployment or peace keeping mission?

[ ] Yes

[ ] no

8. How many years have you been employed in the army?

[ ] 0-1 years
[ ] 2-3 years
[ ] 4-5 years
[ ] 6-9 years
[ ] 10-14 years
[ ] 15-19 years
[ ] 20-24 years
[ ] 25-29 years
[ ] 30 years or more

9. In which function have you spent the majority of your army career?

[ ] Training
[ ] Staff
[ ] Regimental

10. What is your highest educational qualification?

[ ] School certificate
[ ] University entrance
[ ] Polytechnic based Certificate/Diploma/Degree (eg. NZCE)
[ ] Undergraduate university Diploma (eg.Dip.Bus.Stud.)
[ ] University Bachelor Degree (eg. BA or Bsc)
[ ] University Masters Degree (eg. MA or MBA)
[ ] Doctorate Degree (eg. PhD)
[ ] Other academic qualification(s) ______________________

____

Appendix 2

Massey University Ethics Committee Approval For Research

6 March 1995

MASSEY
UNIVERSITY

Private Bag
Palmerston North
New Zealand
Telephone 0-6-356 9099
Facsimile 0-6-350 5603

Office of
THE REGISTRAR

Richard J Pech
Dean of Management Studies
Army Training Group
WAIOURU

Dear Richard,

Re: Application HEC94/143

Thank you for your letter and your revised application to the Human Ethics Committee.

Please ensure that you include your contact telephone numbers in both Appendix A and Appendix C. The changes you have made meet the requirements set out by the Committee and the ethics of your project are now approved.

Good luck with your research.

Yours sincerely

Aileen Acty

p.p.

Professor Philip Dewe
(Chairperson)
Human Ethics Committee

Appendix 3

New Zealand Army Approval For Research

21 MAY 1996

Tel DTelN: 367-6111 Ext 7020
Fax DTelN: 367 - 7070

In Reply Please Quote:
4508/1

HEADQUARTERS ARMY TRAINING GROUP
PRIVATE BAG 1702
Waiouru
NEW ZEALAND

20 May 1996

HQ MSI

PhD RESEARCH: DEAN OF MANAGEMENT STUDIES, MILITARY STUDIES INSTITUTE

Reference:

A. HQ Spt Comd 3301/1/Coord dated 16 May 96.

1. Reference A, enclosed, covers the response from DCGS regarding a request from Mr R. Pech to be given access to a wider range of Army officers than is currently possible to assist him in his research. The points made by DCGS regarding the inappropriate by-passing of the correct chain of command are to be brought to Mr Pech's attention.

2. In order for this Headquarters to assist Mr Pech, more detailed information is required regarding the numbers, rank levels, experience and background of personnel he would like to have participate (bearing in mind his current access to officers on courses at Tactical School and MSI). In addition, the proposal should indicate any periods which are unsuitable to him, whether each individual participant or ranks of participants need to be treated separately and how long each session would be likely to take (given that there appears to be a requirement for him to visit the home locations of identified personnel to brief them on the conduct of the survey).

3. When this proposal is received then this Headquarters will be able to canvass ATG units and other formations in order to identify availability of suitable officers.

D.W. BOAG
Major
for Commander

3300/1	
DIR	✓
ADJT	✓
RSM	✓
PSO	
REC	
SSI	
SYS DEV	
R. PECH	

Enclosure:

1. Reference A

DTelN: 347 7807
Fax DTelN: 347 7936

In Reply Please Quote:
3301/1/Coord

RECEIVED
20 MAY 1996
4508/1

HEADQUARTERS SUPPORT COMMAND
PRIVATE BAG 901
UPPER HUTT
NEW ZEALAND

16 May 1996

POSITION	Tick	POSITION	Tick
S3 TRG / TD	✓	A/S3 TD	
S3 TRG		TD WO	
TRG CLK		TD CLK	

HQ LF Comd
HQ ATG
HQ 5 BLG
HQ 5 Log Regt

Ph.D. RESEARCH: MR RICHARD PECH, DEAN OF MANAGEMENT STUDIES, MILITARY STUDIES INSTITUTE

Reference:

A. Army 1000/1/Coord dated 10 May 96 (ATG only)

1. Mr Pech has requested from CGS, access to a wider range of officers within the New Zealand Army, in order to assist with research currently being undertaken. The research subject is competencies for command within the New Zealand Army.

2. Clearance has been granted for Mr Pech to have access to a wider range of senior officers within the New Zealand, for the purposes of his Ph.D study. Headquarters Army Training Group should arrange for Mr Pech to visit selected formations and units at a time convenient to respective locations. Any briefings undertaken by Mr Pech should be given to pre-selected personnel for the purpose of completing any questionnaires.

3. For ATG: Please note paras 2 and 4 of Reference A.

C.E. JONES
Director Corporate Services

RECEIVED
1 4 MAY 1996
By HSO3/1

Telephone: (04) 496 0410
DTelN: 349 7410

Army General Staff
Headquarters
New Zealand Defence Force
Private Bag
WELLINGTON

Army 1000/1/Coord

16 May 1996

Commander Support Command

S3TD

For Information:

Commander Army Training Group

Ph.D. RESEARCH: MR RICHARD PECH, DEAN OF MANAGEMENT STUDIES, MILITARY STUDIES INSTITUTE

Reference:

A. Letter to CGS from Mr Richard Pech dated 8 May 1996

1. In Reference A (copy enclosed), Mr Pech has requested from CGS, access to a wider range of officers within the New Zealand Army, in order to assist with research currently being undertaken regarding competencies for command within the Army.

2. It may be timely to remind Mr Pech that such requests should be directed through the correct chain of command. This Headquarters has no doubt that assistance could have been obtained through either Headquarters Army Training Group or Support Command.

3. Notwithstanding the above, clearance is granted for Mr Pech to have access to a wider range of senior officers within the New Zealand Army, for the purposes of his Ph.D. study. Headquarters Army Training Group should arrange for Mr Pech to visit selected formations and units at a time convenient to respective locations. Any briefings undertaken by Mr Pech should be given to pre-selected personnel for the purpose of completing any questionnaires.

4. It is requested that Mr Pech be advised accordingly of the above.

R.R. OTTAWAY
Brigadier
Acting Chief of General Staff

Enclosure:

1. Copy of Mr Pech's letter to CGS dated 8 May 96