

**AN INVESTIGATION INTO THE COMPETENCES,
CHARACTERISTICS AND PROCESS FACTORS
ASSOCIATED WITH SENIOR MANAGERIAL
TEAM PERFORMANCE**

**A Thesis submitted to Henley Management
College/Brunel University in partial fulfillment of
the requirements for the degree of Doctor of
Business Administration**

by

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ABSTRACT

This study aims to contribute to the understanding of the factors which underpin the effectiveness of managerial teams. The research focuses on examining a selected range of characteristics and competences of team members and their process interaction within the team to produce differing outcomes.

The literature on teams and teamworking is vast, often providing confusing and contradictory evidence. Much of the evidence to support the advantages and benefits is anecdotal and case study based, with authors highlighting a need for more empirical research. In addition the complexity of the field confounds clarity of research studies and findings. Attempts have been made to illuminate the relationships between the variables impacting on team performance through the development and examination of models. This study takes, as a basis for modelling, the Hackman and Morris (1975) Group Interaction Process model.

The research is based on data from 54 management teams drawn from three organisations. The measures employed to examine the characteristics and competences of team members, based on and informed by the literature, are the Belbin Team Roles, the Supra-Competences (derived from the Job Competences Survey), the Watson-Glaser Critical Thinking Appraisal and the Productive Thinking Test (a measure of divergent thinking). Established instruments were selected to measure team processes and team outcomes. These were adapted for this study, based on initial qualitative research with 40 managers from one of the participating organisations.

The literature, and previous research, led to the development of eleven hypotheses. These related to:

- i) the impact of 'balance' of both team roles and competences on team processes and outcomes;
- ii) the impact of thinking styles on team processes and outcomes;
- iii) the impact of team processes on team outcomes; and
- iv) the mediation effect of team processes on input factors in leading to positive team outcomes.

Initial analysis of the qualitative data provided support for many of the team effectiveness factors encountered in the literature and added some new insights into these factors. The quantitative data was examined using correlational, t-test and multiple regression analyses. Results of these analyses provided support for seven of the eleven hypotheses. Notably, evidence is presented to support the concept of team role mix proposed by Belbin. In addition there is evidence of a similar 'mix' phenomenon in relation to team competences (a concept which has previously only been the subject of theoretical consideration). The study has also provided evidence to support the concept of team processes as a mediator variable, and provides evidence from one of the larger samples of senior management teams encountered in the literature. It has also provided illumination of the complexities involved in analysing the performance of management teams. Furthermore, instruments to study teams have been refined in the current research and this, together with the overall findings, provides a potentially valuable platform for further research in this field.

ACKNOWLEDGEMENTS

Throughout this thesis there are numerous references to the complexities, difficulties and challenges involved in attempting to conduct research with managerial teams. At the outset of my research journey I was unaware of the importance of the support of others in helping me to tackle the challenge which I had set myself. Having completed the journey I am aware of how indebted I am to the support of so many people.

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Chapter 1. Purpose, Aims and Scope of the Research

“Every art and every investigation, and likewise every practical pursuit or undertaking, seems to aim at some good: hence it has been well said that the Good is that at which all things aim.”

Aristotle; Nicomachean Ethics

This chapter outlines the genesis of the current research study from a managerial and personal perspective. In addition it introduces the initial research problem and questions and outlines the overall approach to the study.

1.1 Introduction and Importance of Research

The role of teams and their contribution to organisational performance is a dominant topic in much of the current management literature. There is a strong impression given that teams and teamworking are “flavour of the month” and are being viewed as the solution to many pressing, and often complex, issues relating to organisational performance (West, 1994; Industrial Society, 1995; West & Slater, 1995).

In much of the popular literature there appears to be a common assumption that the case for team working is proven and well understood. In their book, *The Wisdom of Teams*, Katzenbach and Smith (1993) make two statements which typify the assumptions frequently adopted. These are:

- i) “It is obvious that teams outperform individuals”; and
- ii) “Team is a word and concept well known to everyone”.

However, even a cursory review of the vast literature on teams and teamworking reveals that these assumptions are, at the best, questionable. West and Slater (1995) in a review of the evidence for the benefits of teamworking comment that:

“Assumptions about the value of teams are plausible, but the research shows this value is difficult to demonstrate.”

Furthermore a number of authors have highlighted a degree of confusion and divergence in the use of the concept of a team in an organisational context (eg, Critchley & Casey, 1984; Higgs & Rowland, 1992).

Given the importance ascribed by organisations to teams and teamworking it is necessary that rigorous evidence of the effectiveness of teamworking, in delivering improved performance and related organisational benefits, should be available to underpin significant organisation decisions. In practice, the realisation of expected benefits and performance improvements is difficult to achieve. A survey of 100 UK organisations conducted in 1995 examined teamworking practices found a high degree of consensus amongst participants that it is difficult to build teams and realise the benefits of teamworking (Employment Development Bulletin, 1995).

Much of the evidence to support the benefits of teamworking is said to be rooted in group research (Katzenbach & Smith, 1993; Ray & Bronstein, 1995; Tjosvold, 1991). However, the direct evidence relating to the study of teams per se tends to be primarily derived from case studies and anecdotal illustration. A clear need for empirical and organisationally-based research into teams has been highlighted by a number of authors eg, Furnham et al, 1993; West & Slater, 1995; Dulewicz, 1995(a).

A notable feature of many of the investigations into teamworking is the lack of clarity over the meaning of the findings and implications of these for different levels of management. For example, Belbin's original research (Belbin et al, 1976; Belbin, 1981) focused specifically on managerial teams, yet much of the subsequent research and literature on Belbin Team Roles has used samples and illustrations involving mixed level sub-samples of teams (eg, Berry, 1995; Furnham et al, 1993), or even applied the constructs to non-managerial teams (eg, Fisher et al, 1994; Senior, 1996). This lack of clarity compounds the difficulties in developing an understanding of the factors and processes that underpin the effective application of team constructs and development of teams at specific levels within an organisation.

In part the lack of specific studies (particularly in an organisational context) focusing on managerial teams may be due to the difficulty in gaining access to such teams (Pettigrew, 1992; Hambrick & Mason, 1984; Eisenhardt, 1989). The need to understand the specific issues relating to senior management and top teams has been reinforced not only by the interest in this area highlighted in organisational practices and popular literature (eg, Katzenbach & Smith, 1993; Kakabadse, 1991), but also from the range of studies emanating from the links demonstrated between organisational performance and top team characteristics and embedded in what has been termed 'Upper Echelon Theory' (Hambrick & Mason, 1984).

In more recent years there has been a growth in top team studies (Pettigrew, 1992). However, due to difficulties in access these have been limited too often to studies based on archival and demographic data (Pettigrew, 1992; Lawrence, 1991). As a result whilst there is a growing body of data on senior management team relationships to organisational performance the results are often contradictory and the studies fail to shed any significant light on the processes through which such teams come to achieve performance outcomes (Lawrence, 1991). The number of studies which address both inputs and processes at senior level remain relatively rare. Although those which are reported provided intriguing and tantalising insights and, hopefully, will promote further research to illuminate the top team processes more fully (eg, West & Anderson, 1996).

In summary it would appear that there is a continuing need for organisationally based research into teams and teamworking which is methodologically sound (Furnham, 1992; Furnham et al, 1993; Dulewicz, 1995(a); West & Slater, 1995). In addition, within this field of research there is a specific need to develop a clearer picture of the input and process factors (and their interaction) which are specifically relevant to the performance of managerial teams (Pettigrew, 1992; Lawrence, 1991; Hambrick & Mason, 1984).

1.2 Personal Motivation

I have been involved, as a practising consultant, for over ten years in working with organisations on executive and managerial team development. During this period I have constantly sought to find clear evidence of the benefits of teamwork (particularly at senior levels) and consistent and robust frameworks and methodologies which may be applied to the building and development of management teams. At times I have felt frustrated by the plethora of theoretical and popular propositions and approaches to dealing with team selection, processes and development. In examining these I have found that popular and extensively used models, such as the Belbin Team Role model, are subject to challenge and disagreement in relation to their fundamental construct validity (eg, Furnham et al, 1993; Senior, 1997; Dulewicz, 1995(a); Belbin, 1993). The literature abounds with conflicting evidence on the antecedents of effective team performance (Pettigrew, 1992; Furnham, 1992).

During the latter part of 1990, and early part of 1991, I had the opportunity (together with a colleague) to carry out a structured research study within a client organisation which was designed to answer the question "What makes for effective teamworking within our company?". Building on my experience of conducting academic research for an M. Phil (Higgs, 1991) I decided to structure the research for the client on a basis which was as methodologically robust as possible. The research examined 16 teams and involved the development of two questionnaires. The first, to be completed by team members, examined their perceptions in relation to the way in which they functioned as a team. The second was designed to be completed by the senior manager to whom the team reported and the main "internal customers" of the team. This questionnaire was aimed at obtaining a measurement of team performance both in terms of "soft" outcomes (eg, cohesion) and "hard" outcomes (eg, goal achievement). The design of both questionnaires was based on qualitative research amongst a sample of management team members and senior executives within the organisation.

The results of this study (Higgs & Rowland, 1992) were encouraging in that they both helped to identify the importance of team processes and to develop a reliable instrument for examining team performance. However, the study left many questions unanswered and left me with a desire to find out more about the factors underpinning effective team performance and their interrelationships. In reflecting on the frustrations of failing to produce a definitive answer to the clients' question I felt that the following comment by Schein (1988) was particularly pertinent to the study of teams in an organisational context:

"Contingency theory emphasises that there are no simple generalisations about human behaviour in organisations."

Given the complexity of the issues involved in understanding the dynamics of team processes and performance I felt that an opportunity to explore them in an academic research context should be found. The DBA provided an ideal opportunity which enabled me to: i) continue working as a practitioner; ii) build linkages between practitioner and academic insights; and iii) receive structured input to and guidance on the research process which would ensure

methodological rigour built from sound theoretical underpinnings. Stage I of the DBA enabled me to use practical team projects to develop my CDP targets whilst exploring the literature in order to help me frame my research. It was in the process of exploring the literature that I realised that, through my consulting work, I would be able to gain access to managerial teams (including senior managerial teams) in sufficient number to build a substantial data set related to my ultimate research topic. This encouraged me to believe that I had a real opportunity to contribute to the understanding of management teams in an organisational context based on a substantial sample which others had encountered difficulty in realising.

1.3 The Management Problem

In the literature and practice in relation to management teams there is a wide recognition of the potential of teamwork to enhance performance (eg, Hackman, 1990; Belbin et al, 1976; Belbin, 1981; Katzenbach & Smith, 1993; Tjosvold, 1991). However, much of the evidence is based on anecdotal and case study data rather than empirical studies (eg, West and Slater, 1995; Furnham, 1992).

The conclusions from the literature are, broadly:

- i) There is a growing business imperative for effective teamworking;
- ii) The approaches to building and developing effective managerial teamworking either relate to selection and mix of membership or the processes employed by the team in interacting and working together;
- iii) Approaches and interventions relating to developing team performance each claim primacy without presenting evidence clearly explaining all outcome variance.

Overall, given the business importance ascribed to building effective managerial team performance and the absence of clear and consistent evidence underpinning how this may best be achieved, the core managerial problem may be summarised as being:

“What factors should be focused on to enhance the performance of management teams?”

1.4 The Research Questions

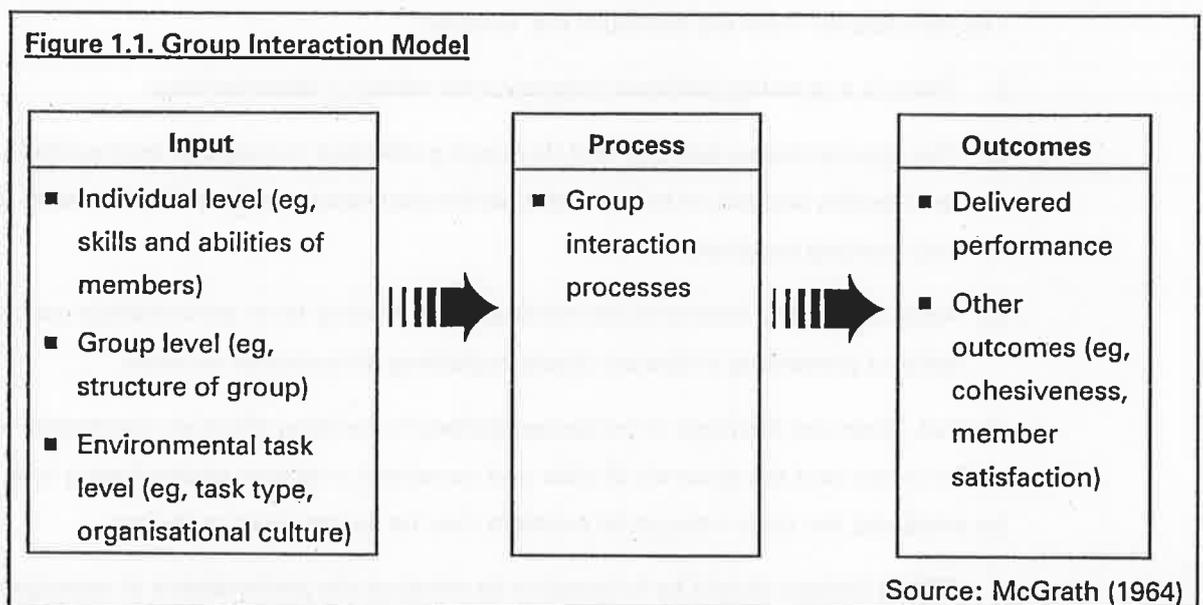
The literature on teams and teamworking is both extensive and diverse. There is no clear explanation of how factors which focus on the inputs to team performance interact with those factors relating to the processes involved in effective teamworking in producing the performance outcomes. Within the literature a very large range of factors impacting on team performance have been identified (within the literature review in this thesis more than 150 stated factors are identified). Much of the literature concentrates on a limited number of factors, either adopting an input focus (eg, Belbin, 1981) or a process focus (eg, Adair, 1986).

The evidence for the assertion that teamworking leads to effective performance is largely case study based with an absence of rigorous proof of the assertion. Belbin's work with Henley Management College (Belbin et al, 1976; Belbin, 1981) is a major exception to this pattern. However, his work focuses primarily on the relationship between team roles, reflecting the

personal characteristics of team members, and their impact in combination on team performance. This work, in itself, has faced challenge (Furnham et al, 1993) and the need for further and more empirically based research into the performance of management teams has been highlighted (West & Slater, 1995; Furnham et al, 1993).

A number of authors argue that the case for teamworking leading to higher performance is made by the research into small groups (eg, Katzenbach & Smith, 1993; Tjosvold, 1991; Ray & Bronstein, 1995). However, the evidence from the group research field is limited in explaining the nature of the relationship between groups and performance in a comprehensive manner. Furthermore, specific studies have produced some conflicting and contradictory results.

McGrath (1964) produced a model to explain group processes and performance. This is summarised in figure 1.1. Within McGrath's model there are a large number of variables and, therefore, it has proved very difficult to test. Hackman and Morris (1975) attempted to test the full process model within an experimental setting. They were unable to validate the full process, although were able to demonstrate the following clear linkages:



- i) Input: Performance
- ii) Process: Performance

In reviewing the reasons for failing to identify a full process linkage, Hackman and Morris (1975) highlighted problems in:

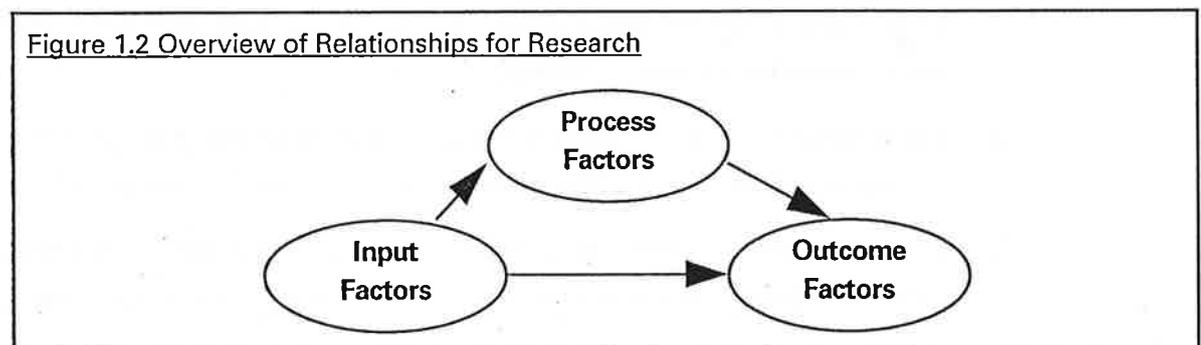
- i) Attempting to deal with too many variables;
- ii) Adopting a limited view of group interaction (primarily focused on communication processes within the group); and
- iii) Being constrained by an experimental research design.

Given the combination of the managerial problem, and the nature and limitations of previous research, the major research questions for this study to address are seen as being:

- i) Is there a relationship between input, process and performance which can contribute to an understanding of the effectiveness of management teams?
- ii) How may this relationship be modelled?
- iii) Which factors in an overall process model have the greatest impact on the performance of management teams?

1.5 Overview of the Research

The focus of the research will be managerial teams examined in an organisational setting. The overall approach will be within a predominantly positivistic paradigm, although some initial qualitative research will be conducted in order to explore the need for modification of the core questionnaires to be employed in the study. Figure 1.2 provides an overall model of the relationships which are to be examined in this thesis.



From the literature (eg, Hackman & Morris, 1975) it is suggested that process may act as a mediator on input factors in explaining performance variations. Furthermore, the experience of Hackman & Morris (Ibid) suggests that the sheer range of factors involved in the overall process presents a degree of complexity which makes the full process an exceedingly difficult one to demonstrate empirically.

This research is designed to examine the overall process relationships by focusing on a restricted range of variables. The main broad initial research hypotheses which have been formulated to address the research questions are:

- i) Team processes are a mediator in the input to outcome relationship for managerial teams (ie, a process model will describe relationships more effectively than a one-stage model);
- ii) The mix of personal qualities and competences in a management team will be related to both the delivered results and perceived cohesiveness of the team;
- iii) The perceived efficacy of team processes in a management team will be related to both the delivered results and perceived cohesiveness of the team;

- iv) A combination of the mix of personalities (and competences) of a team and the perceived efficiency of its processes will explain more variation in results and perceived cohesiveness than either component alone.

In addition to these core hypotheses the literature suggests the following subsidiary hypotheses:

- i) There will be a relationship between team roles (as a measure of individual characteristics) and competences;
- ii) There will be a relationship between the cognitive abilities of team members and both their competences and team roles.

In order to explore the overall model a limited range of variables have been selected. It is hoped that, in this way, the complexity issues (highlighted by Hackman & Morris, 1975) may be ameliorated. The input factors have been limited to those identified at the individual level within McGrath's original model (McGrath, 1964). The input factors selected and their proposed operationalisation are as follows:

- i) **Team Roles:** These will be the Belbin Team Roles derived from the 16PF via the original Henley formulae (Dulewicz, 1995(a));
- ii) **Competences:** The competence framework used will be that of the Supra-Competences (Dulewicz, 1995(a)) which will be arrived at using the Job Competences Survey instrument;
- iii) **Cognitive Abilities:** These will be measured using a combination of the Watson-Glaser Critical Thinking Appraisal and the Fletcher and Dulewicz Productive Thinking Test;
- iv) **Team Processes:** The measure of team processes will be designed to be broader than the limited, and communication-based, framework employed by Hackman and Morris, (1975). It is intended to use a team process questionnaire derived from the Board Effectiveness questionnaire developed by Dulewicz and Herbert (1995). Modifications to this instrument were based on interviews and focus group discussions designed to identify critical team processes associated with effective performance;
- v) **Team Outcomes:** The assessment of team outcomes is an area of difficulty which has been highlighted in the literature. A number of authors (eg, Furnham, 1992; Hackman, 1990) indicate the potential value of using a combination of "hard" and "soft" measures. In keeping with this it is planned to use a brief outcome questionnaire to be completed by the executive to whom a team reports. This questionnaire will be based on that employed by Higgs and Rowland, (1992) and may require modification resulting from initial focus group and interview results.

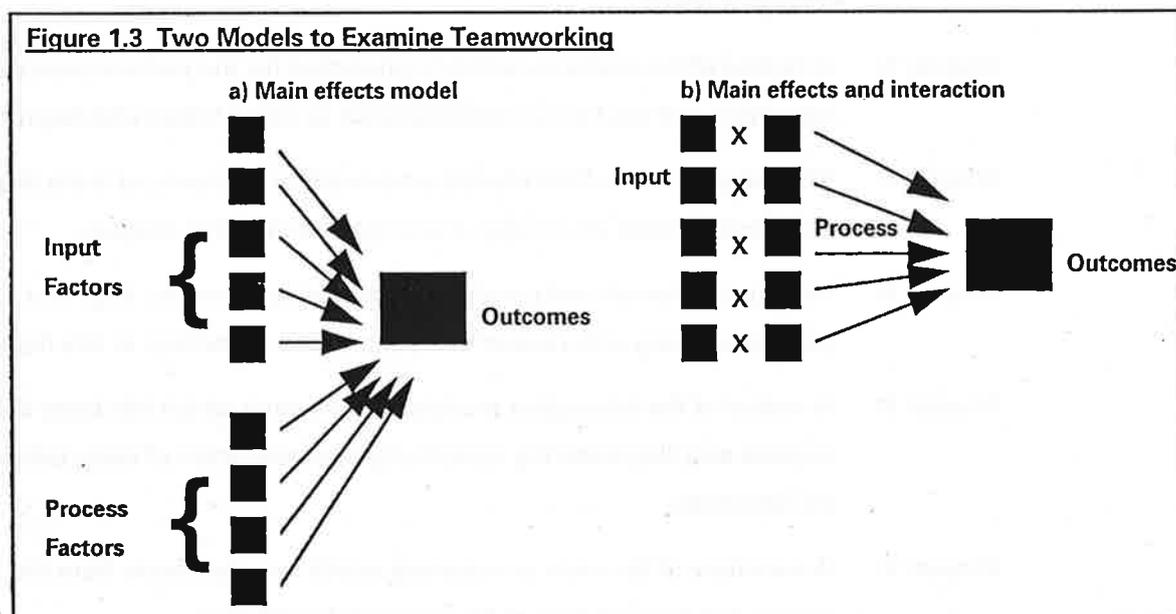
For the purposes of the model testing the above instruments will need to be analysed to produce a more limited range of variables. The input factors will be reduced as follows:

- i) **Team Roles:** The standard Belbin Team Role Analysis identifies eight distinct roles. Berry, (1995) produced a program to report a Team Role Index which identifies the extent to

which the actual team roles of members represents an “ideal” mix in Belbin terms. It is this team role index which has been used in this research;

- ii) **Competences:** A similar index to Berry’s Team Role Index has been developed to express the mix of competences present in each of the teams;
- iii) **Cognitive Abilities:** For each team average Watson Glaser Critical Thinking Appraisal (CTA) and Productive Thinking Test (PTT) scores were used as measures of cognitive abilities of the team;
- iv) **Team Process:** The team process questionnaire has been factor analysed to identify the core variables. It was anticipated that some 6 to 10 variables would result from this analysis;
- v) **Team Outcomes:** The team outcome questionnaire was factor analysed to produce the main outcome dimensions. It was anticipated that the questionnaire would produce at least two outcome factors from the analysis.

In seeking to examine the viability of models, two models were tested. One entailed developing multiple correlations for all input and variable factors with both performance and cohesiveness variables. The second model examined all combinations of input and process variables in terms of the multiple correlations of these with the performance and cohesiveness variables. (This represented a full process model). These two approaches are summarised in figure 1.3.



1.6 Limitations and Constraints

Whilst this research will have the benefits of being conducted in an organisational context and thus contributing in an area of limited current data (West & Slater, 1995; Dulewicz, 1995(a)) it will lead to a number of further limitations. The focus on managerial teams within this organisational context constrains, to an extent, the design of the study. In addition the extent of past and anticipated organisational changes in response to volatile market conditions within the organisations which I am able to approach acts as a further design constraint. Taken together

these constraints lead to a design which is correlational and cross-sectional. As a result there are limitations on causal inferences which may be drawn from the results of the study (Lehman, 1991; Wright & Fowler, 1986; Graziano & Raulin, 1989).

A further consequence of focusing on managerial teams was a limitation on the number of organisations that I was able to engage in the process. Whilst cross-sectional studies have the benefits of generalisability (Lehman, 1991; Wright & Fowler, 1986; Moser & Kalton, 1971) these were being significantly reduced in working with a relatively small number of organisations. Although it was anticipated that a sizeable sample, in terms of the number of management teams, would be realised (a sample in excess of 50 teams was anticipated) there remained limitations in terms of analytical strategies. These limitations impacted on the number of variables which could be considered in the application of multivariate analysis and the inability to apply structural equation modelling techniques (such as LISREL) to fully explore causal relationships (Hair et al, 1995). On balance it was decided that the benefits of conducting a study of this type with a significant number of managerial teams in an organisational context would outweigh the limitations resulting from this decision.

1.7 Structure of the Thesis

The overall thesis is organised and presented as follows:

- Chapter 2:** An examination of organisational needs for teamworking and discussion of the nature of teams.
- Chapter 3:** A review of the evidence which is presented for the performance benefits of teamwork and the factors demonstrated as being linked with team effectiveness.
- Chapter 4:** The range of Team Role Models proposed for purposes of team design, selection and development are reviewed and discussed in this chapter.
- Chapter 5:** The specific issues and considerations relating to senior level and Top Teams are discussed along with research directions and limitations in this field.
- Chapter 6:** A review of the interaction models and research which has been designed to explore and illuminate the complexity of examination of team behaviour and performance.
- Chapter 7:** A summary of the main conclusions which may be drawn from the literature review and presentation of the research hypotheses.
- Chapter 8:** The methodological approach to the current research and detailed research design are presented in this chapter.
- Chapter 9:** A summary of details of the sample is provided together with the results of the qualitative phase of the study and an examination of the main study variables.

- Chapter 10:** An exploration of the results of the correlational analyses of the relationships between the variables in the study. An examination of the differences (in terms of research variables) between high and low performing teams.
- Chapter 11:** An examination of the alternative models proposed through multivariate analysis. An overall discussion of the results and the extent to which they provide support for the research hypotheses.
- Chapter 12:** Overall conclusions from the study. In this chapter the practical implications of the findings and indications of areas for further research are also discussed.
- Appendices:** Within the appendices the core research instruments are provided, together with tables, data summaries and support materials for the core thesis. Individual questionnaire and psychometric instrument responses are not provided in the appendices. However, they are available for inspection in separate files or on computer disc.

1.8 Summary

This chapter has set out to provide an understanding of the background to this research study together with an overview of the structure of the study and thesis as a whole. The importance of this research both from a practical and academic perspective has been emphasised along with the complexities of studying managerial teams in an organisational context and subsequent limitations on research design.

The next chapter explores the need to examine teamworking in more detail and, in so doing, examines conceptual and definitional issues in relation to teams.

Chapter 2. The Need for Teamwork and the Nature of Teams

"No man is an island, intire of it selfe; every man is a peece of the continent, a part of the maine"

John Donne: Devotions upon Emergent Occasions (1624)

There exists an extensive range of literature on teams, teamworking and related topics. Much of the more recent literature has focused on the topics of work teams, self-directed teams and self-managed teams (eg, Tjosvold, 1991; Ray & Bronstein, 1995). As the current research study is focused on managerial teams the full range of the more recent teamworking literature has not, therefore, been reviewed. However, although the focus is on senior managerial teams it is necessary to explore some of the broader-based background literature in order to examine underlying factors which appear to be driving the focus on teamworking and definition of teams within an organisational context.

In this chapter the drivers of interest in teams and teamworking are examined together with a discussion of the nature of teams and their position in an organisational context.

2.1 Increase in the Use of Teams

Lawson (1995) reports on a survey of 62 UK companies to examine the introduction and expansion of teamworking within organisations. Over 50% of participants reported that the introduction or expansion of teamworking was a dimension of broader employee involvement activities designed to improve organisational performance. They also reported a London School of Economics study which compared Japanese and UK organisations. In this study around 70% of organisations in both countries reported that teamworking was the predominant approach to organisational design and working practices. Dumaine (1994) reported a USA survey of Fortune 1000 companies in which some 68% of participants stated that they were actively encouraging and using teamwork within their organisations. These surveys typify the growing trend amongst organisations to look to teamworking as a new means of improving organisational performance; a feature which is consistently reported in studies of changing organisational practices and initiatives (eg, Borrelli et al, 1995; Employment & Development Bulletin, 1995). The extent to which the use of teams and teamworking has become embedded in organisational thinking is typified by the recent statement made by Osterman (1994):

"More than half of all US firms are now exploring some form of team-based work system."

This evidence of a growing use of, and focus on, teams and teamworking describes practice, but raises questions relating to the underlying reasons for this trend. These reasons are explained in the following sections of this chapter.

2.2 Factors Driving Organisational Focus on Teams

In outlining the factors which appear to be driving the organisational interest in and focus on teams it is necessary to touch on a range of topics each of which deserve a paper (or even a

book!) in their own right (indeed many have been the subject of much detailed research and analysis). However, the purpose here is to highlight the issues in order to provide a backdrop against which teams and teamworking may be examined in more detail.

The overarching issues which seems to face most organisations relate to the significant and fundamental changes taking place in the environment in which they operate (Moss-Kanter, 1983; Sparrow, et al, 1993). The growth in perceived levels of competitiveness is creating an imperative for organisations to find new ways of working and responding to the challenge (Handy, 1985; Tjosvold, 1991; Ghoshal & Bartlett, 1995; Ray & Bronstein, 1995; Drucker, 1988).

In addition to changes in national economic environments, including the major impact of deregulation (Tjosvold, 1991; Ray & Bronstein, 1995; Sparrow et al, 1993; Wickens, 1995), there is an apparently unstoppable trend to globalisation both in terms of markets and the spread of multi-national, global and transnational organisations (Ghoshal & Bartlett, 1995; Tjosvold, 1991; Higgs, 1994; Davison, 1994). This level of change and environmental volatility has led many organisations to re-appraise their views on the drivers of competitive advantage (Ulrich & Lake, 1990). In a world-wide survey conducted in some 2,000 companies by the consulting firm Towers Perrin for IBM (Towers Perrin, 1992) a view emerged from CEO's, senior line executives and HR specialists that "people provide the only long-term sustainable competitive advantage". This view is by no means new. The positioning of people as a critical strategic resource has been raised on a number of occasions (Blake et al, 1987; Drucker, 1988; Ulrich & Lake, 1990; Senge, 1990; Tjosvold, 1991) and the call has readily been taken up and reinforced by others (eg, Ray & Bronstein, 1995; Moss-Kanter, 1993; Jashapara, 1993).

In addition to the market-related environmental changes, organisations have had to face changes in society and the values and expectations of those very people who will provide the competitive edge (Critchley & Casey, 1984; Higgs & Rowland, 1992; Moss-Kanter, 1993; Robinson, 1991). This change has been flagged for some time and the implications of a better educated population with a desire for a greater say in managerial processes have been discussed as specific drivers for teamworking (Belbin, 1981). There is little doubt that the economic success of Japanese organisations has played a significant role in influencing and shaping organisations' responses to this volatile environment (Walters, 1995; Hampden-Turner & Trompenaars, 1995). This influence, along with an increased desire to learn from successful organisations (Seddon, 1992; Peters & Waterman, 1982; Senge, 1990) has led to a range of analyses of means of responding to change and building competitive edge, each of which may be seen as providing a driving rationale for the use of teams and teamworking. In broad terms the areas highlighted by many of these authors may be summarised as: i) evolution of organisational theory; ii) business complexity and turbulence; iii) dealing with competition; iv) managing change; v) new ways of working; and vi) the introduction of specific managerial initiatives. Each of these areas is explored briefly below.

Evolution of Organisational Theory

In many ways teamworking, particularly at managerial levels, may be seen as relabelling established organisational practices. For example, in pointing out that a high proportion of managerial time is spent in working in groups, Blanchard (1988) commented that:

“Most managers spend no less than 50 percent, and possibly as much as 90 percent, of their working time in some type of group activity.”

Whilst Blanchard's comments focus on managers, Schein (1988), taking a broader perspective, comments that:

“In delving into the motivations of workers it was found that workers' relationships to other workers made more of a difference to morale and production than was previously assumed.”

This implies that understanding the behaviour of groups (or teams) within an organisation may be a more appropriate unit of analysis than the more “traditional” unit of individual behaviour. This is reinforced by the observation of Leavitt et al (1973) that:

“Many organisational acts can be more readily predicted by reading a ‘group map’ of the organisation than by reading either individual people maps or total organisational charts.”

In exploring this framework further Leavitt and Bahrami (1988) point out that groups act as the major intermediaries between large organisations and the people who compose them. They point out that groups affect the behaviour of individuals by: i) moulding and changing behaviour, values and attitudes; ii) generating commitment and loyalty; iii) providing a vehicle for contributing to organisation decisions; and iv) contributing to building morale and motivation.

Whilst some authors (see above) position teams as a means of linking individuals to organisations, others see teamworking as one of a number of organisation development interventions (eg, Argyris, 1992; Beer, 1994; Schein & Bennis, 1966; Porras & Berg, 1978; Metlay & Kaplan, 1992). In particular Porras and Berg (1978) point out that, in their review of the literature, some 40 percent of all Organisation Development interventions related to team building or team development. They pointed out that such interventions lead to social systems changes at the level of individuals, leaders, groups and the organisation as a whole. Liebowitz and DeMeuse (1982) specifically identify the linkages between the growth in the interest in and use of teamworking and the natural evolution of organisational theory highlighting that the use of teamworking responds to organisational needs to: i) adapt to change; ii) manage complexity; iii) increase efficiency; and iv) cope with the growth in functional interdependence.

Managing Complexity

In the rapidly changing and demanding business environment decision-making is becoming increasingly complex. Managing this complexity is seen as being too much for an individual to handle (Belbin, 1981; Margerison & McCann, 1985; Davison, 1994; Larson & La Fasto, 1989; Perrow, 1994; Dyer, 1977) and calls for higher levels of involvement (Tjosvold, 1991; Moss-

Kanter, 1993; Belbin, 1981) and the increased use of a range of skills and specialisms (Margerison & McCann, 1990; Belbin, 1976; Goshal & Bartlett, 1995; Blake et al, 1987; Boyelt & Conn, 1991).

It is seen as critical, in order to operate effectively, to use multi-disciplinary and multi-skilled groups to deal with complex decisions and, in doing so, to leverage the talent that is available within the organisation (Goshal & Bartlett, 1995; Wickens, 1995; Senge, 1990; Blake et al, 1987; Hastings et al, 1986). Illustrative of this is the review of healthcare studies in which Eichorn (1974) pointed out that levels of complexity in providing medical treatments have become so great that they can only be addressed by cross-functional and multi-disciplinary teams. It is certainly in the realm of **managerial teams** that decision-making complexity is becoming a major driver of the increasing focus on teamworking. Indeed in a study of managers' expectations of how they might work in the future some 70% of respondents stated that they expected to spend more of their time working in teams (Wheatly, 1992). The indications are that the need for teamwork to deal with complex decisions is extending upwards to **Board level** (Lorsch, 1989).

Responding to Competition

The need to keep pace with competition in terms of introducing teamwork in the minds of many organisations is typified by the comment of Cook (1993):

“Teamworking is no longer an option for many organisations, but a necessary part of corporate effectiveness.”

In broad terms the theme that teamwork is core to building competitiveness is dominant in the popular literature. The assertion is frequently underpinned by anecdotal or case study-based evidence (eg, Katzenbach & Smith, 1993; Tjosvold, 1991; Cook, 1993; Rogers et al, 1995; Drucker, 1988). Herbert (1990) goes beneath the anecdotal level to propose that people (and thus teams) within an organisation need to be viewed as a “prospective asset” and to argue that there is a need to look beyond the mantra of “building competitive edge through people” to examine the linkage between employee contribution and shareholder value.

Managing Change

Volatility and growing pressure in the business environment is leading to an increasing pace of change as organisations develop and implement responsive strategies (Ulrich & Lake, 1990). The sheer speed and pace of change is one factor underlying the increasing complexity of decision-making discussed above (Margerison & McCann, 1985; Tjosvold, 1991; Higgs & Rowland, 1992). Increasingly, however, organisations are finding that large scale projects and programmes designed to bring about significant organisational change are failing to deliver expected results (Beer & Bert, 1990) or bring about required changes in the behaviour of individuals or groups. A view is emerging that the management of change requires more fundamental shifts in organisational thinking than are evidenced in programmatic interventions. The need is seen as being for “corporate transformation and renewal rather than incremental change” (Ghoshal & Bartlett, 1995). The more fundamental shift in thinking on managing change

is seen as requiring a strong focus on behaviour and the ways in which behaviours may be changed and aligned with the need for developing a more responsive and flexible organisation (Seddon, 1992; Katzenbach & Smith, 1993; Ray & Bronstein, 1995; Tjosvold, 1991; Moss-Kanter, 1983; Beeby & Simpson, 1995; Leigh & Maynard, 1994).

New Ways of Organising and Working

Responses to the challenges of the "new environment" encompass changes in thinking in terms of organisation design. The move to flatter organisation structures is a common response, driven by a mixture of needs to cut costs and facilitate greater responsiveness to market conditions and customer needs (Tjosvold, 1991). More fundamental rethinking on organisation design is proposed by a number of writers. Handy (1985) proposes a move to a "cloverleaf" organisation with a relatively small core of managers and staff employed on a "traditional" basis and greater use of specialist resources on a medium-term contractual basis together with the flexibility provided by pools of employees on short-term contracts (or even providing out-sourced services as suppliers). Porter (1985) outlines the idea of a "honeycomb" structure which is significantly flatter than "traditional" structures and requires strategic managers operating in teams across the organisation.

Proposed dramatic alternatives to organisational design have yet to see light of day to any significant extent. However, the challenges to "traditional" organisational thinking and arrangements contained within these models are, in reality, impacting on organisational practices. In an increasing number of organisations the nature of the "psychological contract" is changing (Burgoyne, 1989; Senge, 1990) and both managers and employees are needing to understand the nature of the "new deal" covering their expectations of and relationships with the employing corporation (Ulrich & Lake, 1990).

Beyond shifts in organisational paradigms the reality of working (particularly for managers) is leading to a greater focus on project-based working (Fisher et al, 1994) and, in response to the need for multi-skilled input to complex decisions, significant increases in the use of matrix-based organisational relationships (Ghoshal & Bartlett, 1995). Whilst the project and matrix approaches help to provide capacity to handle complexity and build flexibility at managerial levels a broader need to build flexibility in working practices has been identified as important at all levels in an organisation (Drucker 1988, Tjosvold, 1991). One major way of responding to this need has been the increased emphasis on empowerment throughout an organisation (Moss-Kanter, 1993). When implemented in full this leads to significant changes in working practices and organisational relationships (Stewart, 1990; Seddon, 1992; Tjosvold, 1991).

In addition to changes in working and organisational arrangements emanating from changes in thinking there is little doubt that dramatic developments in technology have had a significant impact on organisation design and enabled a number of the above developments to be implemented effectively. In particular it is felt that the power of information technology in distributing and disseminating information effectively has obviated the need for the "traditional" deep and structured hierarchies (Blake et al, 1987).

Globalisation has led to a new focus on managing across borders. The limitations of the "colonial" model of the traditional multi-national have been identified as markets have become more truly global (Phillips, 1992). Managing across cultures adds additional elements of complexity, including more complex interpersonal relationships (Davison, 1994; Hampden-Turner & Trompenaars, 1995). Organisations are having to review their thinking on how they work with managers from different national and cultural backgrounds. There is a shift from the "traditional" multi-national ethnocentricity to a search for synergy (Adler, 1980). For many organisations a major challenge of the 90's is seen as being that of developing and implementing effective strategies for managing and leveraging cultural diversity (Davison, 1994; Ghoshal & Bartlett, 1995; Phillips, 1992; Higgs, 1994).

In the midst of such a climate of turbulence and change a major challenge for organisations is to learn to operate in new and different ways. Indeed a further change in thinking in itself is the concept of organisational learning (Senge, 1990). Many writers on organisation see the ability to capture, disseminate and build organisational learning as a significant component in developing competitive advantage (Senge, 1990; Jashapara, 1993; Ghoshal & Bartlett, 1995; Katzenbach & Smith, 1993; Wickens, 1995).

Specific Initiatives and Focus

In conjunction with shifts in organisational paradigms and development of new ways of working, a diverse range of specific initiatives are reported as ways of coping with changing environments and building competitive edge. For some the over-reaching focus is on building responsiveness and flexibility through processes of **continuous improvement**. While in some organisations continuous improvement is handled programmatically, in others there is an argument that continuous improvement should, in itself, be seen as a paradigm shift (Seddon, 1992; Tjosvold, 1991; Ray & Bronstein, 1995). It is beyond the intended scope of this thesis to review the diverse range of initiatives designed and implemented to secure improvement in organisational performance. Many may be seen as the progenitors of (or even sub-sets of) continuous improvement (eg, Total Quality Management, Customer Care Programmes, Business Process Re-engineering), (Tjosvold, 1991; Ray & Bronstein, 1995; Meyer, 1994).

Within the focus on continuous improvement a clear need to encourage and increase creativity and innovation within organisations is emerging (Tjosvold, 1991; Wickens, 1995). One result of this move to lateral thinking has been for a number of organisations to think more broadly about stakeholders and relationships with those outside of the organisation as well as alternative and cost effective ways of achieving non-organic growth. From this thinking new ways of working, including supplier partnering and strategic alliances, have emerged (Tjosvold, 1991).

All of the factors outlined in the above sections are seen by many as requiring a shift in organisational focus from the individual to teams. In many ways this represents no more than recognition of common sense (Katzenbach & Smith, 1993). As was pointed out by Blake, Mouton and Allen (1987):

“Most people in modern organisations work in groups.”

However, others are seeing the drivers as placing teams in a fundamentally higher profile. Teams are being increasingly positioned as the building blocks of organisations (Tjosvold, 1991; Belbin, 1981; Margerison & McCann, 1985; Ray & Bronstein, 1985; Katzenbach & Smith, 1993). Some authors position teams as even more pivotal to organisational success:

“Learning is the competitive dimension ... it is achieved through the shared vision attained through teams.”

(Senge, 1990)

It is essential to ensure that such claims are sustainable and that the nature and extent of the relationship between teams and performance is both robust and well understood. These issues are explored in subsequent chapters. However, prior to such a discussion, it is important to be clear as to what is meant by the concept of a team.

2.3 What is a Team?

There is an assumption that the answer to the question “What is a Team?” is well known and understood (Katzenbach & Smith, 1993). Indeed in reviewing the literature there does appear, on the surface, to be a relatively high level of agreement on the definition of what a team is. However, this apparent commonality of view is worthy of further investigation.

In a relatively early definition (Argyle, 1972) proposed that:

“Teams are groups of people who carry out a joint task. They may be assigned to different work roles, or be allowed to sort them out between themselves and change jobs when they feel like it, for example, the crews of ships, research teams, maintenance gangs and miners.”

However, this definition focuses primarily on the process of work allocation. Others point specifically to the commonality of purpose or goal as being a major element in defining a team. For example (Babington-Smith, 1979):

“A team is a group in which the individuals have a common aim and in which the jobs and skills of each member fit in with those of others.”

This definition introduces the elements of common aims and interdependence which are strongly reinforced in definitions offered by other authors (eg, Adair, 1986; Hastings et al, 1986; Higgs & Rowland, 1992).

Focus on results, synergy and satisfaction derived from the process of involvement in the team are additional factors introduced into the definition (Woodcock, 1979):

“Teamwork is the process of individuals working together to accomplish more than they could alone, but more than that it can be exciting, satisfying and enjoyable.”

The importance of reciprocity and interaction is emphasised by Belbin (1993):

“A team is a group in which there are players with a reciprocal part to play and who are dynamically engaged with one another.”

Ray and Bronstein (1995) introduce the elements of empowerment and increasing skill levels as factors in defining a team:

“A team is a group of interdependent, highly trained employees who are responsible for managing themselves and the work they do.”

Issues of size, commitment, goals and accountability are added in the definition provided by Katzenbach and Smith (1993):

“A team is a small group of people (typically less than 20) with complementary skills, committed to a common purpose and set of performance goals. Its members are committed to working with each other to achieve the team’s purpose and hold each other fully and jointly accountable for the team’s results.”

In moving beyond defining a team, the elements which lead to effectiveness and high performance are identified by a number of authors.

Adair (1986) sees an **effective** team as being:

“One that achieves its aims in the most effective way and is then ready to take on more challenging tasks, if so required.”

The desire to **perform as a team** is also highlighted as a differentiating factor (Hastings et al, 1986):

“Successful teams require talented individuals who have acquired the desire and ability to work together effectively.”

The range of definitions of teams and teamworking is, indeed, extensive. Table 2.1 summarises the common elements which authors identify in their attempts to define the nature of a team.

From table 2.1 (which is illustrative rather than comprehensive) it is evident that whilst there is strong agreement that common purpose, interdependence and distinct roles are widely shared components in defining a team there are differences in the other definitional components. Much of the definitional literature is theoretical with clear (and often stated) antecedents in the comprehensive literature relating to small groups and groups dynamics. This literature and its potential relevance to team definition, via the definition of a group, is summarised in the following section.

2.4 Group Behaviour and Dynamics

In reviewing definitions of teams it is inevitable that comparison with research and definitions relating to the longer standing research on group behaviour and dynamics should be examined. In examining the definition of a group and the research underpinning this Schein (1990) proposes that:

Table 2.1 Common Elements in Definitions of a Team

Element	References
■ Common Purpose	Douglas, 1983; Katzenbach & Smith, 1993; Babbington-Smith, 1979; Adair, 1986; Hastings et al, 1986; Higgs & Rowland, 1992; Wellins et al, 1991; Woodcock, 1989; Smith, 1995;
■ Interdependence	Schein, 1988; Ray & Bronstein, 1995; Babbington-Smith, 1979; Hackman, 1990; Tyson & Jackson, 1992; Higgs & Rowland, 1992; Woodcock, 1979; Belbin, 1993; Buber, 1937; Wellins et al, 1991; Woodcock, 1989; Smith, 1995;
■ Clarity of Roles and Contribution	Dyer, 1977; Critchley & Casey, 1984; Blake & Mouton, 1975; Ray & Bronstein, 1995; Katzenbach & Smith, 1993; Argyle, 1972; Higgs & Rowland, 1992; Critchley & Casey, 1984; Douglas, 1983;
■ Satisfaction from Mutual Working	Katzenbach & Smith, 1993; Hastings et al, 1986; Woodcock, 1979; Belbin, 1993; Hunter et al, 1992; Tyson & Hunter, 1992;
■ Mutual and Individual Accountability	Adair, 1986; Katzenbach & Smith, 1993; Higgs & Rowland, 1992; Dyer, 1977; Blake & Mouton, 1975; Hackman, 1990;
■ Realisation of Synergies	Adair, 1986; Dyer, 1977; Higgs & Rowland, 1992; Tyson & Hunter, 1992; Schein, 1988;
■ Empowerment	Ray & Bronstein, 1995; Argyle, 1972; Tyson & Hunter, 1992; Tjosvold, 1991; Seddon, 1992; Schein, 1988;

“A psychological group is any number of people who: i) interact with one another; ii) are psychologically aware of one another; and iii) perceive themselves to be a group.”

The importance of objectives or goals in understanding groups is often identified. For example, Guzzo and Shea (1992) make the observation that:

“Groups exist to pursue an objective or goal (within the organisation).”

In general Guzzo and Shea (1992) make similar observations to writers on teams in terms of the significance of groups to organisations, reinforcing earlier comments by authors such as Leavitt (1975):

“Groups are the building blocks of organisations.”

Groups and Teams

Hackman (1990) proposed a definition of a group in terms of a number of distinct characteristics which were: i) they are real, interactive social systems with boundaries, interdependence and differentiated roles; ii) they have one or more tasks to perform with collective responsibility for output; and iii) they operate in an organisational context.

Argyle (1972) rather than attempt to define a group took the view that:

“One of the central features of work is that it is usually done in groups; groups of individuals co-operating under the direction of a leader or leaders.”

Smith (1967) highlighted the importance of interaction and shared goals in defining a group:

“A group is the largest set of two or more individuals who are jointly characterised by a network of relevant communications, a shared sense of collective identity and one or more shared dispositions with associated normative strengths.”

The importance of conceiving groups from a systems perspective (implied by Smith, 1967) is reinforced by a number of other authors (eg, Gahagan, 1975; Leavitt, 1975; Argote & McGrath, 1993; Katz, 1982; Shaw, 1971. Likert (1961; 1967) highlighted the central role of groups in his systems view of organisations, proposing that: i) organisations can be conceptualised as systems of overlapping groups; and ii) the interlocking groups are connected by individuals who occupy key positions of dual membership, serving as “linking pins” between groups. Thus he introduces the issue of the relationship between groups and their leadership which is a core issue in the literature on teams and teamworking and is, initially, explained briefly in 2.5 below.

In comparing the brief synopsis of literature on group dynamics to that relating to teams it is interesting to reflect on the extent to which differences are presentational as opposed to substantive. Writers and researchers on teams, whilst acknowledging their debt to group theory (eg, Ray & Bronstein, 1995), do tend to identify some significant differentiating factors. A number of these are summarised by Adair (1986) who proposed that the major differences are: i) groups do not necessarily share common goals; ii) in groups there is no specific or implied definition of interlocking roles; and iii) in groups there are no explicit or implied ways of behaving or working. Of these three differentiators the third is probably the hardest to sustain given the nature and level of research on group norms and behaviours (Hackman & Morris, 1975; André de la Porte, 1974; Levine & Moreland, 1990; Berkowicz, 1954; Robbins 1986). However, perhaps the similarities are more useful to explore than the differences, given the level and nature of research available to aid an understanding of group performance. From a review of literature some of the similarities between the definition of groups and teams would seem to be: i) Common Purpose (Guzzo & Shea, 1992); ii) Interdependence (Klein, 1956; McGrath & Altman, 1966; Robbins, 1986); iii) Clarity of Roles and Expectations (Benne & Sheats, 1948; Hackman, 1990); and iv) Satisfaction and Enjoyment (Zander, 1979). If team “theory” and group theory appear to be close then it may well be that understanding group effectiveness and performance will aid developing an understanding of the nature and value of team performance. However, for a number of writers (Tjosvold, 1991; Seddon, 1992; Ray & Bronstein, 1995) there are significant organisational implications of a focus on teamworking which go well beyond an extension of the application of group theory. Indeed they tend to argue that teamworking entails greater complexity than group theory.

2.5 Teams and the Role of the Manager

In looking at teams in organisations the nature of the impact of teamworking on the role of the manager needs to be considered. Indeed within the extensive literature on groups this issue has been highlighted by Likert (1961; 1967). In examining the commonly identified elements in the definition of a team the requirement to consider the extent to which a team changes or supplants the role of the manager needs to be examined. At the level of the self-managed team the enduring role of management is seen as being subsumed within the remit of the team (Ray & Bronstein, 1995):

“Teams perform almost all of the tasks that a supervisor once performed.”

In many ways the expectations of what teams will contribute to an organisation do overlap with earlier views on the expectations of managerial delivery, for example:

- i) balancing the relationships between behaviour, task and situation (Adair, 1986; Emmett, 1967);
- ii) making sound decisions and effective use of resources (Drucker, 1988; Mintzberg, 1973);
- iii) communicating and building commitment to a common purpose (Emmett, 1967);
- iv) implementation of strategies that require the effort of many (Argyris, 1960).

However, the respective roles of managers and teams remain real and significant within an organisational context. It may be that as new styles of organisation and ways of working emerge the numbers and levels of management may decrease and be replaced by teams (Handy, 1985; Ray & Bronstein, 1995). However, a clear managerial role will be likely to remain. The enduring role of management and its relationship to teamworking is well summarised by Everard and Morris (1988):

“The primary task of organisational management is forming groups of individuals, building them into effective working units or teams and getting these to work together effectively in pursuing the organisation’s purpose and goals.”

Furthermore they point out that although the drivers of change are leading to an increasing focus on teams there remains a need for teamworking to be managed:

“Teams are the building blocks of organisations; managers are the glue that holds the teams together.”

In understanding the nature, role, contribution and effectiveness of teams it is important to draw on a combination of the understanding generated by group research and research into managerial performance and effectiveness. In looking at the area of managerial effectiveness it is necessary to link the growing volume of literature on managerial competences to the established literature on teams, groups and team leadership. This factor is explored in more detail in Chapter 4 (4.5).

2.6 Summary

This chapter has examined the growing trend to focus on teams and teamworking within organisations and the antecedents of this trend. It has explored the diverse definitions of the construct of a team, the common elements of such constructs and the linkages between theories around teamwork and earlier research on groups in organisations. In the next chapter the justification for the organisational 'faith' in teams as a means of delivering superior performance will be examined together with earlier research into group performance. In examining this literature the common factors relating to team and group effectiveness will be explored.

Chapter 3. Teams and Performance

"There are only two qualities in the world: efficiency and inefficiency"

George Bernard Shaw; John Bull's Other Island

The consistent rationale put forward, within the literature, for the role and growth of importance of teams in organisations is that teams produce superior performance to individuals (eg, Tjosvold, 1991; Katzenbach & Smith, 1993; Ray & Bronstein, 1995). Frequently this rationale is stated to be based on evidence from earlier research into groups (eg, West & Slater, 1995; Adair, 1986; Margerison & McCann, 1985; Tjosvold, 1991; Senior, 1996). Therefore, in establishing the validity of the underlying rationale for teamworking it is useful to begin by reviewing, briefly, the evidence on performance which is provided by research into groups. This is followed by an examination and discussion of the direct evidence which supports the assertion of linkages between teamworking and performance.

Having reviewed the evidence relating to performance linkages the factors which are proposed as accounting for effective team performance are examined. This discussion opens up a vast range of literature and potential effectiveness factors. Within the relatively early group literature alone McGrath and Altman (1966) reported some 2700 references to factors that influence group behaviour. Thus in this part of the chapter a synthesis of the array of effectiveness factors is developed using a framework employed by Hackman and Morris (1975) which was based on the earlier group interaction process framework postulated by McGrath (1964).

In reviewing the performance evidence it is important to bear two points in mind. The first relates to the definition and description of performance. This issue is influenced by the larger debate around measuring organisational performance in the context of organisational behaviour (Kaplan & Norton, 1992; Eccles, 1991); this debate highlights the potential validity of employing "hard" and "soft" measures of performance (Furnham, 1992; Schein, 1988). In transposing the debate into the team context the issues are crystallised by the observation made by Furnham (1992):

"It is frequently and erroneously assumed that hard data is better because it is easier to measure reliably and less prone to human error. It may, indeed, be more reliable but it is not at all clear that it is more valid. Hard data may be influenced by different sources of noise and, on occasions, less reliable."

However, in spite of the "Hard/Soft" debate, Furnham (1992) goes on to highlight that, in the context of team studies, the problems in developing robust conclusions relate to the difficulty in developing robust measures of team performance. This need for "mixed measures" in evaluating team performance is further emphasised in more recent literature (eg, Borrelli et al, 1995; Berry, 1995).

The second issue which impacts on this chapter is that of methodology. In order to achieve metric robustness a significant amount of earlier research has been of an experimental design. However, in pursuing this route there are concerns over the generalisability and practicality of the research findings (eg, West & Slater, 1995; Senior, 1997; Dulewicz, 1995(a); O'Leary-Kelly et al, 1994; Shaw, 1971).

3.1 Groups and Performance

A vast amount of work has been conducted in relation to the concept of small groups (both in academic research and popular literature (Pitt & Nel, 1994)). The attempt to build a review of teams on the back of group research is complicated by the difficulty in defining groups and identifying the impact of variables on performance in an organisational setting (McGrath, 1964). The predominant basis for developing insights into group performance has been the comparison of the performance of groups to that of individuals. Within the realms of group research this aspect has received somewhat less attention than exploration of the factors which contribute to behaviour and performance within the group (Pitt & Nel, 1994).

The group dynamics movement, which began under Kurt Lewin (McGrath, 1964), has shaped the nature of much of the research into groups and performance. The significant focus of this research was empirical with a tremendous emphasis on laboratory methods. However, the generalisability of the outcomes of such studies to organisational settings is questionable (O'Leary-Kelly et al, 1994). It does appear that the research evidence splits between the empirical "laboratory" data at one extreme and the narrative, case study, descriptions at the other. Attempts at reviewing the wealth of literature available on this topic involve considering a spectrum ranging from the traditional narrative approach, prone to Type I errors (that is inferences of relationships that do not exist), to meta-analytical studies which are more prone to Type II errors (that is failure to detect relationships because of low levels of correlation) (Guzzo, 1988).

Focusing specifically on the relationship between groups and performance a major challenge arises; that of defining and operationalising performance measures. To deal with this Hackman and Morris (1975) presented a useful way of categorising the outcomes of group behaviour in terms of:

- i) Solutions: complete solutions; "seed" ideas (when time does not allow for achieving a complete solution); problem re-definition;
- ii) Other outcomes: increase in intra-group trust and support levels; greater levels of communication; greater level of confrontation of problems; higher level of work responsibility and satisfaction.

This categorisation may also be applied to analysis of performance evidence in relation to teams and will be revisited later in this chapter. Whilst this framework does not obviate the problems of operationalisation, it does provide an indication of elements of performance, each of which may be more readily operationalised. A further complication in establishing clear evidence in

terms of the contribution of groups to enhanced performance is the array of variables in terms of the composition of the group, nature of the group task and appropriateness and efficiency of processes which in turn impact on the performance of the group (O'Leary et al, 1994; Locke & Latham, 1990). The interplay of these variables is well summarised in the model of group interactions described by Hackman and Morris (1975), which was built from the model proposed by McGrath (1964), and is summarised in figure 3.1. The logic underlying this model is that input factors affect performance outcomes through the process of interaction (Pitt & Nel, 1994). In practice this may also provide a useful framework for the examination of teams and team performance and will be examined further in subsequent chapters in this thesis.

Before examining the overall proposition relating to teams in detail, it is important to establish the nature of evidence to support the fundamental proposition that groups are more effective than individuals in performance terms. The evidence available is somewhat mixed. The search for evidence is now long standing. One of the earliest studies (Ringleman, 1913) involved comparing groups and individuals in an exercise entailing pulling on a rope. The outcome of the pulling was measured and Ringleman consistently found that the average results for groups of seven pulling together produced a pull which was 75% of the cumulative total of the individual pull scored by each group member. Indeed in a later study (Klein, 1956) it appeared that interaction in a group can reduce effectiveness. In this study it was found that each person added to the rope-pulling group reduced the average individual contribution to the overall "pulling score" (using the Ringleman exercise). However, illustrative of the variability of results and complexity of studying group performance is the outcome of a study conducted by Holt (1987). In this study it was found that in groups having a strong sense of identity, the result of "Ringleman pulls" was that the group produced a pull 19% higher than the sum of the individual effort.

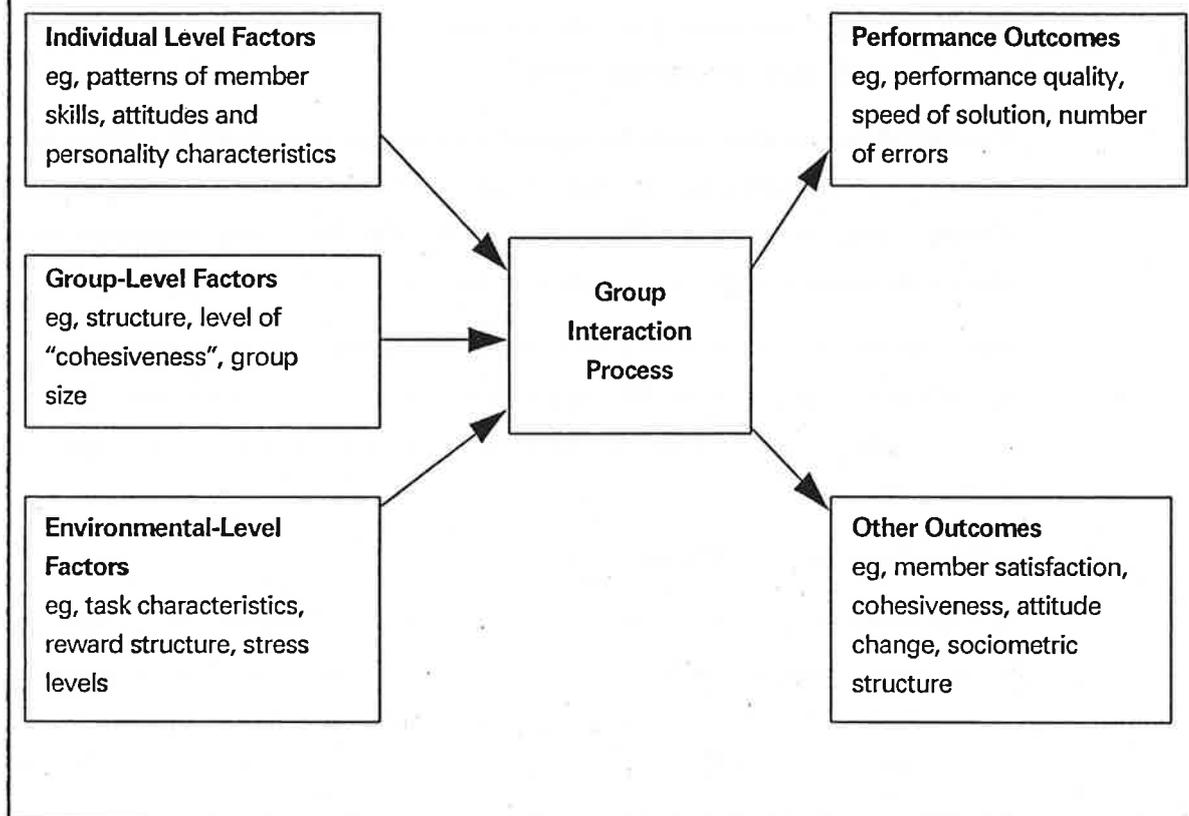
The "Ringleman" evidence has been explained by some (Locke & Latham, 1990; West & Slater, 1995) as attributable, in part, to the point that group working may only be appropriate for more complex tasks. In general the positive effect of group working is proposed as being more significant in areas of work involving decision-making and problem-solving (Shaw, 1971) rather than pure implementation of operational tasks.

Again in this area the evidence is somewhat mixed. In a study involving individuals and groups answering a range of questions relating to problem-situations Taylor and Faust (1952) found that while groups could produce the answers in a shorter lapsed time than individuals the total time, in person minutes, was considerably greater. Indeed it increased as the size of the group increased.

The view that groups provide more creative input to problem-solving is also challenged by a study involving counting the ideas produced in a "brainstorming" exercise conducted by both individuals and groups (Taylor et al, 1958). In this study it was found that in a five minute period the sum of ideas produced by a number of individuals was 68 compared to 37 ideas produced in the same time by an equally sized group. Furthermore, it does appear that the quality of ideas in

a group approach are equal to, but do not commonly exceed, those of individuals within the group (Diehl & Stroebe, 1987). In exploring problem-solving the quality of ideas needs to be considered in relation to volume. Watson (1928) demonstrated that in a word construction test groups consistently outperformed individuals from a volume perspective. Thus once again a degree of inconsistency in evidence and conclusions is highlighted by differing studies.

Figure 3.1 The Hackman-Morris Group Interaction Process Model (1975)



In looking at how groups impact on problem-solving Maier and Solem (1952) pointed out that, even when one person in a group knows the correct answer to a problem, the status hierarchy within the group can prohibit the persistence of that individual and lead to an incorrect solution. A significant impact on the view that groups have a beneficial impact on performance has been derived from the studies involving the NASA "Moon Landing" exercise (Hall, 1971). In these studies, involving groups solving a problem with a "right" answer, it has been found that the group solution consistently outperforms the average individual solution. Furthermore, Cummings et al (1974) demonstrated that the quality of the group solution increases with size of the group although speed does not change. The NASA exercise represents a problem with a "right" solution. However, even when using problems without an evidently correct solution it has been found that groups can produce a better solution than individuals. This conclusion is based on further work using the scenario in the film "Twelve Angry Men" studied by Hall (1971) and in which it was found that groups performed better than individuals on an indeterminate task.

Whilst Hall's studies were of an experimental or laboratory nature examples of group performance in an organisational context were reported by Galluci (1985). In reviewing group-working in an organisational setting Galluci reported that, in a programme using diverse skilled teams to address organisational problems, it was feasible to both identify cost savings and improve the morale of the team members. The implications of this study were that group decisions were more likely to lead to better results than could have been achieved by individuals. This combination of productivity and group "morale" endorsed earlier findings which have indicated that highly cohesive groups are more productive than less cohesive groups or individuals (Berkowicz, 1954).

The importance of clear goals for groups to work towards in order to achieve performance outcomes is highlighted in a number of meta-analytical reviews of group behaviour (Locke & Latham, 1990; O'Leary et al, 1994) in both of these studies it was shown that the existence of **clear performance goals** were positively related to overall effective group performance.

Although the rationale for focusing on teams in organisations is often stated to be based on group research (Adair, 1986; Margerison & McCann 1985; Tjosvold, 1991; Ray & Bronstein, 1995) it is clear from the foregoing brief discussion that the evidence produced is neither clear cut nor consistent.

3.2 Evidence for Team Performance

In spite of the evidence for team performance derived from group research the need for evidence of direct team performance continues to be important. Although much of the rationale for teams is said to be rooted in group research there is a body of literature which purports to present clear evidence of the value, in performance terms, of the benefits of teamworking. However, much of the evidence presented is descriptive and based on case studies and there seems to be relatively little empirical evidence (Furnham et al, 1993; West & Slater, 1995).

In examining the team literature and the associated performance evidence, it is possible to group the available data into that relating to: i) managerial teams; and ii) project, work-based and associated teams. In practice the evidence to support the added value of managerial teams is less extensive and clear than that relating to operational or work teams. In part this may be due to the purpose and nature of such teams being concerned primarily with strategic rather than operational decisions (eg, Dainty & Kakabadse, 1992).

In addition to building the case for teams, based on group research and specific team research, much of the underlying thinking is based on research demonstrating the significance of people, skills and skill-mix in building organisational performance. Moss-Kanter (1993) reports on a Harvard Business School study of 12,000 managers in 25 countries in which it was found that there were:

"Intrinsic correlations between profit, growth, job satisfaction and the rating of skills of people within the organisation."

Within this context Moss-Kanter appears to use the term intrinsic to mean expected. In an analysis of the survey conducted by Towers Perrin for IBM into the HR priorities and competitiveness factors for performance in the year 2000 Sparrow, Schuler and Jackson (1993) point out that effective teamworking consistently appeared as one of the top five priorities for action.

The evidence which is provided to support the assertion that teams are important to performance may readily be categorised into the solution and "other" outcome groupings proposed for group research by Hackman and Morris (1975). The nature of the available evidence on the contribution of teams to organisational performance is strongly biased towards the case study format and is thus subject to many of the Type I errors (feasibility of generalisation) pointed out by Guzzo (1988) and limitations of this method highlighted by Yin (1989).

A major issue in establishing evidence demonstrating the value of teams in an organisational setting is that of performance measurement (Furnham et al, 1993). In reviewing the literature it appears that a common basis of measurement of team performance is that of assessment by higher levels of management and acceptance by "significant others" (Hackman, 1976; Cohen & Ledford, 1994; Senior, 1997). The broader and more robust measures identified include productivity, creativity and innovation (Blake et al, 1987).

In reviewing some of the key case studies presented in the research literature the majority of illustrations focus on performance outcomes, although these split relatively evenly between specific/detailed illustrations and general indications of performance benefits. The evidence for this is summarised in table 3.1. Although the studies highlighted in table 3.1 do not present an exhaustive review of the available literature they are fairly representative. Todryk (1990) asserts that investing time and effort in team development leads to enhanced performance in terms of project teams. In a study which combined simulations and case studies Steufert and Swazey (1986) demonstrated that in effective teams members generate more options to inform decision-making and thus result in improved decision-making.

Leigh and Maynard (1994) using anecdotal evidence claim to demonstrate that teamworking can lead to reduced timescales for realising and capturing planned project benefits. Chance (1989), in case study reports claimed to demonstrate that teams can both increase productivity and reduce costs. At the 'softer' level Hardingham and Royal (1994) claim that anecdotal/case study evidence demonstrates that effective teamwork increases commitment, loyalty and efficiency. Whilst the above examples focus on a number of the "softer" outcomes of team performance, Johnson and Johnson (1989) use case study examples to purportedly demonstrate both productivity and quality increases in team-based outcomes. This view is supported by Fisher et al (1994) through a more structured study and Higgs (1994) by means of a more qualitative study. In highly specific situations Horak et al (1991) report that a study within hospitals demonstrated a linkage between teamworking in a health care environment and clinical outcomes. However, in reviewing the overall evidence the dominance of either anecdotal or

case study data to support the linkage of teams and performance is very evident. A notable point from reviewing this data is that the majority of studies relate to **non-managerial teams**. In addition the evidence is either very general or relates to examination of comparison **between** teams rather than examination against external, objective criteria.

Table 3.1 Examples of Linkages Between Teams and Performance

Author	Organisation	Team(s)	Nature of Study	Results
Adair (1986)	John Laing International	Regional Project Team	Case Study	<ul style="list-style-type: none"> ■ Improved project management ■ More successful tenders ■ Improved joint venture management ■ Improved employee morale and commitment
Adair (1986)	Marks and Spencer	Company-wide Team working approach	Case Study	<ul style="list-style-type: none"> ■ Versatile staff ■ Basis of company's above market performance
Adair (1986)	Bechtel Great Britain Ltd	Project Team for New Tender	Case Study	<ul style="list-style-type: none"> ■ Improved project management led to savings of £250,000 ■ Increased success of tenders ■ Improved employee satisfaction and commitment
Belbin (1981)	Henley Management College	Teams on General Management Course	Experimental	<ul style="list-style-type: none"> ■ Different mixes of Team Roles led to differential performance in a competitive management exercise
Belbin (1981)	Simpson Group (Aust.)	Management Teams	Case Study	<ul style="list-style-type: none"> ■ Increase in market share from an average of 20-30% to an average of 55-85% ■ Increased profitability by 25% ■ Share price quadrupled
Belbin (1981)	Hilltown Engineering Ltd	Management Team	Case Study	<ul style="list-style-type: none"> ■ Achieved 21% return on capital in an unfavourable market
Margerison & McCann (1990)	University of Queensland	Teams on a University Executive Development Programme	Experimental	<ul style="list-style-type: none"> ■ Different mixes of Team Roles led to differential performance in a competitive management exercise
Margerison & McCann (1990)	Unigate Diaries	Executive Team	Case Study	<ul style="list-style-type: none"> ■ Developed new strategy to deal with changing market
Margerison & McCann (1990)	Bailey's USA	Management Team	Case Study	<ul style="list-style-type: none"> ■ Changed leadership behaviour ■ Better decisions ■ Increased productivity and profitability
Margerison & McCann (1990)	Hong Kong Bank	Management Teams	Case Study	<ul style="list-style-type: none"> ■ Improved teamworking and understanding ■ Faster response to change
Margerison & McCann (1990)	Hewlett Packard (Europe)	Divisional Management Teams	Case Study	<ul style="list-style-type: none"> ■ Improved cross-functional management ■ Projects go faster ■ Improved sales performance ■ Higher morale and productivity

Table 3.1 Examples of Linkages Between Teams and Performance (Continued)

Author	Organisation	Team(s)	Nature of Study	Results
Phillips, N (1992)	Exxon Chemicals	International Change Management Team	Case Study	<ul style="list-style-type: none"> Improved multi-cultural teamworking
Tjosvold, D (1991)	Allen-Bradley (USA)	Operating Teams	Case Study	<ul style="list-style-type: none"> Improved morale and motivation Improved service quality
Tjosvold, D (1991)	Canadian Post - Secondary Educational Institutional	Faculty Teams	Interviews / Case Study	<ul style="list-style-type: none"> Generated more innovative solutions as a team
Wall, Kemp, Jackson & Clegg (1986) (in Tjosvold 1991, p72)	British Confectionary Manufacturer	Semi-Autonomous Work Teams	Quasi-experiment	<ul style="list-style-type: none"> Higher degrees of job satisfaction and involvement
Tjosvold, D (1991)	3M's Decorative Products Division	Quality Improvement Teams	Case Study	<ul style="list-style-type: none"> Full 100% score on customer quality index over 3 years
Tjosvold, D (1991)	Daewong Pharmaceutical (Korea)	Organisation-wide	Case Study	<ul style="list-style-type: none"> Moved from struggling in the 1970's to top class first ranking on growth, sales and productivity in Korea
Ray & Bronstein (1995)	Credit Card Company	Data Entry Teams	Case Study	<ul style="list-style-type: none"> Six times faster customer query responses Error rates down from 3.5% to 0.5%
Ray & Bronstein (1995)	Credit Card Company	Service Department Teams	Case Study	<ul style="list-style-type: none"> 0% increase in productivity 120% increase in quality
Ray & Bronstein (1995)	Glass Manufacturing Company	Management Team of New Plant	Case Study	<ul style="list-style-type: none"> More profitable than other plants within 5 months of set up
Ray & Bronstein (1995)	Speciality Banking Company	Business Unit Management Team	Case Study	<ul style="list-style-type: none"> Increased profits Reduced waste
Hastings et al (1986)	Small Publishing Company	Management Team	Case Study	<ul style="list-style-type: none"> Won major computer database contract against all odds
Hastings et al (1986)	Financial Institution	Senior Management Team	Case Study	<ul style="list-style-type: none"> Encouraging innovation and challenge
Hastings et al (1986)	Buttermouth (Conservation Company)	Management Team	Case Study	<ul style="list-style-type: none"> Greater clarity of strategy and confidence and commitment of the team
Hastings et al (1986)	NCMT Engineering	Senior Management Team	Case Study	<ul style="list-style-type: none"> Reduced uncertainty in a volatile environment
Hastings et al (1986)	Financial Services Group	Integrating management teams following merger	Case Study	<ul style="list-style-type: none"> Successful merger in difficult environment
Seddon, J (1992)	Canadian Bank	Work Teams	Case Study	<ul style="list-style-type: none"> Re-engineered processes to meet customer needs

Table 3.1 Examples of Linkages Between Teams and Performance (Continued)

Author	Organisation	Team(s)	Nature of Study	Results
Seddon, J (1992)	Financial Services Organisation	Work Teams	Case Study	<ul style="list-style-type: none"> Improved accuracy and timeliness of quotations
Katzenbach & Smith (1993)	BNR	Divisional Management Team	Case Study	<ul style="list-style-type: none"> Became No. 1 intermodal carrier within 1 year of formation Created new organisational structure to overcome functional barriers
Katzenbach & Smith (1993)	Citibank	Customer Service Project Team	Case Study	<ul style="list-style-type: none"> Improved customer satisfaction in eleven areas
Katzenbach & Smith (1993)	Deloitte, Haskins and Sells	Change Management Teams	Case Study	<ul style="list-style-type: none"> Reversal of trend in dealing productivity In "big 6" went from last to first in new accounts won
Katzenbach & Smith (1993)	Dunn and Bradstreet	Project Team	Case Study	<ul style="list-style-type: none"> Turnaround on report generation cut from 7 to 3 days
Katzenbach & Smith (1993)	Eli Lilly	New Product Team	Case Study	<ul style="list-style-type: none"> Fastest roll-out of new medical product in company's history
Katzenbach & Smith (1993)	Enron	Divisional Management Team	Case Study	<ul style="list-style-type: none"> Achieved \$10 million savings in 6 months
Katzenbach & Smith (1993)	Garde State Brickface	Divisional Management	Case Study	<ul style="list-style-type: none"> Became highest-revenue, most profitable division within 6 month period
Katzenbach & Smith (1993)	General Electric	Operating Management Team	Case Study	<ul style="list-style-type: none"> Reduction of backlogs by 30%
Katzenbach & Smith (1993)	Hewlett-Packard	Divisional / Business Unit Management Team	Case Study	<ul style="list-style-type: none"> Comparative margin performance increased
Katzenbach & Smith (1993)	Sealed Air	Site Team	Case Study	<ul style="list-style-type: none"> Reduction of waste by 0.5% Downtime reduced from 20% to 5% Absenteeism down to 1.6%
Katzenbach & Smith (1993)	Weyer Laeuser	Site Team / Business Unit Team	Case Study	<ul style="list-style-type: none"> Delivery performance increased from 85% to 95%
Katzenbach & Smith (1993)	Investment Bank	Regional Leadership Team	Case Study	<ul style="list-style-type: none"> Revised (improved) business mix within 3 months
Katzenbach & Smith (1993)	Knight-Ridder	Newspaper Advertising Team	Case Study	<ul style="list-style-type: none"> Reduced ad. production errors to under 1% and saved \$10,000 per month
Katzenbach & Smith (1993)	Kodak	Product Line Leadership Team	Case Study	<ul style="list-style-type: none"> Reduced inventory Reduced missed deliveries by 50%
Katzenbach & Smith (1993)	Motorola	Business Unit Management Team	Case Study	<ul style="list-style-type: none"> Increased profits from \$25 million to \$60 million Increased ROA from 6.5% to 16.5 %

Table 3.1 Examples of Linkages Between Teams and Performance (Continued)

Author		Team(s)	Nature of Study	Results
Katzenbach & Smith (1993)	Pall Corporation	Leadership Team	Case Study	<ul style="list-style-type: none"> From 1970-1980 had highest return to shareholders in Fortune Top 1,000
Katzenbach & Smith (1993)	Pfizer	Project / New Product Team	Case Study	<ul style="list-style-type: none"> Build new facility under budget and ahead of schedule
Robinson, A (1991)	Variety of UK Schools	Management Teams	Structured Research	<ul style="list-style-type: none"> Staff perceptions in successful teams more positive Effectiveness in management of change
Carrington, L (1994)	Mixed Multi-National Sample	Board Teams	Survey	<ul style="list-style-type: none"> 90% not believe teams work delivers improved customer service
Arkin, A (1995)	Yardley	Work Teams	Case Study	<ul style="list-style-type: none"> Cost savings \$10,000 p.a. Greater job satisfaction Greater output (from 75% to 98% target) Reduced waste (from 10% to 2%)
Senior, B (1995)	Mixed Public & Private Sector Teams	Mixed	Structured Research	<ul style="list-style-type: none"> Showed balance in Belbin Teams led to better performance as rated by managers
Fisher SG, MacRossen DK & Walker CM (1994)	High-Technology Organisation	Product Development Teams	Structured Research	<ul style="list-style-type: none"> Showed balanced teams in Belbin terms better than others in terms of objective measures of project performance
Blake RR, Moulton JS & Allen RL (1987)	Miscellaneous	Project Teams	Case Study	<ul style="list-style-type: none"> Properly structured teams achieved goals in 50% of budgeted time
West, MA (1990)	National Health Service	Various	Longitudinal Study	<ul style="list-style-type: none"> Climate for innovation accounted for 3-5% of variation in innovation
Procter, JD (1995)	Raytheon	Work Teams & Strategy Teams	Case Study	<ul style="list-style-type: none"> Reduced managerial levels Improved business performance
Walters, M (1995)	Rank Xerox (UK)	Managerial Teams	Case Study	<ul style="list-style-type: none"> Improved communication Clear evaluation of performance
Belbin, M (1993)	Cambridge Product Innovation	Management Team	Case Study	<ul style="list-style-type: none"> Acquiring new business
Higgs MJ & Rowland D (1992)	Oil Company	Mixed Project and Work Teams	Case Study	<ul style="list-style-type: none"> Impact on customer rating of teams and members satisfied
Berry (1995)	Mixed organisations and levels	Work-based/permanent teams	Field Study	<ul style="list-style-type: none"> Demonstrated that "inbalanced teams" in Belbin terms are less successful than "balanced" team
Higgs (1988)	Financial Sector	Management Team	Organisational Research	<ul style="list-style-type: none"> Showed focus on team mix and process improved planning; performance relationship

Whilst the evidence to support the team:performance relationship can appear impressive it is important to bear in mind that there are frequently a range of variables associated with the

performance outcomes of which teamworking is only one, (eg, Tjosvold, 1991; Ray & Bronstein, 1995; Furnham et al, 1993; Dainty & Kakabadse, 1992).

3.3 Benefits of Teams and Teamworking

The evidence from both group research and, more recently, team research has tended to be used to highlight a range of potential benefits accruing from the use of teams and teamworking in an organisational context (eg, Belbin, 1981; Adair, 1986; Tjosvold, 1991; Ray & Bronstein, 1995). In broad terms, the benefits which tend to be highlighted are:

- i) **Performance:** Teams tend to be more productive than individuals operating independently or groups operating on a competitive basis (Tjosvold, 1991); Teams can achieve results more rapidly. Studies have shown that teams can produce results in 50% of the time it would take groups of individuals (Blake et al, 1987); Teamworking can facilitate organisational change and corporate renewal (Ghoshal & Bartlett, 1995); Teams tend to outperform individuals in terms of problem-solving and cognitive tasks (Hill 1982); The majority of studies show that teamworking unlocks the potential within groups (Woodman & Sherwood, 1990); Team performance is an important variable in all organisational performance (Likert, 1961).

In addition to specific team studies a number of authors point to the corporate success of organisations that make extensive use of teamworking such as ICI, Marks and Spencer, IBM, Shell and Hewlett Packard (Margerison & McCann, 1985; Belbin, 1981; 1993; Robinson, 1991; Hastings et al, 1986; Tse et al, 1988).

- ii) **In terms of the impact of teamworking on the attitudes, morale and motivation of team members:** Teamworking leads to greater satisfaction amongst team members (McGrath, 1984; Woodman & Sherwood, 1990; Margerison & McCann, 1985; Adair, 1986; Arkin, 1995); Interventions to build teamworking invariably have a positive impact on the attitudes and perceptions of team members (Tannenbaum et al, 1992).
- iii) **In terms of process and teams' roles within organisations:** Teams pool information to solve effectively a variety of intellectual tasks (Laughlin, 1988); Within a team the facility to express and discuss minority views leads to improved quality of decisions (Maier, 1970); High commitment of team members leads to the stimulation of greater effort and output (Katz, 1982).

The literature and research evidence on the relationships between teams and absolute performance is by no means conclusive or consistent. In many cases there is an absence of rigour or structure in the research (Furnham, 1992). However, in spite of this, the positive evidence available on a research or anecdotal basis has led to teams and teamworking being seen as pivotal to developing performance and building competitive advantage in many organisations. The prevailing view on teamworking in business is typified by the quote provided by Phillips (1992). In her book she provides a quote from John G Holloway, the Vice President of Exxon Chemicals Europe:

“Teamwork constitutes the cornerstone of quality which is the bridge to greater efficiency, creativity and innovation in business operations.”

Such generalised and positive statements tend to underpin the growth in emphasis on teams in organisations in spite of concerns over the rigour and generalisability of research and the existence of some research providing contra-indicators. For example, although teamworking may be productive, Price (1982) shows that members of a team who feel that their contributions to the team are not identifiable may exert little effort on the part of the group and thus have an adverse effect on performance.

In a recent survey of UK company directors it was found that over 90% did not believe that teamworking delivered greater customer focus (believing that teams put their own interests before those of the organisation or its customers) (Carrington 1994).

Although Tannenbaum et al (1992) highlight the positive impact of teamwork on individuals' attitudes and perceptions **they find no relationship between this and performance**. Indeed the use of team building interventions can indeed have a negative impact on a group members' morale and motivation (Higgs & Rowland, 1992, Critchfield & Casey, 1984).

In looking at **comparative team performance** the experimental evidence is extremely strong. The seminal work of Belbin (1976, 1981) demonstrates clearly that the impact of the mix of differing “types” within a team has a significant impact on team performance. The evidence presented by Belbin is based on a long-term study of the performance of a range of groups of managerial teams on a computerised management game included in the Henley General Management course. Although this work was developed in an experimental setting its findings have been widely upheld within organisations and supported by a range of follow-up case study illustrations demonstrating the organisational applicability of the findings. In similarly structured research Margerison and McCann (1985) have demonstrated similar results of comparative performance based on differing mixes of team roles.

The rationale for focus on teams is stated to be based on clear evidence of their superior contribution to performance (eg, Katzenbach & Smith, 1993; Tjosvold, 1991; Ray & Bronstein, 1995) demonstrated both through direct studies and from evidence derived from group research (Adair, 1986; Tjosvold, 1991; Ray & Bronstein, 1995). In reviewing the literature there is evidence of the performance benefits of groups and teams. However, this is by no means overwhelmingly positive and robust and raises a number of questions and issues warranting further research. These include:

- i) The need to develop unambiguous, effective and relevant measures of performance to provide a basis for studying the impact and contribution of teams to organisational performance.
- ii) From robust measures a need to determine, within an organisational context on a structured basis, the nature and extent of team contributions to improving performance.

Achieving both of the above points is, no doubt difficult given the range of variables impacting on potential performance measures and the problems in isolating the contribution of teamworking in relation to changes in delivered performance, given that a move towards greater use of teams is frequently a part of a wider cultural change within an organisation, (Tjosvold, 1991; Ray & Bronstein, 1995; Moss-Kanter, 1991; Senior, 1996).

In terms of the Hackman and Morris (1975) model, the research to date does indicate, (both in terms of groups and teams) that there is evidence of both performance and other outcomes. In the subsequent sections of this thesis the input and process elements of the Hackman and Morris model and their impact on outcomes will be reviewed and discussed.

3.4 Appropriateness of Teams and Teamworking

In understanding the relationship between teams and teamworking it is important to consider when the team construct will add value. Although much of the popular literature points to the benefits of teamworking and "universality" of its appropriateness this view has been challenged. Critchley and Casey (1984) point out that the conditions for effective teamworking relate to situations entailing high uncertainty and maximum choice. In connection with senior management teams they suggest that these conditions are best met when the team are involved in strategic problem-solving and decision-making. Yet they suggest that their practical experience indicates that the substance of 90% to 95% of managerial "team" meetings and discussions relate to operational issues. This contention is borne out by Dainty and Kakabadse (1992) who emphasise that the majority of top team discussions focus on operational issues. Higgs and Rowland (1992) develop Critchley and Casey's arguments and suggest that experience in organisational settings indicates that the universally applicable value of teamworking is questionable and that there may be more than one type of team with differing behavioural characteristics and requirements. Higgs and Rowland (1992) further propose that in some situations, within an organisational context, it may be counter-productive to impose a teamworking "model" on a group of "co-located" individuals who add value through their specific and personal contribution.

Although beginning with a perspective that teamworking has the potential to transform organisational performance, Ray and Bronstein (1995) point out that the appropriateness of teamworking as a means to improving organisations is to a large extent dependent on the culture of the organisation and its readiness to move in this direction. In reviewing the literature it does appear that the appropriateness of teamworking is related to two key factors which are:

Complexity of Tasks

The nature of the task to be tackled is seen as a significant factor in determining the appropriateness of teamworking. In general it appears that teams are not as effective in dealing with simple tasks as complex ones (Johnson & Johnson, 1991; Tjosvold, 1989; Belbin, 1993; Critchley & Casey, 1984). Teams appear to be able to add value in performance terms in situations where there is a diversity of possible solutions (Maier, 1970) and teamworking

represents a more effective approach than either independent or competitive working in dealing with complex problems or the management of change (Johnson & Johnson, 1989). Meta-analysis of research into teams has produced some mixed results. However, from such analyses it does appear that the process of discussing issues with others "leads to the achievement of superior decisions on complex tasks" (Tjosvold, 1991).

Requirement for Interdependence

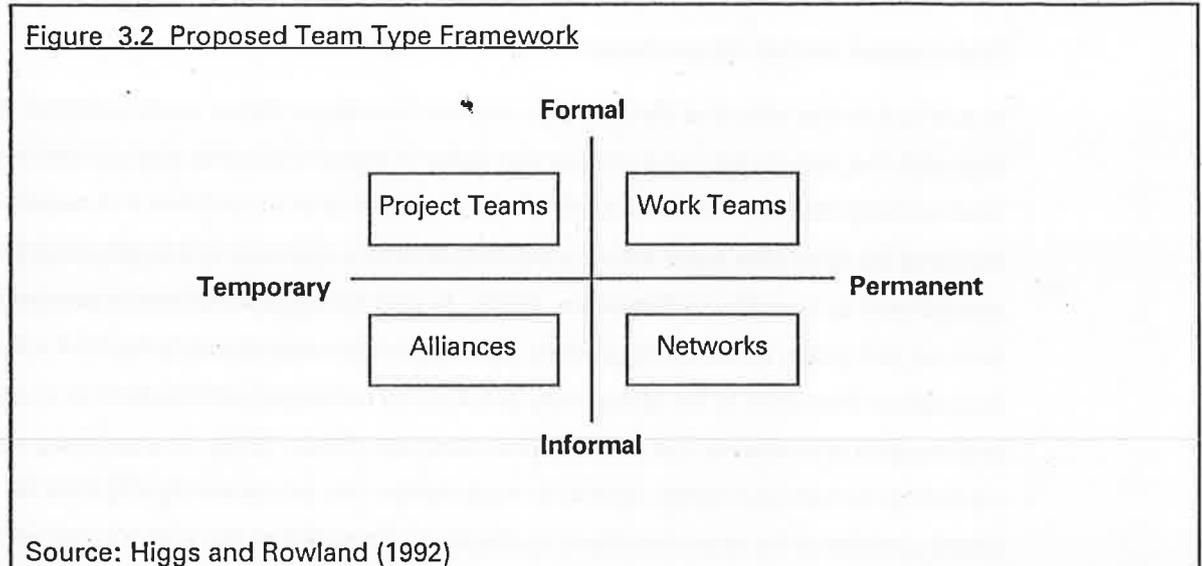
In addition to the nature of the task the need for interdependence amongst team members to deal with the task is seen as an important factor in determining the appropriateness of teamworking (Belbin, 1981). In dealing with a specific task or problem it is necessary to balance the need for specialist input with the interdependence involved in bringing a range of specialisms to bear (Ray & Bronstein, 1995). In part the benefits of interdependence may be seen as being due to the unequal skills involved in team membership and the extent to which less skilled members in the group may produce an enhanced contribution as a result of the input and support provided by the more skilled members (Klein, 1956). In examining cooperative performance between teams within an organisation the perceived significance of interdependence by team members is a factor in determining the group's perception of themselves as a team (Higgs & Rowland, 1992). One element of interdependence is seen as the need for the effective exercising of interpersonal skills in order to achieve the required purpose and goals of the team (Critchley & Casey, 1984).

In addition to considering the appropriateness of teamworking it does appear that it is possible to identify different types of team and related behaviours and approaches to teamworking (Higgs & Rowland, 1992). This may imply that there are specific **teamworking competences** required in addition to a mix of individual competences. In reviewing the research from Henley and subsequent practical applications of this, Belbin (1993) identifies that differing team roles and combinations are appropriate at different stages in a project. This view is expanded and developed in research designed to validate the Belbin concept of mix of roles in determining effectiveness of team performance (Senior, 1997). The concept of different types of team is further developed by Phillips (1992) who, in looking at international teams, identifies the following broad types: i) task groups; ii) working parties; iii) process groups; and iv) problem-solving groups and proposes that the nature and characteristics of each type are somewhat different. In addition Phillips (1992) suggests that, within these types, there are differences in behaviours and effectiveness factors determined by whether the team is a voluntary or imposed grouping.

The typography of teams is viewed in a somewhat different way by Katzenbach and Smith (1993) who propose the following team types based on their overall constitution or purpose: i) Teams which recommend things (eg, Task Forces); ii) Teams which make or do things (eg, Worker Team, Sales Team); and iii) Teams which run things (eg, Management Teams). The parameters which can impact on the type of team and associated effectiveness factors may be seen in terms of the extent to which they are: i) formally or informally structured; and ii)

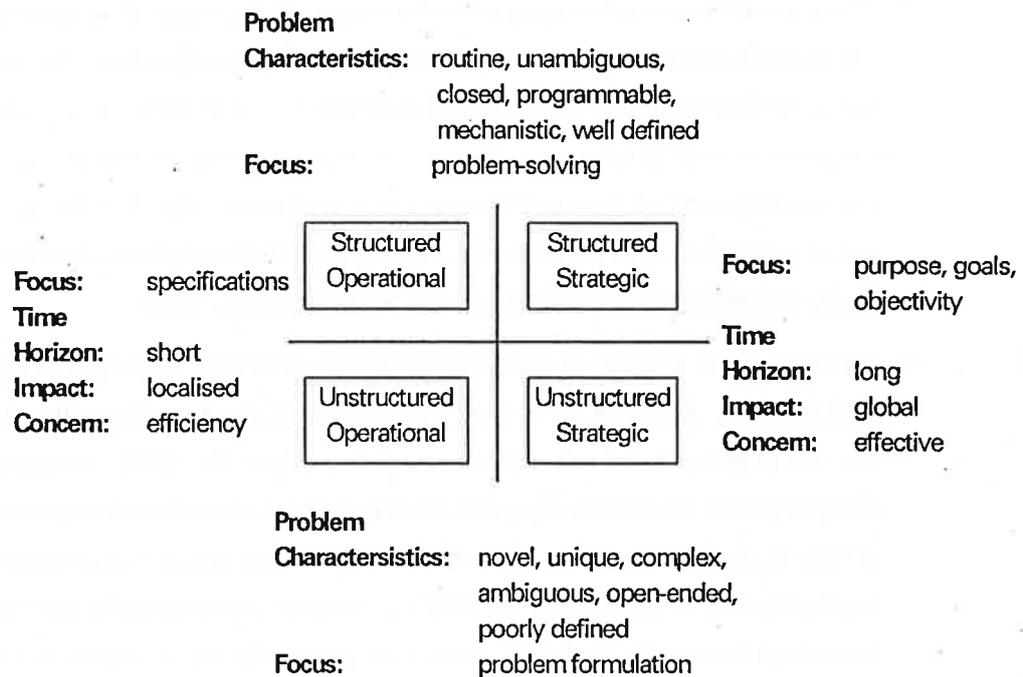
temporary or permanent in association. These factors are combined in an overall model proposed by Higgs and Rowland (1992) which is summarised in figure 3.2.

Whilst this model may be theoretically appealing it is far more difficult to study and analyse data relating to the informal than formal teams in an organisational context (Higgs & Rowland, 1992).



Given that teams appear to be at their most relevant and effective in dealing with solving problems and making decisions in a complex environment (Belbin, 1981; 1993; Johnson & Johnson, 1989; Tjosvold, 1991) it may be useful to combine teamworking with understanding of decision-making. This may be particularly appropriate in considering the role, nature and effectiveness of management teams (Dainty & Kakabadse, 1992; Belbin, 1993; Higgs & Rowland, 1992). In reviewing managerial decision-making Berthon, Pitt and Money (1995) proposed a model of decision-making context which is illustrated in figure 3.3.

Whilst the argument concerning appropriateness of teams and teamworking is raised in the literature (eg, Critchley & Casey, 1984; Higgs & Rowland, 1992; Hayes & Clark, 1985) and a number of typologies have been proposed it does appear that, in many of the reported studies, there has been little discussion of the implications or limitations in respect of team types. In particular, the differences between management teams and other team types is not always considered in reporting of the results of studies (eg, Furnham et al, 1993; Berry, 1995; Fisher et al, 1994; Senior, 1996). Whilst Belbin et al (1976) reported results specifically concerned with managerial teams it is notable that many of the subsequent Belbin Team Role Studies have applied the constructs to other team types with little or no acknowledgement of the limitations or implications of doing so (eg, Furnham et al, 1993; Fisher et al, 1994; Senior, 1996; Berry, 1995). It has been the more recent growth in top team studies (Pettigrew, 1992) building from the Upper Echelon theory espoused by Hambrick and Mason (1984), which has provided the major group of studies relating specifically to a team type (ie, senior management teams).

Figure 3.3 A Typology of Decision-Making Contexts

Source: Berthon, Pitt and Money (1995)

3.5 Team Effectiveness Factors

In the preceding sections the debate around the strength and robustness of evidence relating to performance enhancements attributable to groups or teams was reviewed. In order to understand why groups and teams can deliver enhanced performance it is important to identify those factors which contribute to achievements in group or team settings. Understanding of the factors impacting on the effectiveness and performance of teams can be aided by considering what is known about the factors influencing group performance outcomes. In reviewing the literature on both groups and teams a diverse range of stated effectiveness factors are encountered. McGrath and Altman (1966) in a major review of group research and literature reported some 2700 references. In a more recent study on team effectiveness Senior (1996) reported some 35 team effectiveness factors. In order to discuss the effectiveness factors a means of managing the large number of items is necessary. The Hackman and Morris model (Hackman & Morris, 1975) shown in figure 3.1 above provides a useful framework for summarising the performance factors identified in the group research literature. Table 3.2 provides an overview of the input and process factors identified as impacting on performance outcomes. Within both of these areas there are a number of points which should be emphasised, these are considered below.

Input Factors - Group Level

- i) There are differences in views as to the nature of the impact that **cohesion** has on the relationship between groups and performance. The ambiguity of the relationship is suggested to be related to the extent to which the goals of the group are clearly aligned with the goals of individual group members (Seashore, 1954). However, some writers believe that the development of clear and strong group norms are critical to the realisation of effective group performance (André de la Porte, 1974). This builds from the view expressed that highly cohesive groups are more effective (Berkowicz, 1954).
- ii) A considerable amount of group research has examined the impact of **group size** on group performance. As much as 42% of the variation in group performance is seen to be related to the size of group involved in problem-solving (Manners, 1975). However this finding does bring together the impact of group-level factors (size) and environmental level factors (nature of task ie, problem-solving). The value of increasing group size in terms of productivity is highlighted by Thomas and Fink (1963). However, they do point out that whilst performance outcomes, in specific terms, increase with group size (up to a peak at 11 members) the satisfaction outcomes decline with increasing size.
- iii) The nature of the **task** performed by groups is seen by some as having a major impact on their performance. The extent of the task impact can account for as much as 50% of performance variations (Poole et al, 1985).

Process Factors

Hackman and Morris (1975) define group processes as being:

“The mediator of input-performance relationships which refers to all observable interaction behaviours in a group that occur between two arbitrary points in time (t^1 and t^2)”.

In looking at group processes in these terms, one area in which the research does provide some clear evidence is that of the nature and formulation of group goals. In a significant meta-analytic study O’Leary et al (1994) indicate a strong relationship between group goals and performance. This study reinforces the view that the nature and process of setting group goals has a positive impact on group performance (Locke & Latham, 1990). In a major review of group studies Locke and Latham showed that 93% demonstrated a positive relationship between group goals and performance. In a somewhat larger study O’Leary (1994) reinforced this finding.

Within an organisational context the extent of group working is becoming more prevalent (Guzzo & Shea, 1992) and as a result it is pointed out that groups exist to pursue specific objectives or goals. Within the study by O’Leary et al (1994) it was found that performance was higher in groups which were **involved** in the goal setting process and in which goals were clear, precise and clearly understood. The importance of the goal setting process is emphasised by Guzzo and Shea (1992):

“Understanding of group goal setting and its ability to influence groups and their performance is important.”

Although goal setting is thoroughly examined this is only one aspect of group process factors. Other factors are less well researched and there is seen to be a need for further study into the impact of processes on performance (Hoffman, 1979).

A particular impact of this area of research may well relate to the need to understand the impact of corporate culture on performance. Berthon, Pitt & Money (1995) do point out that externally focused cultures encourage a more strategic and less operational view of problems. This highlights a relationship between environmental and process factors. In addition the relationships between the external environment and required input factors has been clearly identified by Ashby (1956):

“For a system to deal effectively with variety encountered in its external environment it must possess a corresponding degree of internal variety.”

In looking at specific research and writing covering team performance factors there are a number of similarities to, and elaborations on, those factors examined in group research. In reviewing the literature on teams and teamworking a diverse range of factors underpinning effective performance are identified. In the books and journal articles reviewed for this research some 150 factors were identified (these are summarised in Appendix I). Clearly all of these are not discrete factors and equally clearly such a range makes it difficult to draw any conclusions. However, the factors may be grouped and examined in the format of the Hackman and Morris (1975) model used above to examine group performance factors. This analysis is shown in table 3.3. Within this framework there are still a significant range of effectiveness factors identified. Reviewing these factors further enables some of the most commonly mentioned ones to be identified (Appendix I also provides a summary of factors and references encountered in the literature reviewed).

Individual Level Factors

From the literature the following broad groupings of individual level factors have been identified:

- i) The need for a **mix and appropriate blend of skills and knowledge** is highlighted by many researchers as a critical condition for effective team performance (eg, Margerison & McCann, 1985; Belbin, 1976, 1981, 1993; Woodcock & Francis, 1986; Blake et al, 1987; Proctor, 1985; Fowler, 1995; Klein, 1956; Hackman, 1990; McClure & Werther, 1993; Larson & La Fasto, 1989). However, whilst many point to the importance of the team having the right skill mix as being a criterion for membership, others emphasise the value of the teamworking experience in building new skills and knowledge and focus on the potential to develop skills rather than their absolute possession as a selection criterion (Katzenbach & Smith, 1993; Ray & Bronstein, 1995; Higgs & Rowland, 1992; Dumaine, 1994; Higgs, 1994).

Table 3.2: Examples of Factors Impacting on Group Performance (using the Hackman & Morris (1975) Framework)

Input	Process
<ul style="list-style-type: none"> ■ Individual Level Factors: <ul style="list-style-type: none"> — Individual characteristics and properties of group members (Hackman & Morris, 1975; McGrath, 1984; Gladstein, 1984; Hoffman & Maier, 1966; O'Leary et al, 1994) — Personalities (Hoffman & Maier, 1966; Galluci, 1985) — Common attitudes, values and standards of behaviour (Robbins, 1986) — Diversity of skills (Klein, 1956; Hoffman, 1979; Ashby, 1956; Spencer & Pruss, 1992; Cook, 1993; Dumaine, 1994; Larson & La Fasto, 1989; Likert, 1961) — Nature of clarity of roles (Benne & Sheats, 1948; Dayol & Thomas, 1968) ■ Group Level Factors: <ul style="list-style-type: none"> — Cohesiveness (McGrath, 1984; Gladstein, 1984; Hackman & Morris, 1975; Berkowicz, 1954; André de la Porte, 1974; Seashore, 1954; Levine & Moreland, 1990; Shaw, 1975; Anderson et al, 1990) — Size (Thomas & Fink, 1963; Manners, 1975; Anderson et al, 1990; Larson and La Fasto, 1989; Sherwin, 1976; Shaw, 1975) ■ Environmental Level Factors: <ul style="list-style-type: none"> — Task characteristics (Poole et al, 1985; Delbecq, 1967; Shaw, 1971; McGrath, 1984; Gladstein, 1984; Galluci 1985; Hoffman, 1979) — Reward (McGrath, 1984; Gladstein, 1984; Brown, 1995) 	<ul style="list-style-type: none"> ■ Goal Setting: <ul style="list-style-type: none"> — Participative (Hoffman & Maier, 1966; Locke & Latham, 1990) — Alignment of group and individual goals (Berkowicz, 1954; Seashore, 1954; O'Leary et al, 1994; Locke & Latham, 1990; Guzzo & Shea, 1992) — Source (O'Leary et al, 1994; Zigon, 1994) — Types (Zander, 1990; Zigon, 1994) — Specificity (O'Leary et al, 1994; Zigon, 1994; Spencer & Pruss, 1992) ■ Interaction: <ul style="list-style-type: none"> — Need for conflict resolution (Galluci, 1985; Deutch, 1985; Pavelt & Lau, 1983) — Level required (McGrath & Altman, 1966; Anderson et al, 1990) ■ Interdependence: <ul style="list-style-type: none"> — Collaborative information sharing (Hoffman & Maier, 1966; Dyer, 1997; Isabella & Waddock, 1994) — Effort recognition (Price, 1987; Brown, 1995) ■ Participation: <ul style="list-style-type: none"> — Involvement in decision (Hoffman & Maier, 1966, Locke & Latham, 1990; Eichorn, 1974; Likert, 1961) — Motivation through participation (O'Leary et al, 1994, Locke & Latham, 1990; Hambrick, 1995; Maier, 1967; Likert, 1961)

Table 3.3: Summary of Factors Impacting on Team Performance

Input	Process
<p>Individual Level Factors</p> <ul style="list-style-type: none"> ■ Skills of members: <ul style="list-style-type: none"> — mix of skills — complementarity present and required — potential as well as actual skills — levels and nature of competence ■ Roles: <ul style="list-style-type: none"> — balance of functional and team roles — balance of differing team roles — clarity and understanding — interdependence of roles — role structure, contribution and allocation ■ Member-specific: <ul style="list-style-type: none"> — expectations — levels of self-insight and understanding — previous experience — flexibility — sense of contribution — belief in value of contribution 	<ul style="list-style-type: none"> ■ Objectives, Goals and Purposes: <ul style="list-style-type: none"> — nature of goals and purpose — involvement in establishing goals — clarity of timescales — measurable and achievable goals — clarity of standards developed by team ■ Interaction: <ul style="list-style-type: none"> — levels of openness — confrontation of issues — challenge processes — co-operation — trust — mutual respect and support — levels of information sharing — checking assumptions — communication patterns — decision processes — levels of involvement and participation — identifying and exploration of issues — building on and combining ideas — managing and disseminating information — cross-training of members — idea generation and sharing — regular feedback and reflection
<ul style="list-style-type: none"> ■ Group Level Factors ■ Cohesiveness: <ul style="list-style-type: none"> — shared rules and processes — sense of identity — mutual accountability ■ Structure: <ul style="list-style-type: none"> — size of team — nature and extent of hierarchy — basis of selection of members — functional or cross-functional 	

Table 3.3: Summary of Factors Impacting on Team Performance (Continued)

input	Process
<p>Environmental Level Factors</p> <ul style="list-style-type: none"> ■ Task: <ul style="list-style-type: none"> — nature of task(s) — organisation of tasks and roles — complexity of task — ambiguity of outcome ■ Reward: <ul style="list-style-type: none"> — recognition and reward structures — recognition of success — recognition balanced between team and individual — HR infrastructure ■ Organisational Culture: <ul style="list-style-type: none"> — existence of a performance culture — valuing diversity — encourage new thinking and challenge — provision of support — degree of empowerment — legitimising action — provision of example from the top 	<ul style="list-style-type: none"> ■ Management/Leadership: <ul style="list-style-type: none"> — leader role and style — nature of power — exercise of authority — interface management — removing barriers to performance — structuring roles and contribution of members — building commitment

- ii) In considering individual level factors **the differences between functional and team contribution and role** are highlighted as being important elements to understand and manage (Belbin, 1976; 1981; 1993; Adair, 1986; Margerison & McCann, 1985; Ray & Bronstein, 1995; Phillips, 1992). Belbin's work developed a framework for understanding team roles and questions of mix and balance of roles in underpinning effective performance. It is a well structured piece of research and represents a seminal influence on team selection and development (Dulewicz, 1995(a); Parkinson, 1995; Senior, 1997; Berry, 1995). The concept of team roles, mix and competences is explored in more detail in the next chapter.
- iii) However as roles are defined there is a high degree of consensus that **interdependence** between members is a critical element of both defining teamworking and contributing to effective performance (Tjosvold, 1991; Lawrence, 1994; Blake et al, 1987; Walters, 1995; Higgs & Rowland, 1992; Critchley & Casey, 1984). The interdependence factor is seen as requiring support in terms of members having **clarity over their role and expected contribution** (Higgs & Rowland, 1992; Tjosvold, 1984; 1991; Margerison & McCann, 1985; Blake et al, 1987; Walters, 1995; Wickens, 1995; Nixon, 1990; Dayol & Thomas, 1968).
- iv) For a team to be effective there is a view that not only does there have to be interdependence and an appropriate mix of membership, but the members have to have a **belief in the value of their contribution and the value of acting together** (Tjosvold, 1991; Bushe, 1986; Drucker, 1988; Tannebaum et al, 1992; West & Slater, 1995; Cheung, 1983). Belief in contribution and valuing the group effort was identified by Holt (1987) as one of the major performance drivers for teams and an important element in overcoming the "social loafing" phenomena reported by a number of researchers into group behaviour.

A review of individual level input factors, particularly in relation to managerial teams, leads to consideration of individual **competences** (Dulewicz et al, 1995; Finn, 1993; Kakabadse, 1991) which is an issue explored in the next chapter.

Group Level Factors

In examining the group level factors the following points emerge from the literature:

- i) **Cohesiveness** is a factor identified as having a significant impact on group performance, both in a positive and negative sense (see above). It is generally emphasised as a positive factor in the literature on teams and teamworking (eg, Tjosvold, 1991; Ray & Bronstein, 1995; Blake et al, 1987; Katzenbach & Smith, 1993; Higgs & Rowland, 1992; Fowler, 1995; Babbington-Smith, 1979; Larson & La Fasto, 1989). However, a number of authors highlight the potentially negative impact on performance of high levels of cohesiveness. Within the group literature Mayo (1933), in his famous Hawthorne studies, highlighted the potentially negative implications of strong adherence to group norms (an example of cohesion as a group). Janis (1972) developed this negative connotation of cohesiveness and labelled it as "group think" which was defined as:

“A deterioration of mental efficiency, reality testing and moral judgement that results from in-group pressures”.

He provides examples which demonstrate that excessive like-mindedness and striving for unanimity can damage the effectiveness of a team. This point is further reinforced by Boss and McConkie (1981) who point out that the cohesiveness of a team can be counter-productive when loyalty to the team becomes more important than loyalty to the organisation.

In many cases “team culture and commitment” is the way in which cohesiveness is expressed. A strong link is established between cohesiveness and shared commitment to purpose, goals and direction (Blake et al, 1987). The directional relationship between group cohesiveness and performance is questioned by Mullen and Cooper (1994). In a meta-analysis of studies examining the relationship between cohesiveness and performance Mullen & Cooper established that the direction was from performance to cohesiveness and not vice versa. Thus cohesiveness may, in reality, be an output rather than an input factor. However, the impact of **previous experience** in the team is seen by some researchers as being an important group level input factor (Hastings et al, 1986; Margerison & McCann, 1985; Blake et al, 1987). Rather than being uni-directional the relationship between performance and cohesiveness may be an iterative one. There is a view that the extent to which team members accept **mutual accountability** for the achievement of team goals and objectives is more important to effective performance than general cohesiveness of the group (Katzenbach & Smith, 1993). Viewing cohesion as a result of the team having worked together to achieve successful outcomes could indicate that cohesion should be viewed as being an **outcome** rather than input (or even process) factor.

- ii) **Size of Team** is not commented on as a performance factor to the same extent that size is examined as a factor in group research. This may be because much of the research into teams builds from previous group theory (Tjosvold, 1991; Ray & Bronstein, 1995). The main attention paid to team size relates more to the team being of sufficient size to encompass the required range of skills or allow for an appropriate mix of team roles (Belbin, 1981; 1993; Margerison & McCann, 1985; Robinson, 1991, West & Slater, 1995; Katzenbach & Smith, 1993; Fowler, 1995; Adair 1986). However, a number of team studies have also reinforced the findings from group research (eg, Anderson et al, 1990; Johnson & Johnson, 1989).

Although size of team is clearly an effectiveness factor, the linkage of this to the time for which the team have been together is shown to be significant by a number of studies (eg, Hambrick & Mason, 1994; Katz, 1982). Within some of the more recent top team studies the time working together as a team (tenure) is a frequently considered factor (eg, Hambrick & Mason, 1984; Smith et al, 1984; Pinto et al, 1993).

- iii) In examining **team structure** it would appear that lack of hierarchy and absence of status barriers are important factors related to success (Robinson, 1991; Blake et al, 1987; Fowler, 1995; Nixon, 1990). The absence of hierarchy appears particularly important in looking at

self-directed teams (Seddon, 1992). Ray and Bronstein (1995) point out that in many of the more successful examples of the introduction of self-directed teams "the team take over almost all of the tasks formerly carried out by supervisors".

- iv) One major group level factor emerging from reviewing the team literature, particularly in relation to managerial teams, is the importance of **cross-functional representation and working**. Belbin et al (1976) point out that teams are more successful when:

"Individuals subsume their functional role to the team/company overall needs and goals."

The benefits, in performance terms, of sublimating "turf issues" and focusing on team purposes are highlighted by a number of writers (Blake et al, 1987; Guzzo & Shea, 1992; Proctor, 1995). The cross-functional input combined with a share of purpose which overrides narrow functional interests can be critical to the success of managerial teams (Dainty & Kakabadse, 1992). Building understanding and developing effective networking are seen as important elements in effective senior level teams (Ghoshal & Bartlett, 1995; Adair, 1986; Belbin, 1993).

Environmental Level Factors

The key environmental level factors which are encountered within the literature are:

- i) The nature of the **task** being undertaken by a team is seen as being an important group effectiveness factor. The research and literature on teams tends to mirror that on groups in this respect (eg, Tjosvold, 1984; 1991; Higgs & Rowland, 1992; Deutsch, 1985; Margerison & McCann, 1985; Belbin, 1981; Woodcock & Francis, 1981; Lawrence, 1994). It appears that individual tasks should be perceived as meaningful and intrinsically rewarding (Guzzo & Shea, 1992) and also that the team should have intrinsically interesting tasks to perform (West & Slater, 1995).
- ii) In examining **managerial teams** the need for the focus is seen to be on more complex and strategic tasks involving high levels of ambiguity and uncertainty (Critchley & Casey, 1984). However, as Critchley and Casey point out from their research:

"90 to 95% of the time of managerial teams is spent on addressing operational issues."

The emphasis for managerial teams on strategic and complex tasks is highlighted by a number of authors (eg, Blake et al, 1987; Proctor, 1995; Dainty & Kakabadse, 1992; Phillips, 1992; Ghoshal & Bartlett, 1995; West, 1994). The very rationale for teamworking is seen by some as the need to bring together a range of skills to solve complex or ambiguous problems (Belbin, 1976; 1981; Margerison & McCann, 1985; Adair, 1986; Tjosvold, 1991; Hastings et al, 1986). However as Argote (1982) points out there is a need to consider the contingency perspective and that if a task is too challenging team performance may be impaired through fear of failure.

Although there is a significant degree of agreement on the relationship between the nature of the task and team performance, the proponents of self-directed teams argue that the benefits of teamworking may be realised irrespective of the nature of the task (Seddon, 1992; Ray & Bronstein, 1995). Within this framework teamworking is more a fundamental element and expression of corporate culture than a specific element or process within a "traditional" organisational context.

- iii) The importance of reinforcing the value of teamwork is emphasised by many writers who suggest that **appropriate reward and recognition mechanisms** are necessary to develop effective team performance (Bushe, 1986; Woodcock, 1989; Adair, 1986; Blake et al, 1987; Katzenbach & Smith, 1993). Ray and Bronstein (1995) suggest that many attempts to develop and implement effective teamworking have not succeeded as a consequence of the failure to develop a supportive HR infrastructure (including reward and recognition). For a number of authors the need to balance and blend individual and team rewards are seen as critical challenges to be faced by organisations seeking to build effective teamworking (Brown, 1995; Senior, 1996; Katzenbach & Smith, 1993; West & Slater, 1995).
- iv) Reward and recognition appear to be interpreted fairly broadly ranging from financial rewards (Brown, 1995) to "celebrating success" (Blake et al, 1987; Hastings et al, 1986). There is, however, a fairly strong level of agreement that the environment should encourage **regular and open feedback** (Deutsch, 1985; Tjosvold, 1991; Margerison & McCann, 1985; Belbin, 1981; Blake et al, 1987; Woodcock & Francis, 1981; Walters, 1995; Katzenbach & Smith, 1993; Hackman, 1990; Goleman, 1996; Dulewicz et al, 1995; West, 1994). The use of feedback and progress reviews to **stimulate learning and development** can be an important factor determining the effectiveness of team performance (Senge, 1990; Ghoshal & Bartlett, 1995; Phillips, 1992; Dainty & Kakabadse, 1992; Parkinson, 1995).
- v) Ray and Bronstein's (1995) emphasis on the importance of a **supportive organisational culture and climate** to the achievement of effective teamworking is borne out by the findings and views of many researchers and authors (Tjosvold, 1991; Deutsch, 1985; Bushe, 1986; Phillips, 1992; Parkinson, 1995; Blake et al, 1987; Proctor, 1995; Katzenbach & Smith, 1993; Harris & Harris, 1989). Culture is somewhat difficult to define. Whilst a detailed discussion of organisational culture is beyond the scope of this thesis, it may be helpful to consider some of the wide range of definitions encountered in order to reflect on culture as an input factor when examining team performance relationships. Schneider (1994) proposes that a definition of culture provides insights into its impact as an input team effectiveness factor. He defines culture as:

"A shared perception of organisational policies, practices and procedures, both formal and informal."

Morgan (1984) emphasises both the difficulty of defining culture and its importance in impacting on organisational behaviour:

“Organisations can be considered to be mini-societies with their own distinctive cultural norms and customs. Culture must be accepted as an unseen force in the organisation. A force which everyone knows about, but few could define.”

Beeby and Simpson (1995) in reviewing team case studies drawn from the UK public sector again highlight the importance of culture to team performance, and the difficulty in definition of such culture. They propose a definition, based on their research, as:

“The patterns of meaning and understanding, anchored in core values, that are shared by members of an organisation or management team.”

This definition implies the existence of potentially different organisational and team cultures. The team culture may well be more akin to the factors of climate or cohesion reported in a number of studies (eg, Dulewicz et al, 1995). In practice, the difficulty of defining culture makes for difficulty in operationalising it for research purposes. In team studies which have attempted to incorporate culture as a variable, operationalisation has been in relation to a specific element of culture. For example, West (1994) provides a good example of operationalising culture by focusing on the elements relating to the organisational support for teamworking. In this example, West (1994), provides a good illustration of the impact of a supportive culture on team innovation. In a longitudinal study of 27 National Health Service teams, West showed that organisational cultural factors accounted for 3% to 5% of the levels of innovation achieved by teams.

One particular aspect of organisational culture which appears to be identified as increasingly important to the success of both national and international teams is that of **valuing diversity** (Davison, 1994; Phillips, 1992; Hampden-Turner & Trompenaars, 1995; Ghoshal & Bartlett, 1995; Parkinson, 1995). Katzenbach and Smith (1993) maintain that, from their review of some 400 teams, the existence of a strong organisational performance culture is critical to team success. They view this as a fundamental factor and point out that:

“Teams flow from an organisation’s performance needs and not vice versa.”

Although difficulty is encountered in defining organisational culture there appears a high level of agreement that a “**clear example from the top**” is a critical element in securing effective team performance (Ray & Bronstein, 1995; Tjosvold, 1995; Woodcock & Francis, 1981; Carrington, 1994; Adair, 1986).

Team Process Factors

The analysis of team effectiveness factors using the Hackman and Morris (1975) model (see table 3.3) shows that under the main process headings (Objectives, Interaction and Management/Leadership) a wide range of factors have been identified. Arguably the majority of effort in team research has gone into understanding the comparative impact and significance of **processes** (Critchley & Casey, 1984; Hirschorn, 1991). However, the impact of many process factors on performance often appears to be greater in terms of evidence of changes in attitudes and perceptions than in terms of impacting on performance outcomes (Tannenbaum et al,

1992). In the earlier group research the major process analyses focused on the interaction processes and led to predominantly experimental research designs with numerous limitations and difficulties (Hackman & Morris, 1975). Resulting from the group interaction process focus the concept of process, and related research has been somewhat narrowly defined. Noone (1984) has questioned the "disproportionate emphasis in the research and literature on the interpersonal side of team functioning", which he sees resulting from the interaction focus. He points out that **process** is more than interpersonal behaviours. In reviewing the team literature there is a wide range of elements of team dynamics which go beyond interpersonal behaviours and yet which may be considered as being process factors. These process areas are explored in a little more detail below.

i) Objectives, Goals and Purpose

There appears to be a high degree of consensus that clarity over team purpose, objectives and goals plays a pivotal role in building effective team performance (Katzenbach & Smith, 1993; Tjosvold, 1984; 1991; Higgs & Rowland, 1992; Ray & Bronstein, 1995; Fowler, 1995; Davison, 1994; West, 1994; Wickens, 1995; Nixon, 1990; Walters, 1995; Guzzo & Shea, 1992; Blake et al, 1987; Woodcock & Francis, 1981; Deutch, 1985). In fact, Katzenbach and Smith (1993) argue that the evidence from their study of 400 teams strongly suggests that performance-related objectives are the primary precursor to any form of effective team performance. They argue that teams arise from a performance culture and that the establishment of teamworking in itself is not an intervention which will lead to enhanced performance in the absence of a performance culture. Teams are a natural response to a performance culture rather than a managerial paradigm or method of working in their own right.

The clarity of team goals and objectives is seen as an important performance factor (Deutch, 1985; Woodcock, 1989; Blake et al, 1987; Walters, 1995; Higgs & Rowland, 1992). Achieving clarity requires the establishment of goals which are both measurable and achievable (Deutch, 1985; Katzenbach & Smith, 1993; Phillips, 1992; Zigon, 1994). Ray and Bronstein (1985) in a somewhat contentious statement, maintain that:

"Without goals which can be measured there is no team."

Whilst this view is clearly influenced by the Deming (1982) perspective, it is evident that measurability, in the broader sense of specific purpose and goals and specific criteria for assessing performance, is more widely accepted as being important (Katzenbach & Smith, 1993; Higgs & Rowland, 1992). The importance of clearly defined and specified timescales is seen as providing focus and context for teamworking and subsequent performance (Higgs & Rowland, 1992; Blake et al, 1987; Tjosvold, 1991). In addition to standards of performance being clearly expressed and understood, effective team performance is seen as requiring that these standards are demanding and challenging for both the individual members and the team as a whole (Belbin, 1981; Tjosvold, 1984; 1991; Katzenbach & Smith, 1993; Hastings et al, 1986).

In their study of teams in a leading oil company, Higgs and Rowland (1992) suggest that one reason why project teams appear more effective than "work" teams (ie, permanent, formal teams) may well be that goals are more clearly specified and more precisely time bound. However, although **achievable** goals and objectives are identified as important, a number of authors and studies point to the fact that it is the existence of **challenging goals and objectives** which lead to superior team performance and the building of real team cohesion and commitment (Hastings et al, 1986; Katzenbach & Smith, 1993; Ray & Bronstein, 1995; Wickens, 1995). The importance of challenging and stretching goals and objectives is seen by some as being even more significant in determining the performance of senior managerial and top teams (Ghoshal & Bartlett, 1995).

Whilst the existence of clear goals and objectives help to define the purpose of a team the process by which these are arrived at is also identified as a significant performance factor. In reviewing a wide range of team studies Tjosvold (1991) concludes that:

"Involvement of team members in objective setting aids in envisioning a common direction and uniting the team behind the goals."

This view tends to be given further support by a US survey of Fortune 1000 companies which reported involvement in goal setting as one of the major team success factors (Dumaine, 1994).

ii) **Involvement**

The **importance of involvement** in goal and objective setting as a team performance factor is emphasised in many studies (Blake et al, 1987; Dainty & Kakabadse, 1992; Walters, 1995; Higgs & Rowland, 1992; Fowler, 1995; Ray & Bronstein, 1995; Seddon, 1992; Hackman, 1990; West & Slater, 1995; Wickens, 1995; Nixon, 1990; Dumaine, 1994). In a longitudinal study of NHS teams in the UK, West (1994), concluded that:

"Teams are more effective to the extent that they reflect on and modify objectives, strategies and processes."

The above suggests that **involvement** should be more all encompassing than merely a focus on goal and objective setting. The reason for involvement in goal setting having a positive impact on team performance is suggested as being associated with building ownership of, and commitment to, the goals by individual team members (Tjosvold, 1991; Katzenbach & Smith, 1993; West & Slater, 1995; Davison, 1994). Katzenbach & Smith (1993) point out that, from their study of some 400 teams, the extent to which mutual accountability for team goals was evident indeed reflected (amongst other things) the level of involvement in goal setting. This mutual accountability was, in turn, identified as a major factor underpinning team performance (although this assertion is based on case study evidence rather than being statistically demonstrated). The involvement in goal setting is seen by some as contributing to the cohesiveness of the team (Adair, 1986; Hackman, 1990; Wickens, 1995; Holt, 1987). In the studies reviewed by Holt (1987) the conclusion was drawn that:

"When groups matter to individuals, (team) members perform better."

The impact of commitment through involvement was identified by Holt (Ibid) as leading to the opposite of "social loafing" and was labelled as "social labouring" which leads to enhanced levels of group performance.

iii) Team Interactions

Much of the popular literature on teams and teamworking, and a significant amount of academic research, has focused on examination of interaction processes within teams. However, as Tannenbaum et al (1992) concluded, from their review of the research in this area:

"Interventions which focus on interactions have a reliably positive effect on the attitudes and perceptions of team members, but not on the performance of the team."

they go on to emphasise this point stating that:

"Interpersonal interventions are the least likely to impact on (team) performance."

To a large extent this conclusion is reinforced by Mullen and Cooper (1994) who inferred from their meta-analysis of some 40 team studies, examining the relationship between cohesiveness and effectiveness, that the directional flow was from performance to cohesiveness rather than vice versa. It would seem that much of the evidence relating to interaction processes is more concerned with the group effectiveness outcomes (in the Hackman & Morris 1975 model) and thus with building cohesiveness. The assertion by Katzenbach and Smith (1993) that:

"Teams flow from performance needs and not vice versa"

is in line with the findings of Tannenbaum et al (1992) and Mullen and Cooper (1994).

It may be that many of the interaction factors identified in various studies are second order factors. These may make a difference when primary factors both in terms of input factors and process factors relating to purpose, goals and objectives are in place. This hypothesis has not, however, been tested in a research setting. It is evident that many of the interaction factors will impact on the efficiency of the operation of a team (Tjosvold, 1991; Margerison & McCann, 1995; Adair, 1986). In reviewing the considerable range of interaction factors identified in the literature it would seem that they fall into the following broad categories: i) building cohesiveness; ii) decision processes; iii) communication processes; and iv) team learning. Indeed these categories may be indicative of broad **competences** which need to be present in all team members in order to underpin effective team performance.

iv) Cohesiveness

Building cohesiveness is certainly the area which is most strongly challenged as a causal factor in terms of team performance (Tannenbaum et al, 1992; Mullen & Cooper, 1994; West & Slater, 1995). In some studies the importance of mutual respect, openness, mutual support and trust have been identified as being positively related to team performance (Robinson, 1991; Higgs & Rowland, 1992; Woodcock, 1986; Adair, 1986) and are suggested as being factors related to cohesiveness. In the classic model of group performance (Tuckman, 1965) cohesiveness might be viewed as emerging as the group (or team) progresses through the "Form, Storm, Norm and

Perform" cycle, although the debate remains as to whether the cohesiveness emerges at the "Norming" stage or as a result of "Performing".

v) **Decision-Making**

In examining **decision processes** a number of factors have been identified which are stated as impacting on the effectiveness of team decision making and the value of teams and teamworking in contributing to enhanced decision quality. Dainty and Kakabadse (1992) highlight from their study of European management teams, that at **the more senior levels** the extent of openness and trust between members impacts on decision quality, particularly in relation to strategic decisions. The importance of exploring alternatives, challenging assumptions and generating new and innovative ideas are emphasised by many authors and seen as important interaction processes which enhance effective team performance (Tjosvold, 1991; Margerison & McCann, 1985; Hastings et al, 1986; Phillips, 1992; Blake et al, 1987; Stewart, 1990; Ghoshal & Bartlett, 1995; Nixon, 1990).

Effectiveness of decision-making within teams is seen to be influenced by the team's ability to surface, explore and manage conflict (Deutch, 1985; Margerison & McCann, 1985; Woodcock & Francis, 1981; Katzenbach & Smith, 1993; Adair, 1986; Nixon, 1990). Tannebaum et al (1992) highlight the importance of effective processes for the team to engage in problem finding as a precursor to decision-making. Others highlight participation and involvement in the decision processes as important in determining the quality of decisions and, importantly, the commitment to and ownership of decisions by team members (Robinson, 1991; Tjosvold, 1991; Ray & Bronstein, 1995; Margerison & McCann, 1985; Blake et al, 1987; Adair, 1986; Fowler, 1995).

In an experimental study, Orpen (1995) demonstrated that dealing with decision-making is a key team effectiveness factor. It was shown that effective teams require clear and functioning processes to overcome any barriers to effective decision-making.

vi) **Communication**

Within the team the need for effective sharing of information amongst team members is identified as an important element within the broad heading of **communication processes** (Higgs & Rowland, 1992; Drucker, 1988; Margerison & McCann, 1985; Katzenbach & Smith, 1993; Ray & Bronstein, 1995). In broad terms many writers appear to agree that effective communication within the team, and between the team and other parts of the organisation, are important factors associated with effective team performance (Deutch, 1985; Drucker, 1988; Kutz, 1982; Hastings et al, 1986; Robinson, 1991; Blake et al, 1987; Katzenbach & Smith, 1993; Nixon, 1990).

vii) **Team Learning**

One important aspect of communication processes is that of feedback. In the literature this provides a clear linkage to the overall category of **team learning**. Senge (1990) highlights the importance to both teams and the organisation as a whole of capturing and disseminating

learning in order to improve and build future effective performance. He positions team learning as a pivotal performance factor and describes it as follows:

“Team learning is a process in which a team engages to align and develop its capacity to achieve its objectives through free and creative exploration of complex and subtle issues through deep listening and the suppression of the listeners’ own views.”

Whilst a number of authors do not draw the linkage with team learning directly, many emphasise the importance of regular reviews of process and activities and the importance of the planned acquisition and review of feedback (Tjosvold, 1991; Woodcock, 1989; Phillips, 1992; Blake et al, 1987; Walters, 1995; Katzenbach & Smith, 1993; Nixon, 1990). Guzzo and Shea (1992) point out that, from their review of team studies, the more effective teams have established in-built performance feedback mechanisms. In developing feedback processes the value for teams of multi-source assessment (or 360° feedback) has been highlighted by a number of authors (Ray & Bronstein, 1995; Fowler, 1995; Higgs & Rowland, 1992). The use of feedback as a tool in building individual and team learning is highlighted by Belbin (1993) who points to the importance of developing self-insight in order to adapt personal style and role within a team and to enable a team to cope with a sub-optimum mix of roles. Margerison and McCann (1985) specifically point to the learning value of feedback emphasising the importance to team performance of:

“Reviewing the way in which things work and learning from experience.”

The need for review and learning is reinforced by Parkinson (1995) who points out that:

“High quality learning arises from the review and analysis of mistakes and errors.”

This learning from mistakes is a strong feature in the literature on empowerment, continuous improvement and self-directed teams (Deming, 1982; Seddon, 1992; Ray & Bronstein, 1995; Tjosvold, 1991). However, although (in part) such learning may be included as an interaction process there is little doubt that it is also an environmental or cultural factor (Tjosvold, 1991; Seddon, 1992; Ray & Bronstein, 1995).

viii) **Diversity**

In reviewing the interaction factors an element may be identified which can be threaded through the above broad categories. This element relates to the recognition and valuing of diversity within the team. Deutch (1985) highlights the importance for effective teamworking of “seeing and recognising each others’ perspective on problems and issues faced by the team.” Belbin (1976; 1981) and Margerison and McCann (1985) in proposing team role models highlight the importance of recognising and valuing the contribution from individuals with differing team roles and styles. Indeed Belbin (1993) places this “valuing diversity” factor at a relatively high level stating that:

“Team performance is influenced by the extent to which members correctly recognise and adjust themselves to the relative strengths within the team in terms of differing expertise and team roles.”

Parkinson (1995) extended this view and proposed that a greater understanding of diversity within a team (differing individual contributions and the differing impact of individuals) can play a significant part in improving team performance.

The importance of diversity within a team is seen as becoming of increasing importance when examining the performance of multi-cultural management teams (Hampden-Turner & Trompenaars, 1995). The value of cultural diversity in identifying new ways of thinking within a team is emphasised by Ghoshal and Bartlett, (1995). Within international teams the importance of respecting and valuing differences is highlighted by Phillips, (1992). Thus diversity in style and/or culture can contribute to team effectiveness provided that interaction processes facilitate its recognition and valuing by team members.

ix) Team Management/Leadership

Within the literature describing views and studies on team processes there is a growing emphasis on self-managed and self-directed teams which often plays down the need for a role of a team leader (Tjosvold, 1991; Ray & Bronstein, 1995). Frequently the effectiveness of such teams is seen in terms of their developing mechanisms for effective shared leadership within the team rather than envisaging a separate role for a team leader (Demming, 1982; Seddon, 1992; Ray & Bronstein, 1995; Tjosvold, 1991). Much of this literature, however, does not address the impact of leadership on the performance outcomes of managerial teams. The case studies presented and examined are more concerned with functional, operational or “shop floor” teams. Whilst the self-directed team model may be seen as extreme by many it does appear to be growing in practice as organisations respond to the challenges of operating in more fluid and flexible ways and implementing flatter organisation structures (Seddon, 1992; Ray & Bronstein, 1995).

Within less “extreme” models of teamworking the role, style and behaviours of the team leader are seen as important process factors related to the effective performance of the team. Tjosvold (1991) highlights the importance of the team leader’s interpersonal style and sensitivity in ensuring that other process factors may operate efficiently and deliver superior team performance. Hackman (1990) positions leadership, in a team context, as:

“... being concerned with creating the conditions which support effective team performance rather than attempting to manage and direct behaviours.”

Within the context of senior management teams Eisenstat and Cohen (1990) drew conclusions, from a qualitative study of three top teams, which included support for Hackman’s comment quoted above. They found that the CEOs’ contribution to top teams was concerned with supporting the team processes and providing recognition to the team.

Many writers describe the team leader's role as being concerned with identifying, selecting and bringing together the right mix of individuals and then creating the environment to enable them to achieve the required goals or results (Margerison & McCann, 1985; Belbin, 1981; 1993; Woodcock & Francis, 1981; Robinson, 1991; Adair, 1986). Belbin (1993) identifies a distinct difference between a team leader and a traditional manager (or solo leader) and proposes that the effective team leader: i) chooses to limit his/her role (and delegates responsibility); ii) builds on diversity; iii) seeks talent; iv) develops colleagues; and v) creates a sense of mission. This view is very much aligned to that of Adair (1986). In broad terms the importance of combining vision creation and a facilitating or enabling style is emphasised by a number of writers (Wickens, 1995; Adair, 1986; Nixon, 1990; Fowler, 1995; Blake et al, 1987; Proctor, 1995). Others see the leader as an exemplar (Carrington, 1994) and highlight the importance of top-down commitment to teamworking (Ray & Bronstein, 1995; Lawrence, 1994; Woodcock & Francis, 1981; Blake et al, 1987).

The importance of vision is emphasised by Handy (1985) who states that the team leader:

“Shapes and shares a vision which gives a point to the work of others.”

Hunter et al (1992) extend the visioning role of the leader to the provision of focus, direction and inspiration. However, Katzenbach and Smith (1993) place more emphasis on the leader's role in creating a “performance culture” from which they see teamwork naturally emerging as a means of delivering superior performance. The culture creation theme is supported by Hackman (1990). Others, however, see a critical role as being concerned with communicating behavioural expectations (eg, Saavendra et al, 1990; Steckler & Fondus, 1993; Larson & La Fasto, 1989).

Whilst the self-directed team represents an extreme model, a number of writers do see the effectiveness of the team being enhanced when the barriers of status and hierarchy are removed and the leader becomes more of a team member (Wickens, 1995; Tjosvold, 1991; Walters, 1995; Robinson, 1991).

In a number of studies the particular contribution of the team leader to team performance has been identified as removing organisational barriers to performance and effective management of the interface between the teams and the rest of the organisation (Katzenbach & Smith, 1993; Higgs & Rowland, 1992; Drucker, 1988; Hastings et al, 1986; Proctor, 1995; Walters, 1995; Orpen, 1995; Maxon, 1986; Steckler & Fondus, 1993).

Overall it would appear that the impact on team performance of the team leader can be a significant process factor, but only in as much as the leader is able to create the appropriate environment to enable both input factors and other process factors to be combined to lead to effective performance outcomes.

3.6 Summary

The debate about teams and performance has been reviewed in this chapter together with the earlier group research on which many assertions about the value of teams are stated to be based (eg, Tjosvold, 1984; 1991; Katzenbach & Smith, 1993).

The evidence is clearly somewhat mixed with an over-reliance on case study and anecdotal data. There is evidently a need for further and more rigorously structured research in order to understand the relationships between teams and performance outcomes in an organisational context.

The range of factors within the literature associated with team effectiveness is extremely diverse. This in itself makes for difficulty in research design and inevitably limits the extent to which any single piece of research can examine a significant number of the variables described.

Within the literature, reviewed in this chapter, it appears that the mix of styles, characteristics and roles of team members is a significant factor in describing performance outcome variations. This appears particularly so in the case of management teams.

In the next chapter the concept of team roles and team role mix will be examined in more detail together with the evidence for the contribution of these conceptual models to an understanding of the performance dynamics of managerial teams.

Chapter 4. Team Roles and Competences

"I hold the world but as the world, Gratiano;

A stage where every man must play a part"

William Shakespeare, Merchant of Venice

In this chapter the research and literature relating to the mix of personalities and competences within a team is discussed. In particular the relationship between the team "mix" and performance of the team is examined to determine the extent to which the underlying role or "mix" models consistently explain variation in team outcomes. A number of the team role models which are described in the literature are examined. Particular emphasis is placed on the Belbin Team Roles model (Belbin et al, 1976; Belbin, 1981) which, in a recently published survey of 100 UK organisations (Employment Development Bulletin, 1995), was highlighted as being widely used by organisations for both team selection and development. In addition the chapter briefly discusses the growing literature on competences and considers the extent to which a competency 'mix' model may be more appropriate for studying variations in team outcomes related to input factors than the personality-based team role models.

4.1 Introduction

In reviewing team effectiveness factors within the framework of the Hackman-Morris Group Interaction Process Model (1975) the significance of the mix of individual members' skills has already been briefly discussed. This discussion has highlighted issues relating to mix and appropriateness of skills, clarity of definition of roles and expected contribution. However, differences in **individual style and personality** have also been identified as significant factors in determining the effectiveness of team performance. In pursuing the impact of personality characteristics on team outcomes it is important to be cognisant of the broader debate concerning the relationship between personality and job performance. Whilst there is a significant amount of theoretical agreement on the impact of personality on job performance (eg, Furnham, 1992; Barrick & Mount, 1991; Tupes & Christal, 1961; Argyris, 1960) there is an absence of consistent and valid linkages between personality measures and job performance (eg, Ghiselli, 1973; Locke & Hulin, 1962; Reilly & Chao, 1982; Furnham & Stringfield, 1993). The debate around the predictive validity of personality measures in relation to job performance is summarised by Bushe & Gibbs (1990) who state that:

"Years of research into the effectiveness of people in any role has rarely found any personality or character trait that consistently predicts (job) competence."

Thus whilst the importance and potential relevance of the personality:performance linkage is widely recognised there are clearly challenges to be faced in operationalising the constructs and designing research studies (Furnham, 1992). In part the lack of robust and consistent evidence of predictive validity may be due to the complexity of the phenomena being studied (Furnham,

1992; Nutt, 1986; Barrick & Mount, 1991; Ghiselli, 1973). The preceding chapter highlights this complexity in a group and team context and chapter 6 will expand this discussion and examine research designs aimed at reflecting and examining complex interrelationships of variables.

Whilst it is important to be aware of the limitations and concerns surrounding the study of personality:performance relationships, it is equally important to recognise that a study of team performance would be incomplete without addressing the impact of the personality characteristics of the team members (McClure & Werther, 1993; Schein, 1988; Shaw, 1971). The importance of individual style and personality in terms of its impact on performance was highlighted by Likert (1961) and Eynsenk (1977), who pointed out that:

“... personality factors influence behaviour in groups”.

Shaw (1971), in a major review of the literature on groups, identified that individual characteristics influence group processes in two ways. These are: i) personal characteristics determine an individual's behaviour; and ii) the impact of the combination of individual characteristics within the group in determining the behaviours of the group.

Schein (1988) emphasises the need to recognise organisations as complex social systems. However, in adopting this frame of reference he highlights the significance of reflecting on the impact of individual characteristics on the group and the organisation. He comments specifically that:

“Intergroup collaboration will be related both to overall organisational effectiveness and to individual productivity and morale . . . Questions such as these recognise that the psychological forces operating on an individual are intimately bound up with what happens to the group or the total organisation within which he or she is operating.”

Bales (1970) emphasises the impact of personality characteristics of group members on the way in which not only they behave in a group, but also on the way in which they attempt to change or manage the behaviours of others within the group. He states:

“Each person may be thought of as wishing to maintain his movement, and indeed the movement of all members of the group so far as possible, in his own characteristic value direction.”

Maier (1963) comments on the way in which individual personality may shape behaviour towards other group members, saying that:

“Besides problem-related resources, each individual brings to the group a propensity for thinking and behaving toward the other group members which may have positive or negative impact. These propensities may cause a member's resources to be over - or under-valued and may become barriers to attaining quality or acceptance.”

Furthermore in examining performance in groups Maier and Solem (1952) comment that:

“... the impact of personality types can impair group performance ... even when one member of the group knows the correct solution, hierarchical or personality differences can impair the group's ability to accept the solution.”

In discussing teams (and in particular managerial teams) McClure and Werther (1993) point out that personality variables play an important role in most team building interventions. They comment that:

“Personalities are the primary contextual variables and issues to be addressed if interventions are to go beyond the myth of management teams and create a greater sense of teamwork.”

From the above discussion it is evident that the mix of personalities in a group or team can have an impact on both the way in which the team members interact and the overall performance outcomes. It is in response to these issues that a number of authors and researchers have developed Team Role models to both explain and study the interrelationships of differing personality styles of team members. A number of these Team Role models are explored in 4.2 below.

4.2 Team Role Models

One means of examining differences in the mix of personalities within teams and the impact of such mix on team performance has been through the concept of team roles. This concept has been expressed through descriptions of different types of team roles based on the **personal characteristics or qualities** of the members of a team and expressing these in terms of behaviourally-based “roles”. The concept of a Team Role is concisely and usefully summarised by Biddle (1979):

“(Team) Roles are sets of behaviours resulting from individual characteristics within a group context.”

Whilst Team Roles have gained prominence since the 1970's the concepts have existed in a group context for far longer. In examining group performance and behaviour Benne and Sheats (1948) identified a distinct range of group roles which they labelled as follows: i) Initiator-Contributor; ii) Gatekeeper-Expeditor; iii) Information-Giver; iv) Coordinator; v) Encourager; vi) Information-Seeker; vii) Orienter; viii) Opinion-Giver; ix) Evaluator-Critic; x) Compromiser; xi) Follower; xii) Procedural Technician; xiii) Recorder; xiv) Standard Setter. These roles were used for describing and analysing group and individual member behaviour. They did not, however, attempt to identify an “ideal” or required mix of roles in a group and were derived from observation rather than from specific linkages to personality traits and factors. The typology developed described the “roles” in terms of i) self and other perceptions; ii) ideas and values that will be expressed; iii) quality of interaction in the group; iv) place in the group; v) personality traits; vi) how he/she sees his/her parents; and vii) impact on group satisfaction. Thus whilst not being derived from personality measures and research, this model contains explicit relationships between group role and personality of the group member. In broad terms

the typology encompasses personality (input factors), interactions (process factors) and impact on the group (outcome factors).

A further, and influential, approach to categorising group roles and behaviour was developed by Bales (1950). His original work was developed to provide a framework for observing and analysing group interaction behaviours. Although in later work (Bales, 1970) he developed the framework into a role typology. As with the Benne and Sheats (1948) model the roles proposed by Bales were derived from observational rather than personality research. The model proposed by Bales (1970) identified some 26 group types based on the original interaction framework which is summarised in figure 4.1.

Figure 4.1 Bales Interaction Framework

Actions	Behaviours
Positive (and Mixed) Actions	1. Seems friendly 2. Dramatises 3. Agrees
Attempted Answers	4. Gives suggestions 5. Gives opinions 6. Gives information
Questions	7. Asks for information 8. Asks for opinion 9. Asks for suggestions
Negative (and Mixed) Actions	10. Disagrees 11. Shows tension 12. Seems unfriendly

Source: Bales (1950)

One of the earliest and most influential Team Role models was that developed by Belbin and his colleagues at Henley Management College (Belbin et al, 1976; Belbin, 1981). Subsequent models for describing Team Roles appear to draw considerably on the work of Benne and Sheats (1948) and Bales (1970), although in general terms result in a smaller number of discrete roles. Indeed the Belbin research and model is seen to be based on one of the most rigorous and extensive studies of team building and effectiveness (Dulewicz, 1995(a)). The study was conducted at Henley Management College over a nine-year period beginning in 1969 (Dulewicz, 1995(a)). The Belbin model has been widely used in a variety of settings and, more recently, subject to further academic study and analysis. The results of recent studies have, by no means, been consistent in supporting the constructs underlying the model with some (Furnham et al, 1993; Berry, 1995) challenging the constructs; whilst others (Dulewicz, 1995(a); Senior, 1997; Fisher et al, 1994) have produced evidence supportive of its underlying validity. The discussion on validity is explored in more detail below.

Within the literature there are a range of other team role models which attempt to describe team building and performance in terms of the nature of the roles of team members and the mix of these roles. The only model, from amongst these, which appears to have attracted commercial interest and support coming close to the level of the Belbin model (Employment and Development Bulletin, 1995) is the Team Management Index (Margerison & McCann, 1985). This model is stated to be based on a socio-psychological approach which attempts to link the behaviour exhibited by a person with their functional role (Margerison & McCann, 1985). The Team Roles produced by this model are remarkably similar to the Belbin Team Roles, although the approach to their identification, in terms of the influence of individual preference, is informed by the thinking of Jung (1921). Whilst being a considerable commercial success (the Team Management Index is stated to have over 200,000 managerial users [Berry, 1995]) the Team Management Index data has not been made available for academic investigation or scrutiny.

Although team models have not been developed as selection instruments, the survey reported in the Employment Development Bulletin (1995) showed relatively significant levels of usage of the Belbin Team Role model for selection for both team membership and leadership (16.1% and 17.6% respectively). The use of the Belbin model for such purposes is counselled against due to the nature of the constructs and issues which it sets out to address (Dulewicz, 1995(a); Furnham et al, 1993; West & Slater, 1995; Senior, 1996). This trend in the dominance of the use of team role models in organisational practice underpins the need for further investigation into their underlying structure and validity.

In further discussing Team Role Models the two apparently most commonly used models (Belbin Team Role and the Team Management Index) are examined in more detail. There is an extensive amount of data and research available on the Belbin Team Role Model. The same is not true in respect of the Team Management Index (Berry, 1995). However, the impact on the Team Management Index of Jungian thinking (Margerison & McCann, 1985; 1989; 1990; Berry, 1995) does suggest that there is a potential linkage between the profiles produced by the Myers Briggs Type Indicator and team roles as utilised in the Team Management Index (Higgs 1996(a)).

Belbin Team Roles Model

A considerable volume of the literature relating to team research has been focused on the role of the team leader and their associated qualities (Adair, 1986; Woodcock, 1989). In broad terms this research had been inconclusive and produced individual leadership profiles which represented an "impossible and contradictory 'ideal' leader profile" (Margerison & McCann, 1985). The work in the area of group research has shown a distribution of contributions within an effective group (Benne & Sheats, 1948) and it is, no doubt, this combination of diverse individual contributions which underpinned the thinking and work of Belbin and his associates in their pivotal study at Henley, which led to the emergence of a Team Role model.

According to Belbin (1981) a Team Role is a cluster of related characteristics which comprise second order factors. Within this context they are what Cattell and Butcher (1970) called second-order criterion factors, such as creativity, derived from research on groups of individuals

known to be highly rated on the criterion in question. The original Henley research into team roles, indeed, began with the use of Cattell's 'creativity' equation for identifying managers who would ultimately be classified as Plants (Life, 1987).

In the early stages of the Henley research not only creativity, but also other 16PF second order factors were used as a basis for the formulation of teams for the purposes of the investigation. The early results did demonstrate that correlations, for managerial level team members, were found with some 16PF second order factors (Belbin et al, 1976; Berry, 1995) and that the two widely researched and accepted characteristic scales were: i) Extraversion versus Introversion; and ii) Stability versus Anxiety. From these two categories four components could be identified which are: i) Stable Extroverts; ii) Anxious Extroverts; iii) Stable Introverts; iv) Anxious Introverts. The outcome of the initial research was that effective performance of managerial teams required the presence of a mix of eight team roles which were identified as being:

- i) **Plant:** highly imaginative, experimental, intelligent and assertive
- ii) **Implementer:** tough-minded, practical, conservative, trusting, conscientious and controlled
- iii) **Monitor Evaluator:** intelligent, shrewd and serious-minded
- iv) **Completer (Finisher):** emotional, conscientious, apprehensive, tense and self-controlled
- v) **Resource Investigator:** calm, mature, socially bold, imaginative, radical thinking, trusting and extrovert
- vi) **Team Worker:** outgoing, trusting, humble and group-dependant
- vii) **Co-ordinator (Chairman):** practical, trusting, conscientious, controlled, emotionally stable
- viii) **Shaper:** tense, intelligent, suspicious.

A more detailed description of these roles is provided in Appendix II.

Although this team role model was found to explain variances in team performance in the Henley study it was reported that up to 30% of team members had no clear team role (Belbin, 1981). In subsequent commercial application of the research model Belbin identified a ninth role, that of **Specialist**. There is no published research evidence to support this role and no clear formula to inform its calculation. From a review of its overall description (Belbin, 1993) it does appear to be related to 16PF second order factors which indicate an anxious introvert profile.

Belbin's original work to develop the team role model used a combination of Cattell's 16PF instrument, the Watson-Glaser Critical Thinking Appraisal test and structured observation using the Bales Observation Categories (Bales, 1950). From this research, Belbin identified five interlocking principles of team design (Belbin, 1981) which were:

- i) Members of a management team can contribute in two ways to the achievement of team objectives using either functional or team roles;
- ii) Each team needs an optimum balance in both functional and team roles;

- iii) Team effectiveness will be a function of the extent to which members correctly recognise and adjust themselves to the relative strengths within the team both in expertise and ability to engage in specific team roles;
- iv) Personal qualities fit members for some team-roles while limiting the likelihood that they will succeed in others; and
- v) A team can deploy its technical resources to best advantage only when it has the requisite range of team roles to ensure efficient teamwork.

The formulae for producing Belbin Team Roles from the 16PF are reported by Dulewicz (1995(a)). These are shown in Appendix III. In deriving team roles from the 16PF the significance of the 16PF factor B (a cognitive/intelligence scale) for the roles of Plant and Monitor Evaluator becomes apparent. Whilst it is common practice to use the 16PF to identify Belbin Team Roles it is important to be aware that the cognitive/intelligence element was originally based on a combination of the 16PF factor B scale and the Watson-Glaser Critical Thinking Appraisal (Belbin, 1976; 1981). Beyond specific roles it was found from the original Henley research that effective teams required two roles with high mental abilities (Belbin, 1976; 1981; Berry, 1995). In the research Belbin found that the most effective teams required one Plant plus one other role with higher than average mental abilities. The significance of mental abilities was reinforced by the Henley results which showed that good "runner-up" teams had an overall 'good level of mental ability'. Yet the overall high mental ability teams did not out-perform other teams. In the original research Belbin's findings in relation to the respective performance of high mental ability teams and other teams matched the overall findings of Bahn (1979). Therefore, there may be a need to re-integrate the Watson-Glaser element in the calculation of team roles in future studies to raise the understanding of the impact of 'mental ability' (Dulewicz, 1995(a); Higgs, 1996(a)).

Team Management Index (Margerison and McCann 1985)

Margerison and McCann developed a team role model which looks at teams from a socio-psychological perspective (Margerison & McCann, 1985; Berry, 1995). They identified eight major activities and four key issues which are at the heart of managerial differences and claim these to be derived from the work of Jung (1921). The measures they have devised to examine these activities and issues are:

- i) How people prefer to relate to others (Extrovert versus Introvert);
- ii) How people prefer to gather information (Practical versus Creative);
- iii) How people prefer to make decisions (Analytical versus Emotional);
- iv) How people prefer to organise themselves and others (Structured versus Flexible).

Of the measures employed it is important to comment on the Extroversion - Introversion dimension. Jung (1921) regarded extroversion and introversion as "mutually complementary" attitudes whose differences "generate the tension that both the individual and society need for the maintenance of life". Extroverts, within this Jungian model, are oriented primarily toward

the outer world. Therefore, they tend to focus their perception and judgement on people and objects. Introverts, within this model, are oriented primarily toward the inner world. Their perception and judgement, consequently, are oriented toward the inner world and focus on concepts and ideas. This conceptual framework differs significantly from that more generally employed in the description of personality (Barrick & Mount, 1991; Cattell, 1989). Within trait based models, such as the 16PF, Extroversion is associated with gregariousness, assertiveness, sociability, expressiveness and urgency; whilst Introversion is associated with the reverse of these traits.

Margerison and McCann (1985) conducted a study which bore a number of similarities to Belbin's original study. Again they identified a range of team roles based on personality characteristics. The roles they identified related to:

- i) individual preferences for relating to others in groups;
- ii) how individuals tended to gather and use information;
- iii) how individuals prefer to make decisions.

and the roles identified are labelled and described as follows:

- i) **Creator-innovator:** independent, experimental, develops challenging ideas and pursues own ideas; provides new ways of thinking;
- ii) **Explorer-promoter:** generates ideas and enthuses others, finds out what is happening outside of the organisation; brings information and contacts to the team; influential;
- iii) **Assessor-developer:** looks for ways of making ideas work in practice, 'reality-tester'; unlikely to be carried away with ideas;
- iv) **Thruster-organiser:** ability to get things done; organises people and systems to ensure deadlines met; sets objectives, formulates plans and presses hard for results;
- v) **Concluder-producer:** pride in producing to a standard; delivers what is expected when it is expected; works to set procedures;
- vi) **Controller-inspector:** enjoys detailed work; ensures everything correct; careful and meticulous; can be critical;
- vii) **Upholder-maintainer:** strong conviction about the way things should be done; supportive of others; defends the team; prefers to consolidate, advises and supports;
- viii) **Reporter-advisor:** ability to generate and communicate information; analytical and objective; interested in others and supportive;
- ix) **Linker:** good listener; responsive to others; setting objectives for the team; uses resources; sets an example; co-ordinates team activities.

Margerison and McCann claim that their model is not related to the Myers Briggs Type Indicator (MBTI) and that, in their view, the MBTI confuses personal preferences and preferences in a

work context (Berry, 1995). However, the underlying Jungian origins of the model (Margerison & McCann, 1985) do imply linkages with the MBTI. The perceived links between the Margerison and McCann model and the MBTI is highlighted by authors focusing on the performance of managerial roles and exhibition of behaviours on the basis of learned preferences (McClure & Werther, 1993). Whilst the Team Management Index is extremely popular in commercial applications (Employment Development Bulletin, 1995; Berry, 1995) there is limited publicly available data on which it may be assessed. As was pointed out by Berry (1995) the only data presented for examination is in a sixteen page paper presented at a conference which compared and contrasted the Team Management Index Roles with the Belbin Team Roles based on a population of 4000 managers. However, the reliability data (Cronbach Alphas) presented is based on a relatively small sub-sample of 275 managers. Further inspection and analysis of the data has been denied on the grounds of "commercial confidentiality" (Berry, 1995).

The similarities between the Margerison and McCann model and the Belbin Team Role Model appear strong on the basis of an analysis of the **description** of the roles and underlying analysed or implied traits (see table 4.1). Indeed some authors have used both Belbin Team Roles and the Margerison and McCann model to explore team performance and team development (Cook, 1993). Margerison and McCann's model is seen by some (Berry, 1995) as adding evidence to, rather than conflicting with, Belbin's Team Role model, but as being one which links the behaviour exhibited by individuals in a team context with their functional role. However, the four bipolar scales used in the Team Management Index only produce eight roles (or nine if the Linker role is included) whereas, even if the scales are split trichotomously (Krugg, 1981), there are 81 possible profiles. Even using the implied MBTI profiles would produce sixteen potential profile combinations and the rationale for reducing this to eight or nine roles is neither explicit nor evidenced with research data.

Other Team Role Models

Whilst the Belbin and Margerison and McCann Team Role models tend to dominate much of the literature and research in this field there exist a wider range of models. A number of these are discussed briefly in this section.

Adair (1986), whilst not directly proposing a team role model, does highlight the importance of the impact of personality factors on the style of behaviour within a team. He states that an effective team member needs to:

". . . provide a specialist contribution and be the kind of person able to provide contributions to achieve the task, build and maintain the team and develop or encourage other team members."

Woodcock (1989) proposed a team role model which comprised the following eleven roles: i) Leader; ii) Challenger; iii) Expert; iv) Ambassador; v) Judge; vi) Innovator; vii) Confirmer; viii) Output Pusher; ix) Quality Controller; x) Supporter; and xi) Reviewer.

Table 4.1: Content Analysis of Belbin and Margerison & McCann Team Role Models

Belbin Team Role	16PF Factors	Margerison & McCann Team Role/Function	Traits Implied in Margerison & McCann Roles	MBTI Overall Profile Indicated	Core MBTI
<u>Plant:</u> Creative, imaginative, unorthodox, solves difficult problems	Assertive, venturesome, detached, forthright, serious, experimenting, tender-minded, intelligent, imaginative, self-sufficient.	<u>Creator-Innovator:</u> Creative, solves new problems.	Challenger, experimenting, independent, sensitive, self-sufficient, venturesome.	INTP	NT
<u>Resource Investigator:</u> Extravert, enthusiastic, communicative. Explores opportunities. Develops contacts	Calm, venturesome, imaginative, radical, trusting.	<u>Explorer-Promoter:</u> Enthusiastic, explores ideas, develop opportunities, gather information, communicative.	Enthusiastic, persuasive, develop contacts, influential, communicative, explore ideas.	ENFJ/ENFP	NF
<u>Co-ordinator:</u> Mature, confident, trusting. A good chairperson. Clarifies goals, promotes decision-making.	Calm, assertive, trusting, enthusiastic, detailed, practical, conscientious, controlled.	<u>Linker:</u> Co-ordination, optimises, co-operation, encourages exchange of ideas, promotes decisions.	Enthusiastic, practical, trusting, communicative, sensitive, realistic.	ESTJ	ST
<u>Shaper:</u> Dynamic, outgoing, highly strung, challenger, pressurises, Finds way round obstacles.	Tense, anxious, assertive, venturesome, expedient, tough-minded, suspicious, apprehensive.	<u>Thruster-Organiser:</u> Establishing goals and dealing with hard decisions, making things happen, pressurises.	Practical, assertive, driven, tense, anxious, impatient, tough-minded, expedient.	ESTJ	ST
<u>Monitor-Evaluator:</u> Sober, strategic and discerning. Sees all options. Judges accurately.	Intelligent, serious-minded, shrewd.	<u>Assessor-Developer:</u> Analyse ideas rigorously, assess chances of success. Judges realities.	Practical, analytical, challenging, self-sufficient.	ISTJ	ST
<u>Team Worker:</u> Social, mild, perceptive, accommodating. Listens, builds, averts friction	Outgoing, trusting, unassertive, group-oriented.	<u>Upholder-Maintainer:</u> Providing support for others. Protect the team, avoid friction, get results.	Group-oriented, outgoing, conservative, supportive, consensus oriented.	ESFJ	SF
<u>Implementer:</u> Disciplined, reliable, conservative and efficient. Turns ideas into practical actions.	Conscientious, tough-minded, practical, trusting, co-operative, controlled.	<u>Concluder-Producer:</u> Deliver results, turn ideas into action. Efficiency focus, conservative	Conscientious, practical, conservative.	ESTJ/ISTJ	ST
<u>Completer-Finisher:</u> Painstaking, Conscientious, Anxious. Searches out errors and omissions; Delivers on time.	Anxious, tense, controlled, conscientious, apprehensive.	<u>Controller-Inspector:</u> Assesses detail to assessed, deliver on-time, quality focus. Looks for errors and omissions.	Conscientious, self-sufficient, independent, tense.	ISTJ	ST

These roles have clearly articulated linkages to individual personality factors. However, in a similar way to Bales (1970) the roles are a mixture of personality, interaction and outcomes.

Parker (1990) hypothesises a more parsimonious Team Role model which is derived from the group process model described by Tuckman (1965) [ie, the proposition that groups in working together go through four stages viz i) Forming; ii) Storming; iii) Norming; and iv) Performing]. The roles proposed by Parker are: i) Challenger; ii) Contributor; iii) Communicator; and iv) Collaborator. He suggests that different roles are required at different stages in the team formation process. For example, he proposes that the Challenger role is most important during the "Storming" stage of Tuckman's cycle (Parker, 1990).

Other models have been proposed more recently by Spencer and Pruss (1992), Davis et al (1992), Mumma (1992) and Hunter et al (1992). In examining these models their apparent similarity to the Belbin Team Role model is noticeable (Berry, 1995). Table 4.2 provides a summary of a range of models which, based on an analysis of role descriptions, have been mapped onto the Belbin model.

Whilst there is apparent alignment of many of these models little structured research has been conducted to test the actual overlap and alignment of the model constructs. In part this may be due to the lack of published research data for many of the models (Higgs, 1996(a)); Berry, 1995; Senior, 1997). In one study designed to compare the Belbin Team Role model with the Margerison and McCann Team Index, Higgs (1996(a)) found a degree of evidence for similarity between the two models based on a study of 111 managers in UK financial sector organisations. The study employed a correlational research design and Higgs (1996(a)) concluded that there was a reasonable degree of commonality between the two models. However, the research design limitations indicated a need for further research to confirm the commonality.

Whilst it is not possible to confirm the similarities between the team role models summarised in table 4.2 the above research findings, together with a broad content analysis, do indicate that, at a minimum, there appears a degree of convergence on around eight or nine core roles within a team. Descriptions of the roles encompassed within a number of these models are provided in Appendix II.

4.3 Team Mix, Balance and Performance

The theme of **balance** is emphasised by many writers with **diversity** being seen as a positive factor in contributing to effective performance (Cheung, 1983; Margerison & McCann, 1985; Kline, 1983). The issue of specialism versus general behavioural contributions is raised by a number of authors. Dainty and Kakabadse (1992) based on their study of European management teams state that:

"There is a need to place more emphasis on functional knowledge within a team to secure effective performance."

Adair (1986) also emphasises the need to balance technical/professional competences with "desirable personal attributes". However, the need for specialist/functional contribution has to

be set against the need to rise above functional interests and the "silo mentality" identified by a number of writers and studies as being associated with effective team performance (Belbin, 1976; Phillips, 1992; Blake et al, 1987; Proctor, 1995).

Many writers and researchers emphasise the importance of skill and/or role mix to achieve effective team performance (Belbin, 1976; 1983; Margerison & McCann, 1985; Tjosvold, 1991; Kline, 1956; Katzenbach & Smith, 1993; Fowler, 1995; Blake et al, 1987; Woodcock & Francis, 1981; Phillips, 1992; Davidson, 1994; Proctor, 1995). However, the precise nature of the mix and balance does not tend to be specified. Although Belbin (1976, 1983) highlights a need for a balance of each of the eight team roles he is not specific on the respective significance of each role in the mix. Furthermore as is pointed out by Senior (1996):

"Belbin (1983) points out that balance in teams is related to the goals and tasks faced by the team. Each team needs an optimum balance in both functional roles and team roles. The ideal blend will depend on the goals and tasks the team faces."

However, in the research on which the original Belbin roles were developed, each team faced the same goals and tasks as defined by the management exercise they were undertaking.

The original Henley research entailed studying the performance of management teams in a management exercise used in the Henley General Management programme (Belbin et al, 1976; Belbin, 1981). The research demonstrated that the combination of different roles within a team had an impact on the performance of teams as measured by achievement in the management exercise. Different combinations of team roles were examined and the results consistently demonstrated that a team, in which all eight of the original roles were present, out-performed all other combinations of roles (Belbin et al, 1976). This led to the conclusion that the "ideal" team was one comprising eight members each having a distinct team role (Belbin et al, 1976). However, in subsequent work published by Belbin (Belbin, 1981; 1993) he qualifies this original "balance model" commenting that:

"Very few people have the characteristics of just one Team Role, and we are all far more likely to score strongly on more than one role. In other words, we each have preferred and secondary Team Roles."

Senior (1997), in her study of managerial teams, builds on this comment and uses team's average scores on each role to calculate balance as well as individual role scores. However, she acknowledges the use of subjective judgements in the final determination of the level of balance.

Table 4.2: Comparison of Team Role Models

Comparison of Role Models									
Author	Plant	Resource Investigator	Coordinator	Shaper	Monitor Evaluator	Team Worker	Implementer	Completer	Specialist
Belbin, M (1976, 1983)									
Benne & Sheats (1948)	Initiator-Contributor	<ul style="list-style-type: none"> Gatekeeper-Expediter Information-Giver 	<ul style="list-style-type: none"> Coordinator Encourager Information-seeker 	<ul style="list-style-type: none"> Orienter Energiser Opinion-Giver 	<ul style="list-style-type: none"> Elaborator Standard Setter Opinion-Giver Evaluator-Critic 	<ul style="list-style-type: none"> Compromiser Encourager Follower 	<ul style="list-style-type: none"> Energiser Procedural Technician 	<ul style="list-style-type: none"> Recorder Standard-Setter Procedural Technician Information-Seeker 	<ul style="list-style-type: none"> Procedural Technician Standard Setter
Margerson & McCann (1985)	Creator-Innovator	<ul style="list-style-type: none"> Explorer-Promoter Reporter-Advisor Advisor 	<ul style="list-style-type: none"> Linker 	<ul style="list-style-type: none"> Thruster-Organiser 	<ul style="list-style-type: none"> Assessor-Developer Reporter-Advisor 	<ul style="list-style-type: none"> Upholder-Maintainer Assessor-Developer 	<ul style="list-style-type: none"> Concluder-Producer 	<ul style="list-style-type: none"> Controller-Inspector Concluder-Producer 	<ul style="list-style-type: none"> Advisor
Ray & Bronstein (1995)		<ul style="list-style-type: none"> Commentator 	<ul style="list-style-type: none"> Team Leader Training Coordinator Morale and Recognition 	<ul style="list-style-type: none"> Team Leader 	<ul style="list-style-type: none"> Team Statistician 	<ul style="list-style-type: none"> Morale and Recognition Training Coordinator 	<ul style="list-style-type: none"> Scheduler-Timekeeper 	<ul style="list-style-type: none"> Recorder Team Statistician 	
Phillips, N (1992)	<p><u>Creative:</u></p> <ul style="list-style-type: none"> putting ideas forward pursuing change <p><u>Practical:</u></p> <ul style="list-style-type: none"> provoking thought 	<p><u>Creative:</u></p> <ul style="list-style-type: none"> generating enthusiasm conveying excitement suggesting adjustment to existing proposals 	<p><u>Practical:</u></p> <ul style="list-style-type: none"> co-ordinating group activity delegating tasks summarising activity 	<p><u>Practical:</u></p> <ul style="list-style-type: none"> driving the group forward keeping to agreed goals 	<p><u>Applied:</u></p> <ul style="list-style-type: none"> assessing quality 	<p><u>Practical:</u></p> <ul style="list-style-type: none"> co-ordinating group activity <p><u>Applied:</u></p> <ul style="list-style-type: none"> being aware of members' individual needs keeping to group structures 	<p><u>Applied:</u></p> <ul style="list-style-type: none"> ensuring work is done 	<p><u>Applied:</u></p> <ul style="list-style-type: none"> ensuring work is done paying attention and responding to detail monitoring progress keeping to agreed goals 	
Gibb, JR & LM, (1955)	<ul style="list-style-type: none"> Initiating 	<ul style="list-style-type: none"> Informing 	<ul style="list-style-type: none"> Supporting Informing 	<ul style="list-style-type: none"> Initiating 	<ul style="list-style-type: none"> Evaluating 	<ul style="list-style-type: none"> Supporting 	<ul style="list-style-type: none"> Regulatory 	<ul style="list-style-type: none"> Regulatory 	

Table 4.2: Comparison of Team Role Models (Continued)

Comparison of Role Models										
Author	Plant	Resource Investigator	Coordinator	Shaper	Monitor Evaluator	Team Worker	Implementer	Completer	Specialist	
Belbin, M (1976, 1983)	■ General suggester	■ External liaison ■ Educator	■ External liaison ■ Goal suggester ■ Motivator ■ Arbitrator	■ Motivator ■ Goal Suggester	■ Challenger	■ Arbitrator		■ Challenger		
Spencer & Pruss (1992)	■ Visionary	■ Explorer	■ Peacemaker	■ Challenger ■ Pragmatist	■ Challenger ■ Librarian	■ Peacemaker ■ Coach ■ Confessor	■ Pragmatist ■ Librarian	■ Beaver ■ Librarian		
Mumma (1992)	■ Creator	■ Innovator	■ Moderator	■ Leader	■ Evaluator	■ Manager	■ Organiser	■ Finisher		
Davis et al (1992)	■ Driver	■ Driver ■ Enabler	■ Enabler ■ Executor	■ Driver	■ Controller	■ Enabler	■ Planner	■ Executor ■ Controller		
Hunter et al (1992)	■ Initiator	■ Joker ■ Topic Jumper	■ Compromiser ■ Initiator ■ Encourager	■ Devil's Advocate ■ Recognition Seeker ■ Initiator	■ Opinion-giver ■ Negator	■ Compromiser ■ Clarifier ■ Harmoniser	■ Elaborator ■ Clarifier	■ Blocker ■ Negator ■ Gatekeeper ■ Clarifier		
Parker (1990)	■ Contributor ■ Challenger	■ Communicator ■ Collaborator	■ Communicator	■ Challenger	■ Challenger	■ Communicator ■ Collaborator	■ Contributor	■ Contributor	■ Contributor	
Woodcock (1989)	■ Innovator	■ Ambassador	■ Ambassador ■ Leader	■ Output Pusher ■ Leader	■ Judge ■ Reviewer	■ Supporter	■ Output Pusher ■ Confirmer	■ Quality Controller ■ Output Pusher	■ Expert	

It has, however, been pointed out that in the original research (Belbin et al, 1976; Belbin, 1981) some thirty percent of the managers tested evidenced no distinct Team Roles. It may be that these managers would fit into the latterly proposed (Belbin, 1993) ninth role (ie, that of Specialist). In practice Belbin's original findings have largely been borne out in work on the Henley Senior Management Programme where, on average, some 25% of participants have had no clear BTR and been labelled as Generalists (Dulewicz, 1996). There is, however, no published empirical evidence to support the emergence of Belbin's Specialist role or the possibility that it explains the preferences of those managers whose tests otherwise demonstrate no distinct Team Roles.

Berry (1995) takes the question of balance further and, for Belbin Team Roles, provides a quantitative model for calculating balance and attempts to deal with the fact that Belbin presented no clear processes for measuring and monitoring the extent of team balance. The original "balance model" implies a team size of eight (Belbin et al, 1976). In reality teams of both more and less than eight are encountered. The emergence of the concept of preferred and secondary roles led Belbin to conclude (Belbin, 1981, 1993) that individuals can perform a variety of roles and that a good spread of roles and balance can be achieved in smaller teams of four to six members. However, research evidence to substantiate this is not presented by Belbin. The probabilities of encountering an "ideal" eight member team in a practical setting is very remote (Berry, 1995). Berry calculates the probability of encountering a "balanced" team by chance as being less than one in two thousand. However, he goes on to point out that the probabilities of encountering an "overbalanced" team (ie, a team in which each member has more than one strong Team Role) is very much higher (around one in 90). These probabilities raise questions relating to the measure of mix or balance and indicate the need for further research into the relationship between Team Roles and performance. Berry (1995) addressed the issue of measuring team mix and produced a statistically derived index which: i) compensates for the effect of duplicate roles; ii) allows for the existence of preferred, secondary (and even tertiary) roles; and iii) enables comparisons to be made between teams of different size.

From his research amongst teams drawn from the Henley General Management Course, Fire Officers and groups of students on post-experience university courses, Berry (1995) provides some supporting evidence for the original Team Role model. However, he raises the possibilities that further roles might exist and that the balance of team roles and impact of this on performance may be situational. Although raising an interesting point, in his research Berry uses the Belbin Team Role Self-Perception Inventory which is of questionable validity (Furnham et al, 1993) and furthermore, does not confine his study to management teams alone.

Although the above discussion of mix has focused on the Belbin Team Role model, a common theme in other team role models (Margerison & McCann, 1985; Katzenbach & Smith, 1993; Ray & Bronstein, 1995; Davis et al, 1992; Spencer & Pruss, 1992; Mumma, 1992) is that of balance. The linkage between balance of roles and performance of teams is inferred or claimed by many of

the authors of these models. However, data to demonstrate the nature of the balance and its relationship to performance is not presented.

In addition to examining mix and “balance” in relation to Team Role models, attempts to apply the understanding in practice have led to a more dynamic view of the constructs. In particular a number of authors have commented on the apparent domination of roles at different stages of team development or activity. In 4.2 above the linkages between Team Roles and the Team Formation Cycle were discussed (Parker, 1990). In his later writing Belbin (1993) discusses the dominance and contribution of different Team Roles at different stages in a team project. However, this represents a shift from a managerial to a project team typology and thus must be questionable in terms of validity given the nature of the original research and model development. The linkages proposed by Belbin (1993) are summarised in figure 4.2 below. Both Senior (1997) and Berry (1995) in their research have further explored and supported Belbin’s latter assertion concerning the respective dominance of differing team roles at different stages in a project.

Figure 4.2: Project Stages and Belbin Team Roles

Project Stage	Dominant Roles
Identifying Needs	Shapers, Coordinators
Generating Needs	Plants, Resource Investigators
Developing Plans	Monitor Evaluators, Specialists
Establishing Contacts	Resource Investigators, Team Workers
Organisation	Implementers, Co-ordinators
Follow Through	Completers, Implementors

Source: Belbin, 1993

Whilst there are conceptual leaps in moving from a model rooted in managerial teamworking to a project context (Belbin, Senior, Berry above) the linkage of roles to stages in the development of a team would appear not to raise the same issues concerning consistency in the underlying paradigm. Cook (1993) suggests that the BTR model has considerable value in connection with team development processes. He proposes that different mixes of dominant BTRs have differing significance as teams move through a development cycle. The cycle which he examines entails four stages which he describes as: i) tentative; ii) experimenting; iii) amalgamating; and iv) maturing. Conceptually Cook’s framework is not dissimilar to the ideas of Parker (1990) which were discussed in 4.2 above. The idea of the significance of Team Roles differing with stages of team development is given further support by Stott and Walker (1995). Larson and La Fasto (1989) provide further support for the concept of different needs for Team Role combinations. However, from their research they identified differences related to the objective of the task faced by the team. The model they developed from their research is summarised in figure 4.3. Whilst providing support for differing significance of Team Roles at

different times the Larson and La Fasto model also implies a more complex framework for understanding of team performance and thus implies a more limited explicatory power for Team Role models.

Figure 4.3 Team Mix and Selection Criteria

Objective	Dominant Feature	Process Emphasis	Dominant Selection Criteria
1. Problem Resolution	<ul style="list-style-type: none"> ■ Trust 	<ul style="list-style-type: none"> ■ Focus on issues 	<ul style="list-style-type: none"> ■ Intelligent ■ "Street Smart" ■ People sensitive ■ High integrity
2. Creativity	<ul style="list-style-type: none"> ■ Autonomy 	<ul style="list-style-type: none"> ■ Explore possibilities and alternatives 	<ul style="list-style-type: none"> ■ Cerebral ■ Independent thinkers ■ Self-starters ■ Tenacity
3. Tactical	<ul style="list-style-type: none"> ■ Clarity 	<ul style="list-style-type: none"> ■ Directive ■ Highly focused tasks ■ Role clarity ■ Well defined operational standards ■ Accuracy 	<ul style="list-style-type: none"> ■ Loyal ■ Committed ■ Action orientated ■ Sense of urgency ■ Responsive

Source: Larson and La Fasto, 1989

4.4 Validity of Team Role Models

The two most widely commercially employed team role models (Belbin and Margerison & McCann) were developed and initially validated in an experimental setting using participants on college-based management programmes. It is evident that these models are widely used by organisations, yet there is a dearth of evidence of their validity in an organisational setting. Belbin (1981) comments that:

"The classic mixed team does not, as yet, figure amongst the winning teams in the business world."

This comment is very noticeably in line with Berry (1995) whose observations on the likelihood of encountering perfectly 'balanced' teams are reported above. However, in addition to considerations relating to mix and balance it is important to consider the underlying evidence of the construct validity of Team Roles per se. This is discussed further below.

Validity of Belbin's Model

There have been relatively few studies which have set out to examine the validity of the BTR constructs. One recent study designed to validate Belbin's findings in an organisational context was carried out by Fisher, Macrosson and Walker (1994). In their study they examined six new

product teams within an organisation and correlated (using rank order correlation) the number of Belbin team roles represented in each team with an objective measure of performance. They claimed that the results validated Belbin's assertion that a broader mix of roles led to enhanced team performance. However, apart from the small sample size the researchers discounted the **company worker** (implementer) role in situations where line managers and direct reports were in the same team. Had this role not been discounted the conclusion may well have been significantly different. In addition this study focused on a single industry. Although details of the precise organisational level of the team members in the Fisher et al study were not specified it was implied that the teams were project rather than management teams. Belbin's work specifically focused on management teams and has, both in practitioner and (to an extent) academic work, been confused by using studies incorporating non-managerial or mixed teams.

Senior (1997) set out to validate Belbin's findings on mix and balance of roles. In a study of eleven private and public sector teams she found some evidence to support previous findings on balance and mix. The results of her study showed stronger support when roles were considered in conjunction with project stage, as proposed by Belbin (1993). However, again this study was somewhat limited in terms of sample size, dominance of public sector organisations and inclusion of managerial and non-managerial teams.

Belbin's original work to develop the Team Role model used a combination of Cattell's 16PF instrument, the Watson-Glaser Critical Thinking Appraisal (CTA) and structured observation using the Bales Observation Categories (Bales, 1950). However, much of the subsequent commercial application and structured studies focus on the use of the Belbin Team Role Self Perception Inventory (BTRSPI) (Furnham et al, 1993; Berry 1995, Senior, 1996: 1997). These studies have, generally questioned the validity of this instrument. However, as Belbin (1993) points out, this instrument is not intended to be a 'stand alone' basis for identification of Team Roles and makes reference to his Interplace system which uses a computer-based approach to combining multi-source input (using the BTRSPI) and structured observation. In spite of this specific debate there does appear to be a trend to questioning the overall Belbin Team Role model, based on demonstrated inadequacies of one instrument used to identify Team Roles. The limitations of the instrument have led to inferences relating to the underlying constructs. However, as Dulewicz (1995(a)) demonstrated the use of the original basis for identifying team roles (ie, 16PF) does produce evidence which supports the underlying constructs. In a number of the follow-up studies (Furnham et al, 1993; Fisher et al, 1994; Berry, 1995; Senior, 1996) the teams which have been covered in the research have included non-managerial teams. However, Belbin's studies related quite specifically to management teams (Belbin & Life, 1976; Belbin, 1981) and therefore the validity of findings which relate to samples including non-managerial teams has to be considered.

Perhaps the most fundamental challenge to the Belbin Team Role model's construct validity was made by Furnham et al (1993) who identified poor discriminant validity between the scales used by Belbin. They established that two factors accounted for over 60 percent of variance. The

creative thinker factor (Plant) accounted for 45 percent and the company worker (Implementer) factor accounted for some 20 percent of identified variance. These results were in line with earlier statements questioning the validity of the BTRSPI made by Furnham (1992). However, in responding to his challenge Belbin (1993) highlighted the incomplete use of his overall Interplace system and relied solely on the use of the Belbin Team Role Self-Perception Inventory (BTRSPI) and the use of an adapted normative (as opposed to the BTRSPI ipsative) version.

Broucek and Randall (1996) attempted to address the above instrumentation debate by conducting a number of studies designed to examine the construct equivalence of Belbin's Interplace system (Belbin, 1993) which was referred to in Belbin's response to Furnham et al (Belbin, 1993(b)). Broucek and Randall undertook five studies employing both practising managers and students. They concluded that the results of the studies provided no construct validity support for either the BTRSPI or the Interplace system. However, they highlighted the value of the BTR model in establishing direct linkages between Team Roles and personality traits.

The overall concern of the construct validity of the BTRSPI is questioned by a number of other researchers (Balderson & Broderick, 1996; Senior, 1993, 1997; Berry, 1997; Mottram, 1988). However, in practice its use tends to be supported by an apparently high level of face validity (Senior, 1996; Balderson & Broderick, 1996; Arroba & Wedgwood-Oppenheim, 1994). In particular the use of BTRs for purely developmental purposes is argued for by a number of authors (eg, Parkinson, 1995; Fowler, 1995; Proctor, 1995).

In order to really assess the validity of the BTR model it is important to ensure equivalence in determination of Team Roles with the original research. This entails employing the 16PF and related conversion formulae as a means of calculating an individual's BTR (Mottram, 1988). Employing this basis Dulewicz (1995(a)) carried out a detailed study to identify the extent to which the 16PF and OPQ questionnaires effectively predicted Belbin roles. In broad terms this study validated the relationship between personality factors and team roles. However, although it validated the constructs employed by Belbin it provided no further evidence about the validity of roles and role mix in terms of team performance in an organisational context, the point highlighted by Furnham et al (1993). As Berry (1995) pointed out this was not unsurprising as the performance relationship described by Belbin (1981) related to "balance" in relation to performance rather than individual roles.

Overall whilst there are challenges to the construct validity of the BTR model there is a great deal of confounding of study evidence and conclusions by the lack of direct comparability. Studies purported to challenge or confirm validity of the model frequently employ the BTRSPI as a means of operationalising Belbin's constructs and employ samples which incorporate non-managerial teams. Where the research design is closer to Belbin's original study parameters the results tend to be more supportive of construct validity (eg, Dulewicz, 1995(a)).

Validity of Other Models

The other major Team Role model (Margerison & McCann, 1985) is based on a Jungian framework and is reportedly based on the use of the Myers-Briggs Type Indicator (MBTI) (Berry, 1995; McCrae & Costa, 1993). This model represents a fundamentally different way of examining personality and the impact of personality on organisational performance. Whilst the Belbin Team Role model is based on inherent characteristics, other models, such as the Margerison and McCann model, relate to personality as expressed through individual preferences (Furnham & Stringfield, 1993). There appears little published evidence which directly validates the Margerison and McCann Team Role Model. Available evidence on the underlying MBTI framework which supports this model is also relatively sparse (particularly when compared with the extent of literature available on the 16PF framework which underpins Belbin's Team Role Model).

It would appear, on the surface, that given the similarity in the premises of both Margerison and McCann's and Belbin's Team Role Models, there should be a relationship between them. This possibility does not seem to have been explored in the literature. It would appear to be feasible that an examination of the relationship between MBTI profiles of individuals and their Belbin Team Roles may provide some validation evidence. The study by Higgs (1996(a)) highlights the possibilities that this relationship may provide a degree of validation of the Margerison and McCann model.

Whilst there are challenges to the Team Role model construct many of these are methodologically impaired. The majority of the published research evidence relates to the Belbin Team Role Model. However, the volume of evidence which aligns directly with Belbin's original research focus on managerial teams and Team Roles derived directly from the 16PF instrument is sparse. Where these two components are incorporated into the research the support for the construct validity of the Belbin Team Role model is acceptable. However, the overall concept of Team Roles in explaining variations of managerial team performance is challenged by some authors (West, 1994; Smith, 1995). The basis of these challenges is more concerned with the complexity of the dynamics of the variables involved in understanding team performance than the operationalisation of Team Role models per se.

4.5 Roles or Competences?

Managerial Competences

There is an increasing level of interest and focus on **managerial competences** in relation to managerial performance which is matched by a wealth of literature (Sarawono, 1995; Finn, 1993; Boyatzis, 1982; Spencer & Spencer, 1993). The definition of competences within the literature is subject to a considerable volume of debate (Finn, 1993). Schroeder (1989) defines competences quite simply as "personal effectiveness skills". Others look at competences as being linked to personality and therefore, within the context of the debate on input factors, potentially impact on the understanding of team performance (see 4.4 above). For example,

Pinder and Herriot (1990) define competences as an expression of underlying personal attributes in various types of work situation. This definition certainly addresses the contextual limitations of Team Role models identified by Smith (1995).

The drivers for the focus on competences are often associated with the limitations on the research evidence for a linkage between personality and job performance (eg, Varney, 1985; Bushe & Gibb, 1990). This need for an alternative to personality-based approaches to differentiation is aptly summarised by Goleman (1981) who comments that:

“Competency theory assumes that standard aptitude and personality tests are crude instruments irrelevant to job-life success”.

This view is further supported by Bushe and Gibb (1990) who comment that:

“Years of research into the effectiveness of people in any role have rarely found any personality trait or characteristic that consistently predicts performance.”

Whilst Goleman sees competences as an alternative to the personality-based paradigm the now classic view of competences (Boyatzis, 1982) sees the construct as being an inclusive one which sets personality traits in a broader context. Boyatzis (1982) defines competences as:

“Characteristics which are causally related to effective and/or superior performance in a job. This means that possession of the characteristics precedes and leads to superior performance on the job.”

Thompson et al (1996) provide a similarly (and useful) results focused definition of competences, stating that they are:

“. . . integrated sets of behaviours which can be directed towards successful goal achievement within competence domains.”

In this definition the concept of ‘sets of behaviours’ provides an interesting potential linkage with the concept of roles examined in 4.4 above.

In his detailed review of the literature on competences Finn (1993) produces an extremely useful categorisation of the range of different competency models or frameworks. This may be summarised as follows:

- Input Model:** The input model may be seen as the “traditional” model of management education. Within this model the core assumption is that knowledge leads to capability; that what a person brings to the job is adequate for them to undertake the job effectively.
- Process Model:** Process models describe the individual behaviours, tasks and procedures and contributions to group actions. In process models competence includes intellectual, cognitive and attitudinal dimensions as well as performance.

Outcome Model: The outcome model positions competences as the ability to perform a task satisfactorily when the task is clearly defined and the criteria or standards of success have been clearly outlined. They relate to achievements in a job.

He suggests that each model alone does not completely describe managerial capability, but when pulled together, in what he describes as the contingency model, can provide a valuable basis for identifying and describing an effective manager.

Although there is fairly extensive use made, in practice, of the outcomes model in the UK in the form of the Management Standards of the Management Charter Initiative, a considerable amount of the research literature relates to the process and input models with significant emphasis on personal qualities and motivations (eg, McClelland, 1971; Klemp, 1980; 1991; Boyatzis, 1982; Heller & Porter, 1977; Dulewicz & Herbert, 1992; Schroder, 1990). Whilst this research produces a diverse range of competences it is possible to identify broadly common clusters or themes. (Appendix IV shows the results of a brief content analysis which groups competences emerging from a range of studies into broad categories or clusters.) Dulewicz (1992) presents the results of a study of some 40 managerial competences which are reduced, through factor analysis, to twelve "Supra-Competences". This provides a useful way of capturing and operationalising the apparent competency clustering encountered in the literature.

The language of competences may be helpful in understanding some of the input factors for the performance of management teams. Indeed if, as Tjosvold (1991), Ray and Bronstein (1995) and others have claimed, teams tend to supplant or obviate the need for management and supervision then it would seem to follow that managerial teams would require the range of competences associated with effective managerial performance.

Competency Mix and Team Competences

In his review of the literature on competences, Finn (1993) proposed that team performance may well result from an appropriate mix of competences demonstrated by team members. Indeed this possibility is flagged in the earlier work of Schroder (1989). If competences are seen in terms of the process model (Boyatzis, 1982; Spencer & Spencer, 1993; Finn, 1993) they encompass personality factors and behaviours and this approach may therefore provide an effective basis for examining the balance between functional contribution and personal style and behaviour in designing high performing teams.

Dulewicz (1995(a)) in a study of some 100 managers attending the Henley Management College General Management Course found evidence that there were clear linkages between a number of the Belbin Team Roles and the Supra-Competences developed by Dulewicz (1989) from work carried out using the Job Competences Survey and based on the Assessment Centre literature (eg, Thornton & Byham, 1982). These competences were also linked to the 16PF and OPQ questionnaires. In addition both instruments were shown to be related to the Belbin Team Roles (Dulewicz, 1995(a)).

Much of Schroder's work (1989) is built from his earlier work on superior team performance and he identifies the significance of competences in the role and effectiveness of work groups. Indeed he suggests that the specific competence to facilitate the development of effective cross-functional work groups is critical in modern business environments. However, the research in terms of studying competency mix in teams is currently very limited and should be extended to examine the potential for competency-based models for team design and development. Research in this area is potentially interesting and it may well be that competency mix may prove to be a more useful way of practically designing teams to achieve high levels of performance than current team role models (Stevens & Campion, 1994; Bartlett & Ghoshall, 1995; Higgs, 1991; Hambrick, 1995).

Within the competency literature, although the possibilities of competency mix in teams have been raised, there has been little discussion of the need for, or existence of, specific competences associated with effective individual contribution in a team setting. It may be possible that, in addition to competency mix being important within a team there are specific team working competences required (Finn, 1993; Varney, 1985; Smith, 1995; Isabella & Waddock, 1994; Bradford & Cohen, 1984; Bartlett & Ghoshall, 1995; Larson & La Fasto, 1989).

4.6 Selection and Development of Teams

Practitioners in organisations have been attracted by models such as those of Belbin or Margerison and McCann in terms of identifying the mix of members required to produce effective and high performing teams (Katzenbach & Smith, 1993; Belbin, 1993; Fowler, 1995; Fisher et al, 1994). However, selection is often based on the use of derivative instruments such as the Belbin Team Role Self Perception Inventory (BTRSPI) which have been shown to have low validity (eg, Furnham et al, 1993). Whilst studies have shown that more robust and established instruments (e.g, 16PF, OPQ) have validity in predicting team roles (Dulewicz, 1995(a)) the usefulness of their application may be restricted by lack of robust research data on ideal team role composition in an organisational context. Although there are a limited number of studies which examine linkages between established assessment instruments and team roles there is a wealth of research into the area of assessment of managerial potential (Thornton & Byham, 1982). The linkages between this work and managerial competences has also been well researched and established (Dulewicz, 1989; 1995(a)). Much of the research into this area has concentrated on the use of well validated general personality assessment instruments (eg, 16PF, OPQ) combined with instruments measuring specific areas such as leadership style and effectiveness (eg, Dulewicz & Herbert, 1992) and cognitive abilities measured through instruments such as the Watson-Glaser Critical Reasoning Test (eg, Belbin et al, 1976, Thornton & Byham, 1982).

The link between intelligence and team performance was a specific area explored in Belbin's original research (Belbin et al, 1976). He found that the high intelligence teams (assessed as such through the Watson-Glaser test and factor B on the 16PF), which he labelled as the "Apollo Teams", did not out perform other teams. However, in identifying team roles intelligence did

play a significant part. For example, the Team Roles of Plant and Monitor Evaluator both contain relatively high intelligence loadings. Within the broad area of assessment of managerial competence and potential there has been considerable debate around the predictive validity of measures of intelligence. Whilst clearly not a single predictor the evidence points to its importance as a factor in terms of overall assessment (Thornton & Byham, 1982; Woodruffe, 1990). Belbin's results with his "Apollo Teams" were interesting, but did not contain a comparison with teams comprising members all drawn from the lower end of the intelligence spectrum. Indeed his overall "balanced" team implies a balance of cognitive abilities within the team. This question of balance in terms of intelligence is supported by Bahn (1979) who examined the results of studies of intelligence as a predictor of managerial or executive competence. From the review it appeared that both very high and also low levels of intelligence were associated with ineffective managerial and leadership performance. He concludes, as have many others, that:

"If we use intelligence test scores as simply one of several indicators of competence, they can make a valuable contribution to the critically important assessments involved in executive selection and promotion."

Within organisations the Myers-Briggs Type Inventory is widely used for development work involving managerial competences and team performance. This particular instrument identifies sixteen personality types based on the personality framework developed by Jung (Myers, 1962). The Jungian framework (Jung, 1921) for describing personality is based on an open system viewpoint which suggests that rather than individual personality traits being "fixed" they are capable of growth and development. In particular he proposes that growth and change are especially influenced through interactions with others. This may be a particularly significant aspect of this model in the context of team performance and development.

The basis of the Jungian model proposes three dimensions to identify individual cognitive style. These are:

- i) How individuals approach life (Introversion : Extroversion). Within this model the terms Introversion and Extroversion have very specific meanings different from the more widely used meanings (ie, extrovert meaning sociable and outgoing and introvert meaning shy and withdrawn). The Jungian model assesses these dimensions as relating to attitudes or orientations towards life (Myers & McCaulley, 1985). The extroverted attitude is outward directed, towards objects and people in the environment. The introverted attitude focuses on energy drawn from the environment and consolidated within one's person;
- ii) The way in which individuals become aware of the world (Intuition : Sensing); and
- iii) The way in which individuals reach conclusions about the world (Thinking : Feeling).

The Myers-Briggs Type Indicator extends these dimensions to include a fourth which relates to the way in which individuals use information to make decisions (Perceiving : Judging). Furnham and Stringfield (1993) point out that there have been relatively few studies which have

addressed the relationship between MBTI and occupational behaviour. They point out that of those which have been carried out the majority are based on simulations rather than "real world" settings. They provide an interesting report of a "real world" study which they conducted on 370 managers using "360°" assessment of managerial performance. Although they found good reliability measures and positive correlations between Extroversion, Thinking and Judging and good managerial practice (also negative correlation between good managerial practice and Introversion and Feeling) they point out that in general the strength of the correlations were relatively weak.

In examining the use of the MBTI in assessment centres Pinder and Herriot (1990) found some correlations between performance and MBTI factors with the strongest being with the Introversion : Extroversion dimension. However, they point out that the MBTI correlations were not as strong as those found with the OPQ.

In a study designed to examine organisation development consulting competences Bushe and Gibbs (1990) found a positive correlation between intuition and consulting competence as rated by trainers. They do, however, go on to state that there was more value in using the MBTI as a feedback tool in team training sessions than as an assessment tool. This point is reinforced by McCrea and Costa (1988) who commented that their conclusions from two case studies were that:

"MBTI differences are at the heart of several team problems encountered in managerial and executive teams."

Overall there is a view that the MBTI has limitations as an assessment instrument (McCrae & Costa, 1988) in that:

- i) it is ipsative;
- ii) it contains bi-modal distribution of preference scores; and
- iii) studies do not consistently confirm its validity as a measure or the validity of the underlying theory.

It would appear that the MBTI provides a good illustration of an instrument which can be of value in development with a team or group of individuals, but as yet is not supported by significant evidence of its validity in use for assessment purposes.

Equally many propose that, in spite of doubts over the psychometric validity of the BTRSPI, it has significant value for developmental purposes (Cook, 1993; Higgs, 1996(a); Bushe & Gibbs, 1990).

4.7 Summary

This chapter has examined the relationships between the personalities of team members and the impact of the mix of these on team performance. From the evidence available it is apparent that a relationship exists, although the precise nature of that relationship is difficult to demonstrate in a consistently robust and sustainable manner.

Whilst much has been written about the link between personality and teams, via the construct of team roles, the evidence for the validity of such constructs is somewhat mixed. Equally the concept of team competences whilst theoretically appealing is supported by little in the way of robust research evidence.

In reviewing the evidence on team roles and competences there is an emerging case for a valid relationship between such input variables and team outcomes. However, as West (1994) points out the dynamics of team performance is complex and the construct of Team Roles can only ever provide one element in illuminating these complex relationships. Much of the original work on the construct of Team Roles has been positioned in relation to managerial teams. However, the exploration of the validity of these constructs has failed to adequately distinguish between team levels in the examination of findings. In part this may be due to the difficulties in obtaining access to such teams in organisationally based studies (Pettigrew, 1992). The need for further research to explore the managerial (particularly senior managerial) team issues is explored further in the next chapter, which also explores the specific issues and considerations associated with the "top teams" within organisations.

Chapter 5. Top Teams

“What is not good for the beehive, cannot be good for the bees”.

Marcus Aurelius; Meditations

In reviewing the literature on teams the need for effective team working as decisions become more complex has been highlighted (eg, Davison, 1994; Carrington, 1994; Lorsch, 1989). As has been pointed out in preceding sections, despite this recognition and the fact that complexity is a factor which increases with seniority of teams, the number of studies relating specifically to senior management teams remains relatively sparse.

In the preceding chapters the observation has been made that in many of the studies of teams and teamworking insufficient attention has been paid to delineating findings and conclusions between managerial and other teams. Indeed in some cases findings specifically related to managerial teams have been employed in further studies of non-managerial teams without acknowledging the fact or discussing the potential implications or limitations of such a practice (Higgs, 1996(b)). An exception to the earlier comments on managerial teams arises in connection with research into top teams in organisations. Whilst not yet abundant there is an emerging stream of research which focuses on top teams or “managerial elites” (Pettigrew, 1992). This chapter discusses this research and its implications for further managerial team research.

5.1 Introduction

There is an increasing interest, from both a research and practitioner perspective, in the functioning of top teams and boards of directors. Pettigrew (1992) drew attention to this trend in his comprehensive review of studies of ‘Managerial Elites’. However, gaining access to board teams and ‘managerial elites’ in order to obtain direct data is somewhat difficult (Hambrick & Mason, 1984; Eisenhardt, 1989; Eisenhardt & Schoonhoven, 1990). As a result the majority of studies of top teams have focused on examining the relationships between team demography and organisational outcomes (Pettigrew, 1992). Within these studies demographics are used as surrogates for processes which link the input and outcome variables (Lawrence, 1991; Pfeffer, 1983). Lawrence (1991) challenges this assumption in the study of top teams and argues for the development of means to undertake direct and concrete analysis of the intervening mechanisms and processes which link the input and outcome variables. A step, albeit modest, has been made in this direction by researchers such as O’Reilly et al (1993) who attempted to go beyond archival data and demographic analysis by incorporating CEO descriptions of top team processes in their research design. However, this has led to a number of inconsistent findings (Pettigrew, 1992). In his review of the managerial elite studies, Pettigrew (1992), concludes that there is a need for more direct research into board and top team processes and that the difficulties of access will need to be overcome in order to produce a better understanding of the mediation effect of process in the input to outcome relationship for these teams.

5.2 Top Teams as Teams

In the examination of senior managerial and top teams an initial question arises as to whether or not they do, or are intended to, act as a team. Stott and Walker (1995) point out that, whilst they include the board as a team in their typology of teams, the objectives and roles of the board are often less clear than those for more "traditionally defined" managerial teams. Similarly Spencer and Pruss (1992) include boards in their typology but question whether or not the board is always to be considered as a team. Lorenz (1994) proposes that it is difficult to consider top teams as teams in the widely accepted use of the term. He points out that the leaders who comprise the top team more often behave like "warring barons" than team members. He comments that:

"A top team working together is an oxymoron."

In a qualitative study of three top teams in different sectors and environments Eisenstat and Cohen (1990) found that top groups encounter difficulty in working as a team. The high visibility of group members by the CEO leads, they reported, to "play it safe" behaviours which are not conducive to teamworking. Although the current reality of senior/top managerial groups may be seen as indicating a lack of teamwork there is a view that the growth in competition, environmental volatility and decision complexity are drivers for developing teamworking processes and skills (Davison, 1994; Carrington, 1994; Lorsh, 1989). In spite of this need Lorsh (1989) commented on the apparent paucity of top team (particularly board) studies:

"The need to apply teamworking to assist in dealing with complex decisions is extending upwards to board level. However, there is an apparent absence of team studies at this level."

Hambrick (1995) comments further on the absence or paucity of top team studies. In particular he highlights that the current team research does not address the specific problems and issues of top teams. From his qualitative study involving interviews with 23 CEOs he concluded that one barrier to top team research arises in the definition of the composition of the top team. Flatt (1992) argues that inconsistency in defining the composition of the top team not only acts as a barrier to this research field but, more importantly, may be crucial in determining the results encountered and may contribute to the inconsistency in reported findings from the studies that do occur.

In the studies which have taken place a variety of definitions of composition have been employed including: the executives on the board (Finklestein & Hambrick, 1990), the CEO and direct reports (O'Reilly et al, 1992) and the two highest executive levels (Wiersema & Bantel, 1992). However, the use of arbitrary levels or titles may be flawed in that others may have a significant role in the team and, indeed, titled executives may make no contribution to the team (Keck, 1991). Hambrick (1995) used an approach involving asking the CEOs to identify who they saw as comprising the effective top team. Whilst this approach introduces a degree of subjectivity it does minimise the risk of exclusion of key members and inclusion of redundant members.

5.3 Top Team Research Agenda and Findings

Although there is a general view that top teams have been a relatively neglected area within the team literature there is an emerging body of research in this field (Pettigrew, 1992). In response to the continuing debate and controversy around leadership studies Hambrick and Mason (1984) published an important research agenda paper which argued that the strategic apex of an organisation contained more than individual leaders. The specific thrust of this agenda was to give impetus to the study of top teams. The research focus proposed was one designed to examine "upper echelons" (Hambrick & Mason, 1984) and to do so from a macro-organisational perspective. The core proposition in Hambrick and Mason's upper echelons theory was that:

"Organisational outcomes - both strategies and effectiveness - are viewed as reflections of the values and cognitive bases of powerful actors in the organisation."

The important and complex psychological issues in this proposition were recognised. However, it was proposed that the primary emphasis of the research should be placed on observable managerial characteristics as indicators of the givens that a manager brings to an administrative situation. The observable characteristics which have tended to dominate this stream of research are demographic factors such as age, tenure in the organisation, functional background, education, socio-economic roots and financial position (Pettigrew, 1992).

The studies resulting from Hambrick and Mason's upper echelon agenda have tended to share a common methodological approach entailing the use of demographic data and multivariate analysis. The results have demonstrated linkages between top team characteristics (as measured through demographic data) and aspects of organisational outcomes such as corporate strategies, change and innovation (eg, Finklestein & Hambrick, 1990; Michel & Hambrick, 1992; D'Aveni, 1990; O'Reilly et al, 1993; Bantel & Jackson, 1989). The research, within this framework, designed to provide direct evidence for linkage between top team characteristics and the performance of the organisation, has produced inconsistent results (Norburn, 1986; Keck, 1991; Pettigrew, 1992). The lack of consistency of findings has led to a need to reframe the research approach and in particular to challenge the narrow demographic focus (Pettigrew, 1992). Lawrence (1991) argues that the use of demographic variables as surrogates for intervening processes is flawed and that there is a need for concrete examination of team processes. This raises the issue of difficulty in gaining access to top teams in order to study processes directly. Indeed Pettigrew (1992) argues that a major limitation of the demographically based research design is the absence of understanding of the top team processes. He comments that:

"The more damning indictment of the demography-based top management team research is that no-one has ever been anywhere near a top team in an organisational setting, either to directly observe a team in action, or to interview the members about the links between their characteristics and structure, processes of communication and decision-making and their impact on performance."

Pettigrew (1992) goes on to point out that more recent studies have demonstrated the feasibility of gaining access to top teams (eg, O'Reilly et al, 1993; Eisenhardt & Bourgeois, 1988; Eisenhardt, 1989; Eisenhardt & Schoonhoven, 1990; Pettigrew & Whipp, 1991). Many of these studies have been qualitative, but have, however, thrown light on the processes Lawrence (1991) referred to as being within the "Black Box" of the demography-based research focus.

Hambrick (1995) in a qualitative study involving interviews with 23 CEOs found that the five most commonly reported concerns they had with their top teams were: i) individual capabilities; ii) team process shortcomings; iii) internal rivalries; iv) "group think"; and v) fragmentation. Whilst on initial examination these issues would not appear dissimilar from a number of the factors addressed in chapter three above, Hambrick (1995) does point out that the CEO's concerns with skill gaps were not in relation to basics but related to "higher level" skills such as strategic perspective and interpersonal skills.

Eisenhardt (1989) in a qualitative top team study identified the importance of reviewing the team in a strategic context. He found that the factors which are helpful in aiding top teams to make fast strategic decisions were: i) accelerating their cognitive processing; ii) enabling them to use effective processes and procedures to sharpen and quicken the pace of information analysis; iii) increasing the pressure to "act wisely"; and iv) ensure a sense of certainty and confidence. This last point is reinforced by one of the relatively rare experimental studies carried out on top teams by Isabella and Waddock (1994). In a simulation using a sample of 225 senior managers they found evidence that certainty about the environment amongst top team members was linked to organisation performance. However, levels of certainty were found to be more related to internal team processes than external factors (Isabella & Waddock, 1994).

Hurst et al (1989) in an examination of top teams, focused on the team's involvement in strategic management. They identified that the cognitive behaviours in the strategic arena were of a different order. They commented that:

"Behaviours typically associated with strategic management based on rational and analytical thinking are probably too limiting if strategic opportunities are to be exploited."

They proposed from their study that, in order to be effective, the top team need to: i) deal with novelty and ambiguity; ii) encourage and build on diversity; and iii) manage complexity. The specific requirements of a top team are further elucidated by Eisenstat and Cohen (1990), following their qualitative study of three top teams operating in different sectors and business environments. They identified the following specific requirements for top teams: i) a need for decisions to represent or take account of a range of interests; ii) a need for more creative organisational solutions; iii) members need a higher level of understanding of and support for the decisions they are involved in; iv) enhanced communication; v) a need to spread the burden of managing the organisation; and vi) a need to develop the knowledge, skills and abilities of the team members. Once again it could be argued that these requirements have been highlighted for many team types. Within the Eisenstat and Cohen (1990) findings it does appear that there is a confounding of input and process differences with the contextual element of complexity which

had been highlighted as a specific top team issue by Hurst et al (1989). Eisenstat and Cohen did comment that, within the top team setting, there is a critical role for the CEO in selecting team members and providing support for the team. However, in a qualitative study of 21 teams which included boards and top teams Hackman (1990) found that top teams often suffered from the absence of a supporting organisational context.

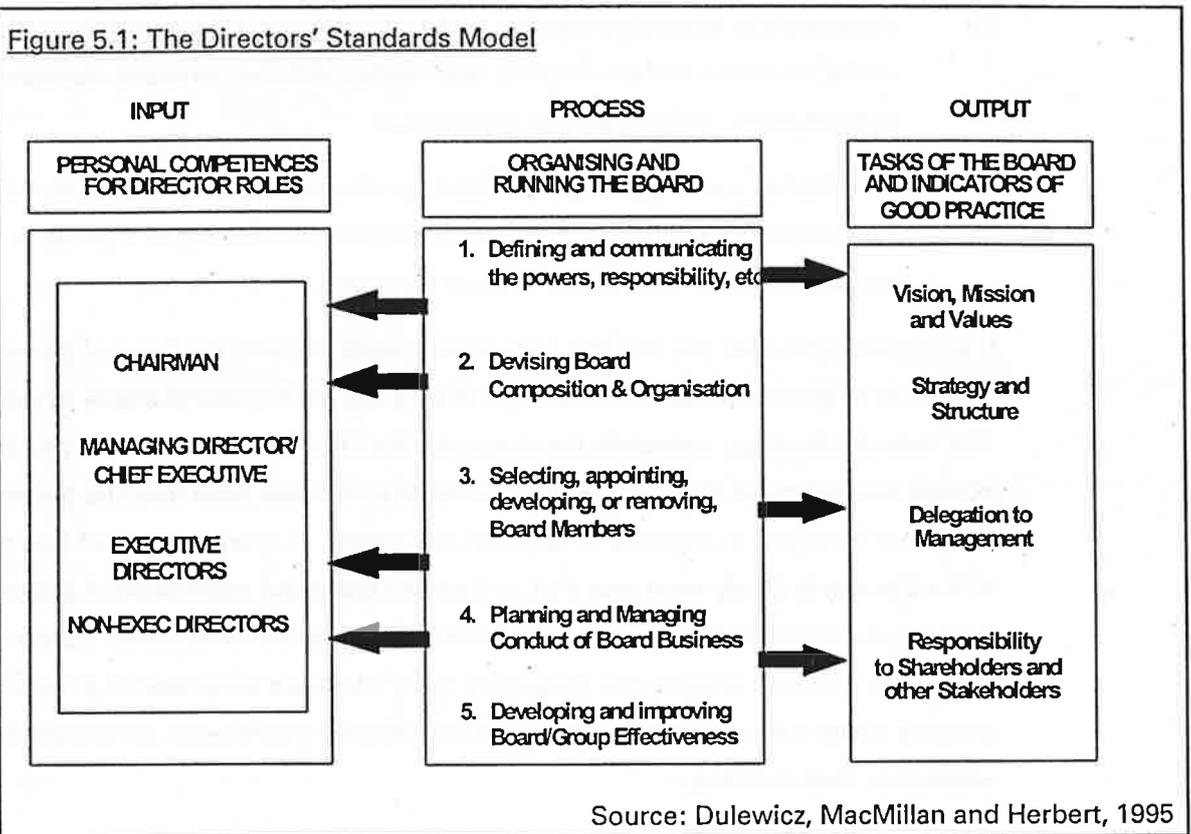
In reviewing the top team research described above it is evident that the research design adopted in demographically-based studies attempts to deal with the complexities of the input : process : outcome relationships through simplification of variables and the use of multivariate analysis. However, this has resulted in inconsistent findings and led to the identification of a need for more direct studies to illuminate and explain the team processes (Pettigrew, 1992; Lawrence, 1991). The relatively few direct studies have been primarily qualitative. Whilst claiming to have identified specific top team factors and issues it could be argued that many of these are not unique to top teams. The major differences which appear to be emerging relate to: i) a greater strategic focus for decisions and actions; ii) greater levels of complexity to be managed; and iii) a less supportive context within which to operate.

5.4 Board Teams and Processes

Whilst the preceding section provided a review of the emerging research into top teams it is evident that the teams studied were not always the boards of the companies in the research programmes. Indeed the definitional debate surrounding top team research (Pettigrew, 1992) and its attempted resolution leads to the conclusion that few of the studies would have been exclusively focused on boards.

However, Lorsch (1989) highlighted the need to study boards as a team as decision-making complexity increases. Dulewicz (1995(b)) in following up on this comment pointed to the broader absence of studies designed to examine board level competences, qualities and processes.

Within the UK a major study of boards was established in 1992 with the aim of extending to board directors the work previously carried out on managerial standards. The results of this study which covered more than 1000 directors were published by the Institute of Directors (1995). The Standards are concerned with three separate, but related aspects of board and individual performance: i) Personal Competences and Knowledge; ii) Organising and Running the Board; and iii) Tasks of the Board and Indicators of Good Practice. Dulewicz, MacMillan and Herbert (1995) carried out further work on the results of the study and proposed a model of the processes of the board which was derived from this research. This model is shown in figure 5.1 below:



The model reflects the central importance of Organising and Running the Board (ORB). However, it should be recognised that, whatever combination of structure, procedure and process is employed, its summation will be critical for the effectiveness with which it integrates the accomplishment of Board tasks with the roles of different Directors (eg, Chairman, Non-Executive Director) and with the personal competences, knowledge, skills and experience of individual Directors. There are important linkages between this specification of how the Board (and especially the Chairman) conducts its business and the adjacent parts of the overall model of Boardroom performance. These linkages are shown in figure 5.1 above.

It can be seen that items 1 to 4 in 'Organising and Running the Board' are essentially concerned with matters of structure and procedure. Nevertheless they possess important connections with both the personal competences and task models, viz:

- i) **Defining and communicating the powers, responsibility, etc. of the Board:** definition of the tasks of the Board including matters of reserved powers and delegation to senior management;
- ii) **Devising Board composition and organisation:** determining Board and committees membership, and individuals' roles and responsibilities by reference to their personal competences and other qualities;
- iii) **Selecting, appointing, developing, or removing Board members:** assessment, selection and appraisal by reference to generic competences specifications for (four) different roles;

- iv) **Planning and managing conduct of Board business:** the co-ordinating qualities required of the Chairman and his working relationship with the Company Secretary and his/her competences, knowledge and experience;
- v) **Developing and improving Board/group effectiveness:** unequivocally concerned with the interaction of individual Directors and their functioning as a group or team with responsibility for the various tasks of the board.

It is interesting to note that this last item deals specifically with the issue of **process** and thus responds to comments on the limitations of such top team research made by Pettigrew (1992). The research findings, especially the views received from directors of high performing companies, indicated the need for the Standards to address, *inter alia*, the processes by which the Board functions as a group, or team, of individuals. A small number of Directors interviewed in the Standards Study were aware of, or had had first hand experience of group process matters, and firmly believed that it was a critical determinant of success. Based on discussions with them, and with experts, the Standards Study identified a number of dimensions of group process which were believed to be relevant to effective Board team performance. These fell under four main headings:

- i) **Predispositions of the Board:** This relatively wide ranging term covers the extent to which:
 - a) individuals are willing to avoid or confront risk, admit to their mistakes, confront bad news, and deal with and respond to change;
 - b) individuals are committed to the vision, mission, values and ethical standards agreed by the board;
 - c) individuals are willing to set demanding targets; and
 - d) the board debates successes or failures and strategic long-term issues, and emphasises past or future business performance.
- ii) **Climate of Board:** Climate covers factors such as the degree to which:
 - a) openness, candour, co-operation and creativity are encouraged or discouraged;
 - b) a formal and positive atmosphere prevails;
 - c) humour and enjoyment are legitimate;
 - d) board performance varies according to circumstances; and
 - e) the board knows how and to what extent it adds value.
- iii) **Relationship Between Board members:** These dimensions are related to the extent to which:
 - a) the board is a cohesive 'team'; and relationships are harmonious, competitive (or complementary) and characterised by trust and loyalty;
 - b) social contacts are encouraged; and
 - c) contributions to meetings are dominated by a few overpowering members, or by non-executive directors and where listening is more apparent than real.
- iv) **Quality of Decision-making:** Relevant issues in this area are the degree to which:
 - a) a lack of preparation and poor time management are apparent;
 - b) dialogue and communications are clear or not;
 - c) debate between members is flexible or rigid, superficial or trivial, and is conducted in an autocratic and directive fashion;
 - d) decisions are made generally on hard (financial) data, and are taken by consensus, or by voting, which conceals significant differences in individual commitment; and
 - e) the Chairman's style is unduly forceful,

discourages initiatives from colleagues and shows complacency with the current membership (ie. is loath to bring in experts or new blood).

This study produced a useful insight into the board processes set within an input : process : outcome model. Furthermore it led to the development of a questionnaire to examine board processes. A study to examine this questionnaire identified a number of distinct process factors (through factor analysis) with good Cronbach Alphas. Furthermore, the study demonstrated clear linkages between process factors and measures of outcome (Higgs & Dulewicz, 1997(b)).

It is noticeable in reviewing the board process items within the questionnaire that many of them overlap with process factors described in chapter three above. As with the research into top teams described in 5.3 above it does appear that the differences between board teams and other managerial teams relate to context and the content of their activities rather than to other input and process factors.

5.5 Summary

This chapter has set out to examine the need for and development of specifically focused research to examine top teams. The paucity of such research has been highlighted by a number of authors (eg, Lorsch, 1989; Dulewicz, 1995(b)). However, within the chapter the emergence of a stream of top team research has been identified. Its methodological limitations have been discussed along with the findings of research designed to explore the process issues neglected by the demographically-based top team research. It appears from the research that the decision content demands and contextual settings are the predominant differences which arise in looking at top teams.

The complexity of studying teams is reinforced in this chapter along with the methodological issues and limitations associated with trying to understand complex interrelationships of a diverse range of variables. The next chapter explores the complexity issues in more detail and examines a stream of research which attempts to build an understanding of teams through the use of interaction process models.

Chapter 6. The Development of Interaction Process Models

"In philosophy, we must distrust the things we understand too easily as well as the things we don't understand."

Voltaire: Lettres Philosophiques (1734)

Throughout the preceding chapters issues surrounding the complexity of research into teams and teamworking and the concomitant limitations of simplified research designs have been consistently emphasised. In the preceding chapter the use of multivariate analysis in order to study top teams was discussed briefly. Whilst multivariate analyses are helpful in illuminating complex relationships, much of the top team research has been limited by adherence to Hambrick and Mason's (1984) demographic approach to these studies. By accepting demographic data as surrogates for team processes, much of the research has been limited and indeed produced inconsistent evidence (Pettigrew, 1992).

This chapter sets out to explore alternative approaches to dealing with the complexities of teamworking through the use of interaction process models. Whilst making use of multivariate analysis this interaction process stream of research explores a broader range of variables than those employed in the demography-based research. Furthermore, the research designs more frequently entail gathering of direct data from the teams, thus addressing "the fundamental concern" over the demography-based research (Pettigrew, 1992).

6.1 Introduction

Dealing with research into any area of organisation behaviour inevitably involves the consideration of a large range of complex phenomena and interrelationships. Schein (1985) summarised this challenge effectively in his observation:

"We cannot understand the psychological dynamics if we only look at the individual's motivations, or only to organisational conditions and practices. The two interact in a complex fashion requiring us to develop theories and research approaches which can deal with systems and interdependent phenomena."

Hackman (1990) further reinforces this point in his observation on a review of the research into teams and groups:

"Influences on group effectiveness do not come in separate, easily distinguishable packages ... To try to sort out the effects of each possible determinant of team effectiveness can lead to the conclusion that no single factor has a very powerful effect - a conclusion reached by more than one reviewer of the group performance literature."

This observation could certainly be applied to much of the evidence presented in the preceding chapters. The diverse range of factors and evidence (often contradictory) can be difficult to make sense of. The need for a theoretical model or framework within which to consider, examine and further test relationships is important (Cooper, 1975). To an extent this has been

attempted by reviewing the literature within the framework of the Hackman and Morris Group Interaction Model (Hackman & Morris, 1975). Developing an understanding of the relationships between input, process and outcome in a team context is particularly challenging given the range of variables and complexities of defining and studying processes (Abell, 1976; Larson & La Fasto, 1989; Barrett-Lennard, 1975). Indeed, Barrett-Lennard (1975) put forward the view that process is emergent, with multiple levels of complexity, and it grows from the nature of the leader and members of the team and their behaviours (both individually and in combination). Barrett-Lennard (*ibid*) states that:

“Simple linear models of cause and effect seem not to be plausibly applicable to the process itself and, still less to its effects.”

Within the field of group research and, to a considerable extent team research, this simplification has abounded. In addition there has tended to be an over-reliance on experimental research combined with associated dangers of over-generalisation (Golembiewski & McConkie, 1975; Hackman, 1990; West & Slater, 1995). The conclusions reached by McGrath and Altman (1966) following their review of the somewhat vast group literature (they identified in excess of 2,700 references) were that:

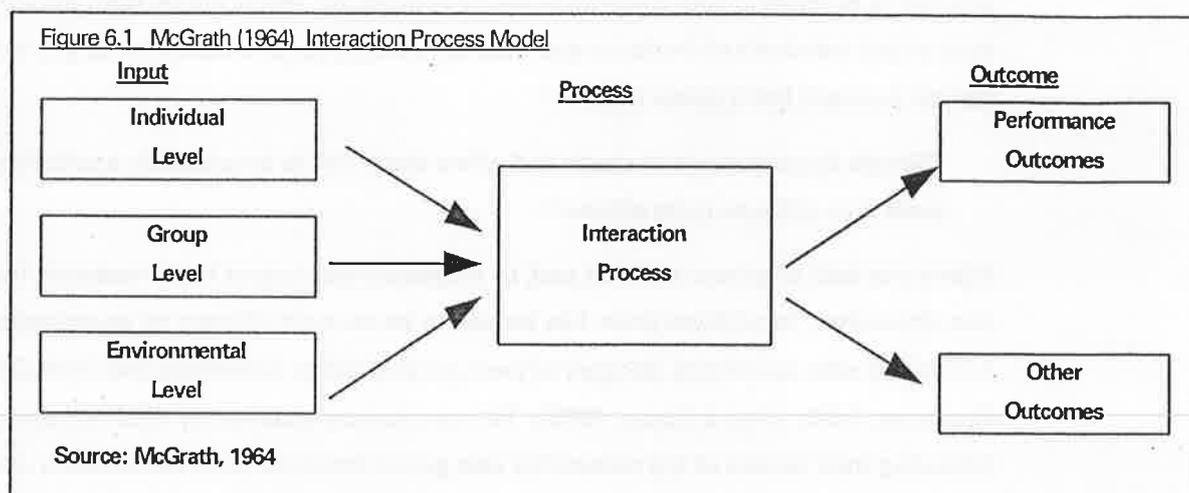
“There have been thousands of studies of group performance over several decades, but we still know little about why some groups are more effective than others.”

It could be said that the same observation may be applied to team effectiveness and performance today. However, there is an emerging stream of research (closely linked methodologically to the demography-based research) which is beginning to provide a means of dealing with the complexity of teams and their interactions and to shed light on previous studies and relationships reported in the literature. This research may be broadly labelled as Interaction Process Model research and appears to have its antecedents in the theoretical model proposed by McGrath (1964) and subsequently explored by Hackman and Morris (1975). The following sections explore this research stream, the major findings and implications for future team research.

6.2 The Hackman-Morris Group Interaction Process Model

Group research has shown that, for many tasks, the pooled output of individuals is better than the output produced by interacting groups (eg, Collins & Guetzkow, 1964; Davis, 1969; Lorge et al, 1958; McGrath & Altman, 1966; Shaw, 1971; Steiner, 1972). However, research has also shown that people working in groups can be harnessed to achieve more effective performance (eg, Hall, 1971; McGrath & Altman, 1966; Shaw, 1971; Mayo, 1933). Hackman and Morris (1975) suggested that the interaction process is the key to realising the benefits of group working and the associated challenge is to identify, measure and change those elements of this group interaction process which contribute to differential effectiveness. They suggested that the difficulties in understanding relationships between interaction and effectiveness were partially due to the research methodologies and conceptual tools. In support of this assertion they

pointed out that research into group effectiveness rarely included explicit quantitative assessment of how group interaction impacts on group performance (Hackman & Morris, 1975). In seeking to build a conceptual framework for exploring the interaction process, Hackman and Morris began with an examination of the model proposed by McGrath (1964). This model is shown in figure 6.1.



The fundamental assumption underlying the McGrath paradigm is that input factors affect performance outcomes through the interaction process (McGrath, 1964). For example, if highly cohesive groups (input factor) perform more effectively than low cohesion groups it should be possible to explain the performance difference by examining the interaction processes of the two groups. The "reason" for obtained input:outcome relationships is always available in the interaction process itself (McGrath, 1964).

Hackman and Morris (1975) set out to explore McGrath's model through a combination of a review of available research findings and specific research which they conducted. In examining the model they considered the Input:Process, Process:Performance and Input:Process:Performance relationships. In relation to the **Input:Process** relationships they identified a significant range of evidence that the nature and direction of group interaction processes are affected by numerous input factors (eg, Sample & Wilson, 1965; Conway, 1967; O'Dell, 1968; Cohen et al, 1961; Hall & Williams, 1966; Deutch, 1985; 1951; Hare, 1952). The input factors identified were: leader attitudes, member personalities, group size, group structure, group history and the nature of the task.

In examining the **Process:Performance** relationships Hackman and Morris (1975) commented on the relative paucity of research directly relating measured characteristics of group process to performance outcomes. However, such studies as did exist generally demonstrated that interaction measures are a better predictor of successful outcome than other measures (eg, Lanzetta & Roby, 1960).

Hackman and Morris attempted to explicitly assess the full **Input:Process:Outcome** relationship by means of experimentally designed research (Hackman & Morris, 1975). The research entailed

working with 108 experimental groups engaged in four fifteen minute "intellective" tasks. In addition they obtained data on further production, discussion and problem-solving tasks. The groups were observed and transcriptions produced which were analysed to identify the interaction categories. Using canonical correlation they found evidence that variation in performance was impacted by the nature of the group interaction process. However, analysis of the weights produced and subsequent multiple correlations failed to provide a clear picture or shed any substantive light on the full **Input:Process:Performance** relationships. Two other studies examined at this time had equally failed to shed light on the full **Input:Process:Outcome** relationships. Sorensen (1971) had found significant input:performance, input:process and process to performance relationships. Katzell et al, 1970, had found process to performance relationships, but no evidence of moderation effects of input conditions.

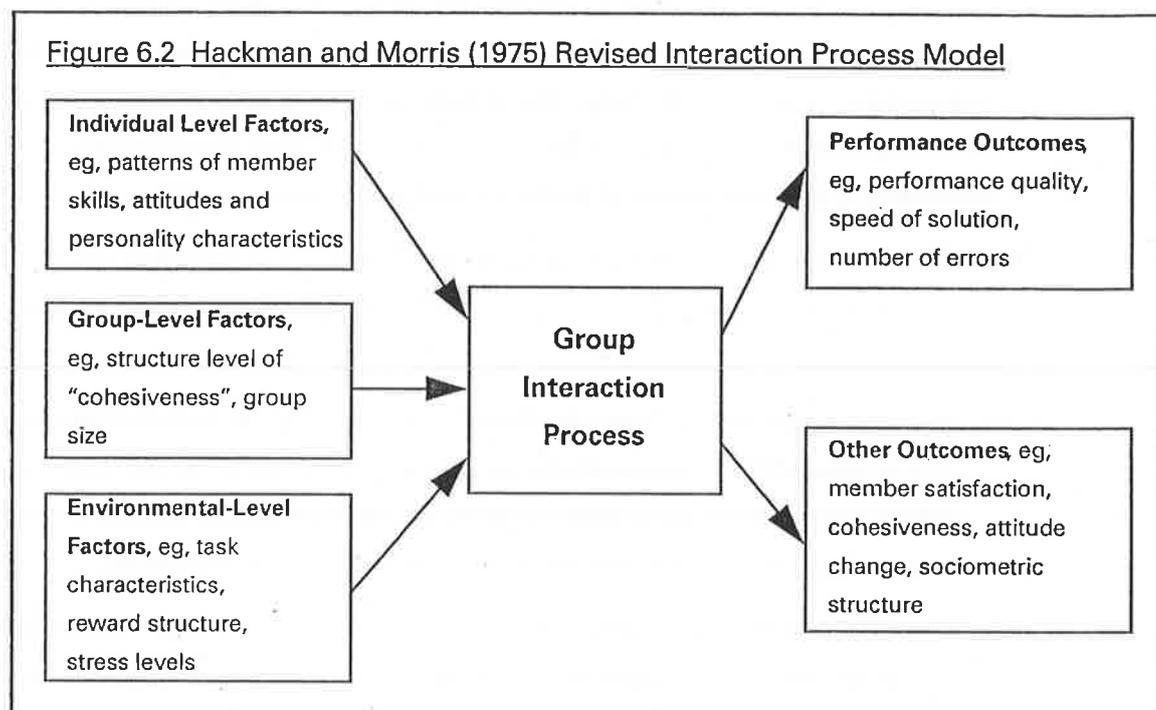
In reviewing the research findings Hackman and Morris (1975) identified five core reasons which they believed underpinned the problems in exploring and analysing the mediating functions of group processes. They were:

- i) **Behaviour categories:** They identified that studies often sampled a limited range of interactions with a common tendency to use communication as the basis for categorisation. Whilst this would be acceptable for exploring input:process relationships it would not be helpful in developing explanations of how process acts as a mediator;
- ii) **Analytic models:** Most interaction coding systems yield summary scores which may be inappropriate for the exploration of complex tasks;
- iii) **Inconsistencies across tasks:** McGrath and Altman (1966) from their literature review identified that the process:performance relationships are likely to vary across differing task types. Thus Hackman and Morris (1975) concluded that a general theory of process mediation may be inappropriate and future research should be task specific;
- iv) **Research settings:** The use of laboratory-based experimental designs with "ad hoc" groups does not allow time for groups to develop and real group formation to occur (Hackman, 1976; McGrath & Altman, 1966). Therefore, Hackman and Morris (1975) proposed that future research should employ designs that allow interpersonal processes to vary more widely than in "traditional" laboratory designs;
- v) **Cultural norms:** Closely linked to the above point is the need for groups to have time to work together in order that the effects of group norms can emerge and be considered in the research.

In their overall conclusions Hackman and Morris (1975) comment that the emergence of a general theory of small group effectiveness may be difficult to develop. They suggest that:

"It may be necessary to settle for a number of smaller theories due to the overall complexity of factors."

In terms of future research design this comment aligns with the suggestion of Katzell et al (1970) that, as the number of variables are so large, a strategy should be employed which enables study of a few at a time. This may either be achieved through examination of parts of a larger model or through grouping variables into a smaller number of "summary variables". The final contribution, from this initial work, of Hackman and Morris (1975) is to propose a revised Interaction Process Model which is shown in figure 6.2 below.



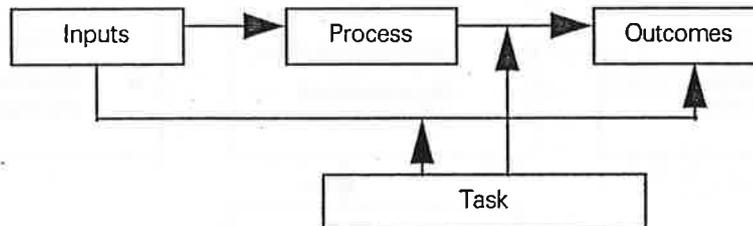
6.3 Developments in Interaction Process Research

There have been a significant number of studies which have followed the Interaction Process model paradigm initially proposed by McGrath (1964) and explored and further developed by Hackman and Morris (1975). Whilst it is not practical to produce a description of all of these studies it is helpful to examine historical progress in thinking by highlighting a number of the more significant studies. In reviewing the development of research designs and results it is interesting to note the impact on design and focus of the studies of the demographically based research stream stimulated by Hambrick and Mason (1984).

Gladstein (1984) conducted a study amongst 100 sales teams in the communication industry. He took the basic Hackman and Morris (1975) model as the basis for the research design, but proposed that task should be included as a moderator variable. The overall model examined by Gladstein (1984) is summarised in figure 6.3. The dimensions used by Gladstein in exploring task as a moderator were: i) complexity; ii) interdependence; and iii) environmental uncertainty. The research design employed differed from that of Hackman and Morris (1975) in that it was field research with the use of control groups. Given the complexity of relationships being modelled the analysis of the overall model was conducted using LISREL (even though the sample was at the lower end of the size range normally considered appropriate (Hair et al,

1995)). The results provided no evidence for task as a mediator in the overall relationships (although Gladstein (1984) observed that there may have been insufficient variation in task variables to enable the moderator relationships to emerge). Overall, Gladstein found little evidence to support the theoretical propositions underpinning the research.

Figure 6.3: Group Interaction Model



Source: Gladstein, 1984

Greenbaum et al (1988) proposed a systems model for examination of group behaviour which is shown in figure 6.4 below. This model bears a significant degree of similarity to the underlying constructs in the Hackman and Morris (1975) model, although it includes a feedback element which is not covered in that model. The model was examined using 16 published evaluations of Quality Control programmes which explored the group effectiveness components of quality performance. Greenbaum et al (1988) were not using the research to test the model specifically, but rather as a framework for examining the extent to which published research produced results linked to the constructs contained within the model. The results of the analysis of the research are summarised in figure 6.5. Greenbaum et al (1988) commented that none of the studies in the review had evaluated the full model (in terms of examining all categories).

Rogers et al (1995) conducted a study in a restaurant chain designed to specifically examine the Greenbaum et al model. The design involved a field study using self-evaluation questionnaires. Due to limitations in the sample size the model could not be confirmed by means of path analysis. However, correlational analysis only confirmed the process:outcome relationships.

Pinto et al (1993) conducted a study of cross-functional project teams in a UK NHS environment. The model which Pinto set out to examine is summarised in figure 6.6 below. In this study Pinto et al (1993) had taken account of a suggestion of Katzell et al (1970) and reduced the number of variables. Interaction Process was condensed to a single variable of Cross-functional co-operation. A questionnaire approach to the research was employed with a usable sample of 62 teams (mean size 4.11; SD: 1.11). Results were analysed using multivariate techniques. The model from the results produced from path analysis and hierarchical regression is shown in figure 6.7. The results from this study emphasised that super-ordinate goals lead to cross-functional co-operation leading to positive psychosocial outcomes. Thus the study indicated a degree of evidence in support of the overall **Input:Process:Outcome** relationship.

Figure 6.4 Greenbaum et al (1988) Group Interaction Process Model

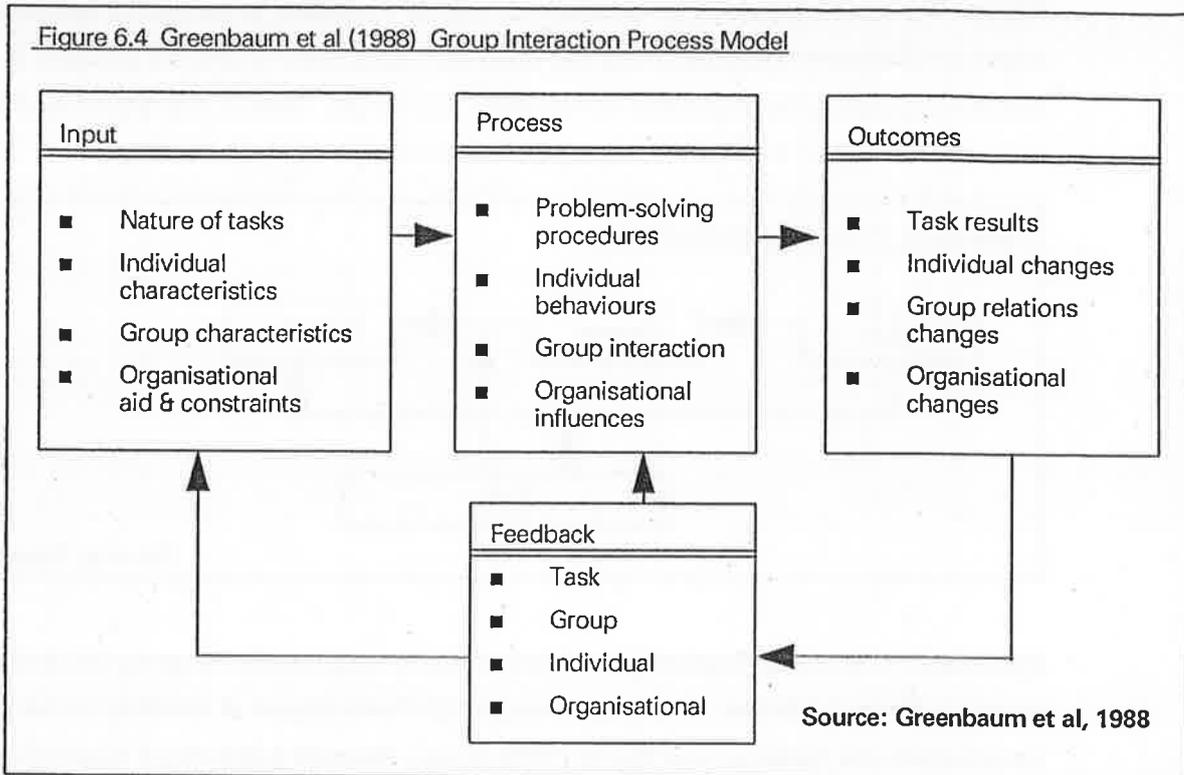


Figure 6.5: Results from 16 Organisations using Greenbaum et al (1988) Framework

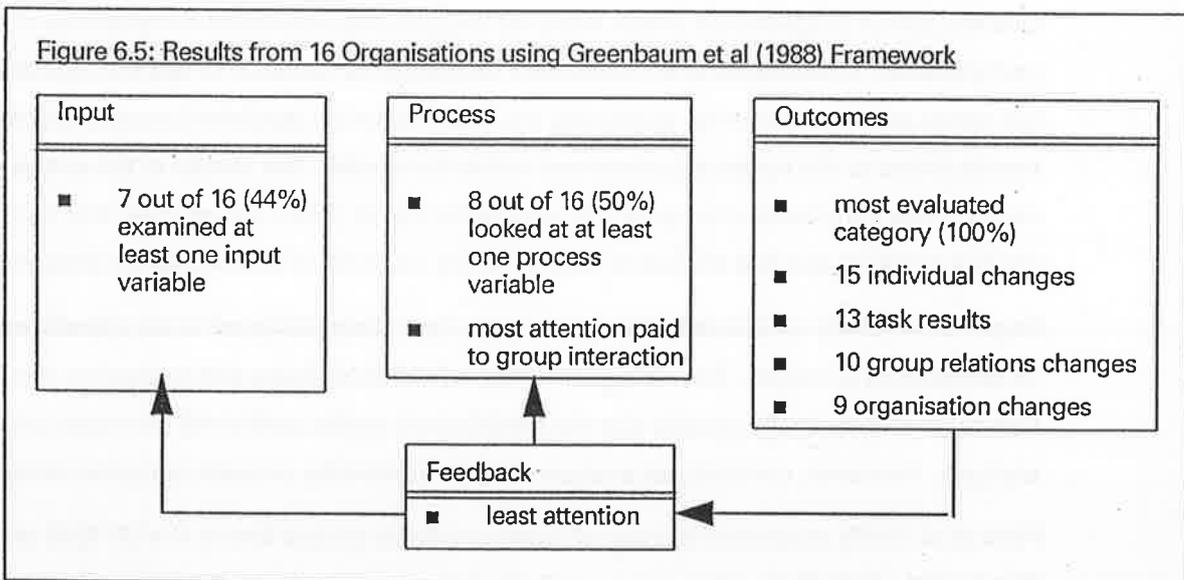
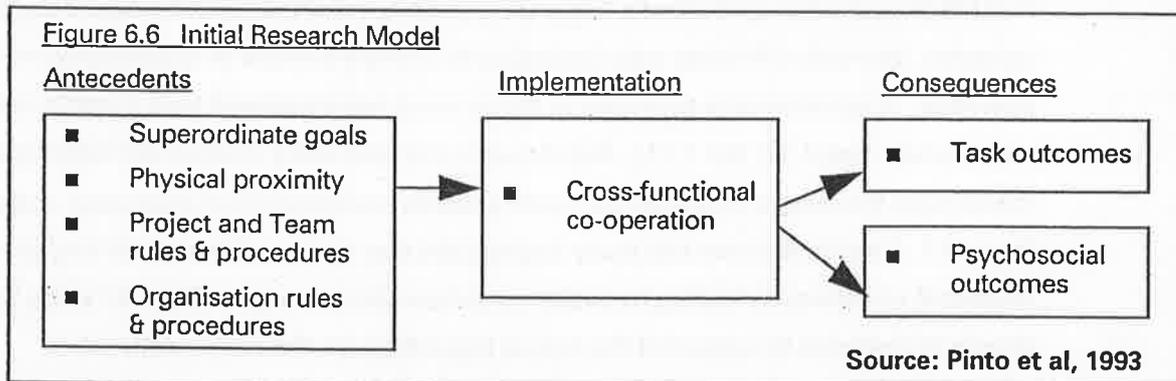
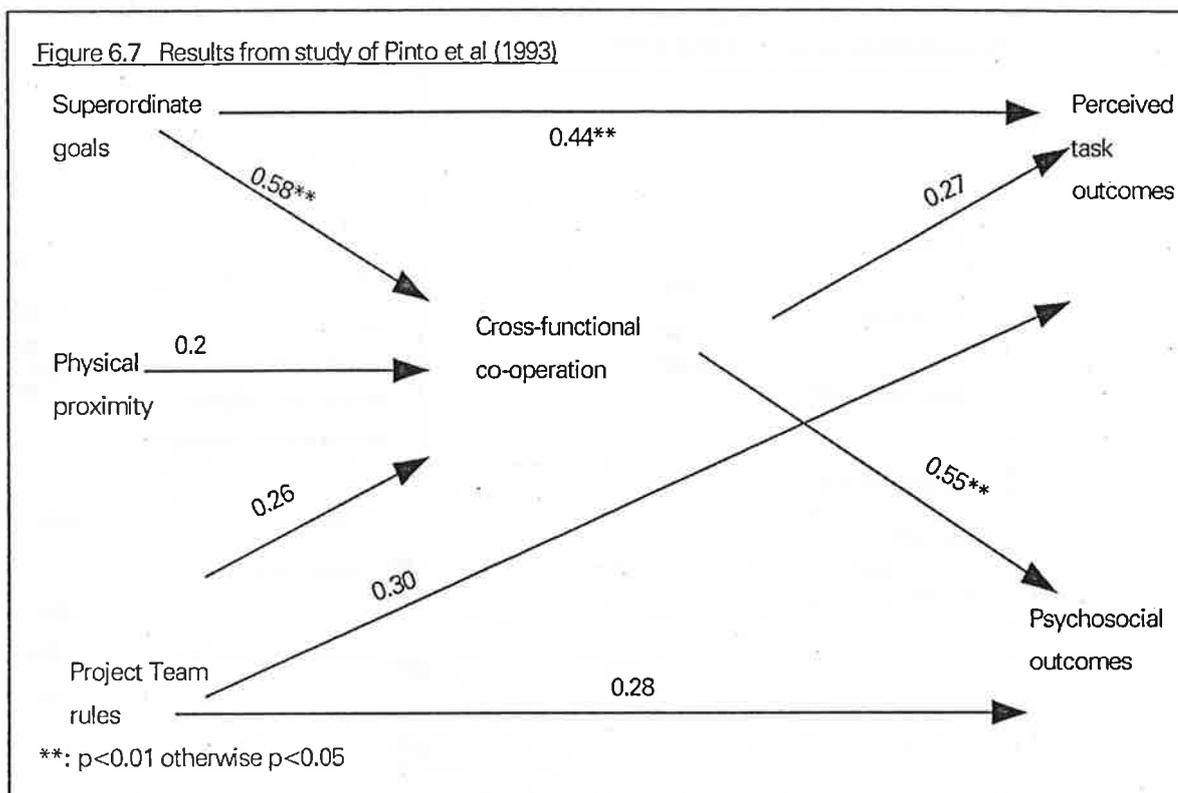


Figure 6.6 Initial Research Model



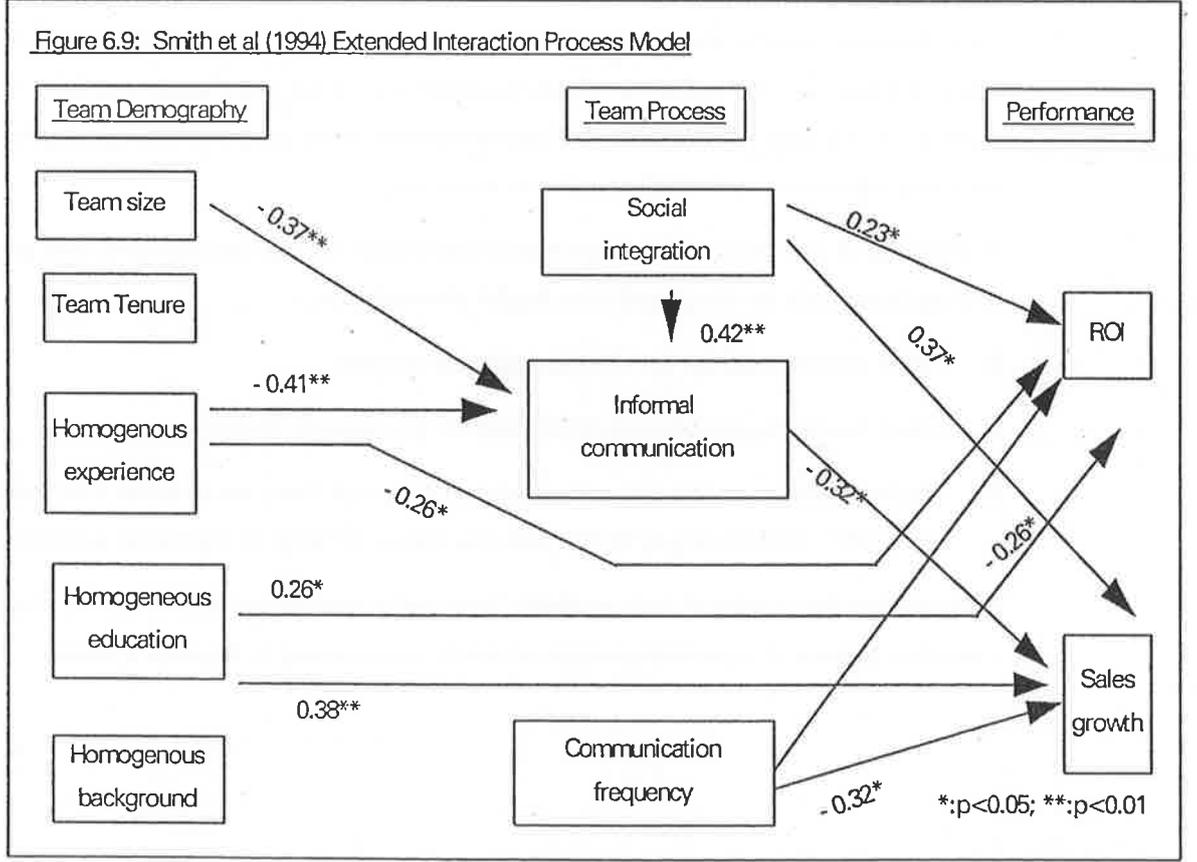
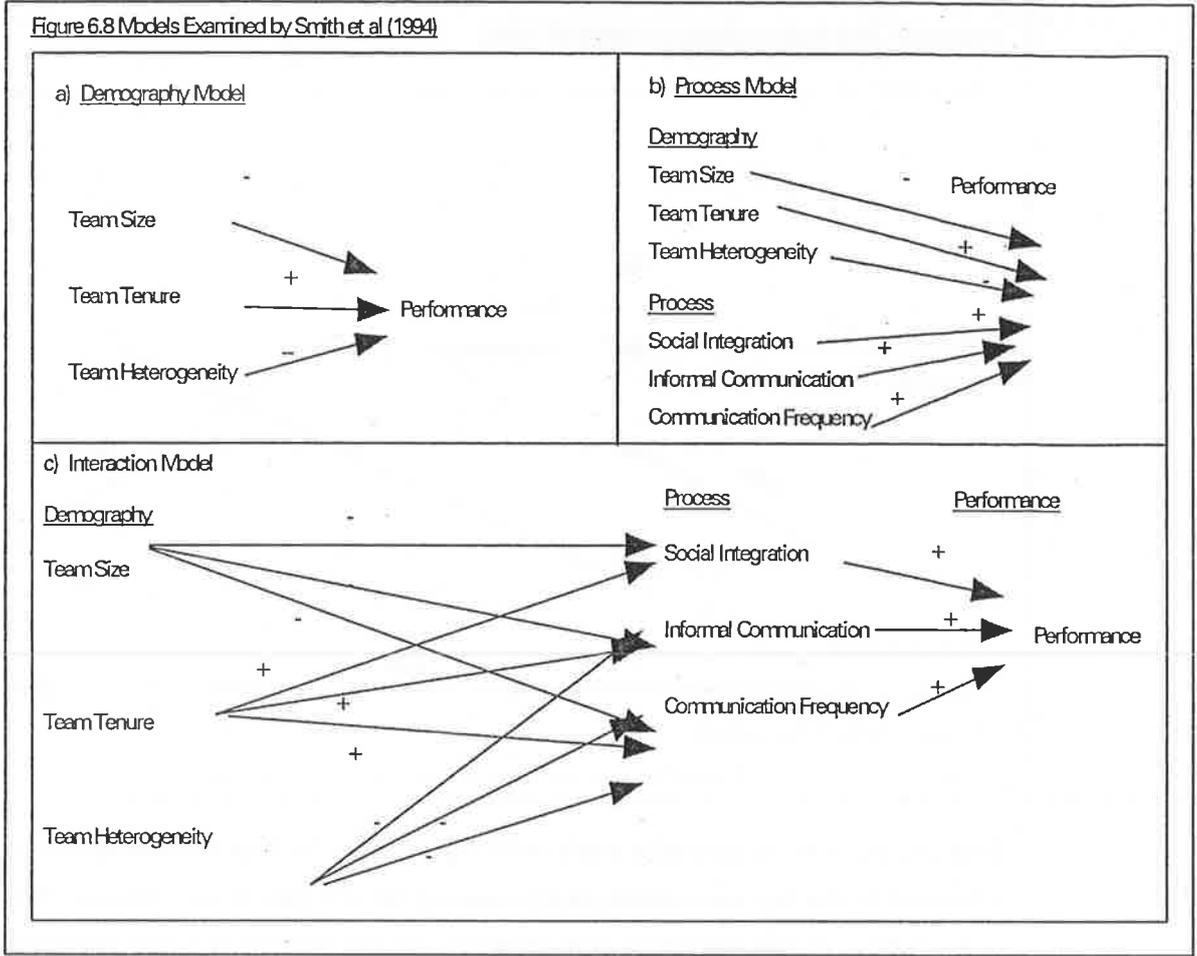


Smith et al (1994) conducted a study of 53 top teams in the high technology sector. Whilst informed by the top team demography research stream (Hambrick & Mason, 1984) the study used questionnaires to explore both demography and process and thus addressed a number of the concerns raised by Pettigrew (1992). The research was designed to examine the three hypothesised models which were developed from a literature review and are summarised in figure 6.8 below. The outcome measures employed were gross sales and ROI. The 53 teams covered 230 usable participants and questionnaires were supported by qualitative research entailing interviews with CEOs and team members.

The results of the study, using hierarchical regression for the demography and process models and path analysis for the interaction model showed that:

- i) There was no support for the demography model;
- ii) There was a degree of support formed for the process model;
- iii) The interaction model was not supported although there were some intervening effects identified. This finding is in line with the earlier findings of Hackman and Morris (1975).

In reviewing the empirical data available from the research Smith et al (1994) identified a complex pattern of interrelationships which is summarised in figure 6.9 below.

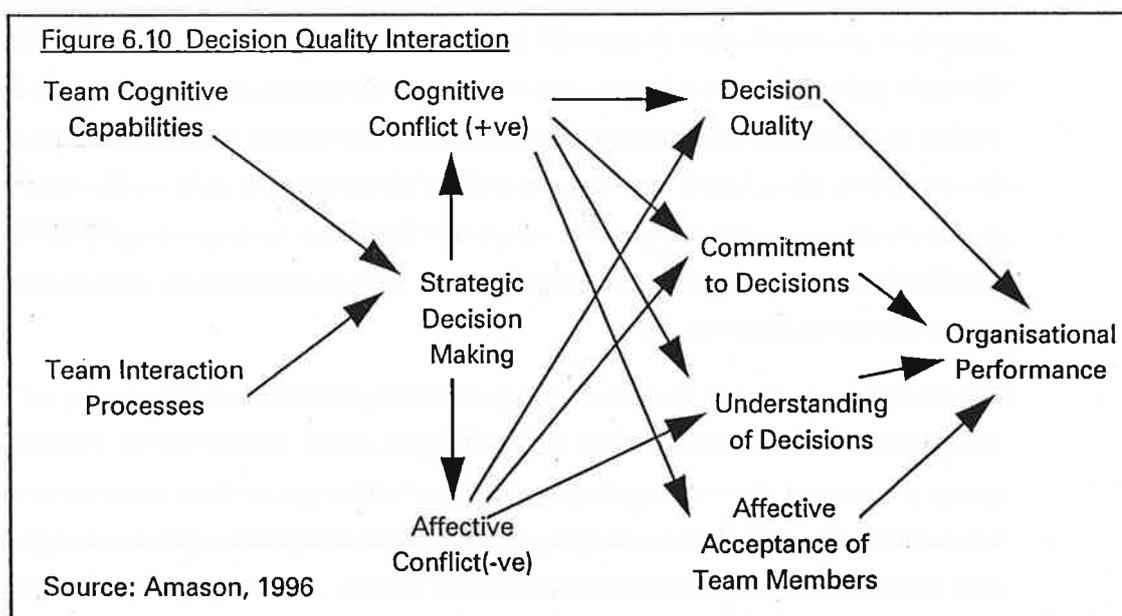


In reviewing the results Smith et al (1994) concluded that:

- i) there was little support for the arguments underlining the demography model;
- ii) partial support is provided for the intervening model;
- iii) team process has a direct impact on performance;
- iv) team demography has both direct and indirect impacts on performance.

Overall, the design of this study and results provide an interesting and useful illustration of the combination of demography and interaction process models and research design. However, the results of the study, whilst providing a degree of illumination of team interactions and processes are by no means conclusive.

Amason (1996) conducted a study to examine the quality of top management team decisions and their influence on organisational performance. Within this framework it was proposed that interaction processes within the team were important influences on decision quality. The interaction processes were examined through a small number of variables concerned with conflict within the team. The overall model examined by Amason (1996) is shown in figure 6.10.



Amason studied top management teams in two industry sectors using a sample of 48 teams and using questionnaire-based research. The main study was followed by a smaller study of five teams using a reduced questionnaire. The data was analysed using correlations and multiple regressions. The findings demonstrated that:

- i) cognitive conflict improves decision quality;
- ii) quality of decisions is improved through multiple perspectives; and
- iii) affective conflict reduces decision quality.

The study does provide partial support for interaction process constructs. However, the methodology does provide more rigorous support for findings in experimental small group research (Amason, 1996).

Prussia and Kinicki (1996) conducted a study with 81 groups to test a model with three group level mediators (group affective evaluations, group goals and collective efficacy). This was an experimental design using student samples. The aim was to find specific evidence of process as a mediator variable. Prussia and Kinicki (1996) pointed out that whilst process as a mediator variable had been proposed and widely supported (Hambrick & Mason, 1975) little research evidence had been provided to support this proposition. The Prussia and Kinicki study employed covariance structural analysis to test a range of alternative models. The results provided partial support for the input:process:outcome group effectiveness framework proposed by Hackman and Morris (1975). However, no support was found for the mediating role of group goals. They did, however, identify that their omission of group member ability as an input variable had been significant as the literature indicates this to be a predictor of group effectiveness.

In a specific study relating to innovation in top management teams West and Anderson (1996) undertook an examination of some 27 hospital management teams. The study employed the McGrath (1964) interaction framework and used questionnaires and established innovation measures to explore innovation within the teams. The results demonstrated partial support for the mediating role of team processes as well as demonstrating both input:outcome and process:outcome relationships. The results led West and Anderson to speculate that the contributions of input and group process factors may be differentially potent at different stages of the innovation process.

Overall, the research into models of group and team interaction processes by no means produce conclusive results although it does provide at least partial support for the mediating impact of group processes. The methodologies employed whilst not, to date, confirming the group interaction process model do certainly provide more illumination of team and group dynamics than the previous more simplistic correlational studies. Furthermore, by focussing on the examination of process these studies offset the limitations of the top team demography-based studies (Pettigrew, 1992).

6.4 Summary

Throughout the preceding chapters the importance of considering the complexities in understanding teamworking has been highlighted, and the limitations of failing to take this into account in research designs have been discussed. Whilst the top team demography-based research provides one means of attempting to manage complexity, the limitations of this framework in providing insights and illumination of team processes have been examined (Pettigrew, 1992).

In this chapter the development of an interaction process model as a means of engendering enhanced understanding of team performance has been discussed. From a review of a sample of the research in this field it is evident that the full input:process:outcome relationships has enjoyed, at best, partial support. However, it is equally evident that the research designs and methodologies associated with this stream of research result in greater illumination of the dynamics of team performance than earlier and more simplistic frameworks.

In the next chapter the lessons from the literature will be reviewed, some broad conclusions drawn and a number of hypotheses formulated which form the basis of the current research study.

Chapter 7. Development of Research Hypotheses

"The meaning of a proposition is the method of its verification."

Moritz Schlick; *Philosophical Review*, 1936

In the preceding chapters the evidence and issues surrounding teamworking which are presented in the literature have been reviewed and discussed. This chapter sets out to identify the conclusions which may be drawn from this review, the needs for further research identified in the literature and an overall picture of the inter-relationships which appear to be involved in the attempted explication of the antecedents of effective team performance. From this summation process the core hypotheses examined in the current research study are presented and discussed.

7.1 Introduction

The foregoing review of the research and literature on teams and teamworking set out to explore the extent to which Katzenbach and Smith's assertions that:

- i) "It is obvious that teams outperform individuals"; and
- ii) "Team is a word and concept well known to everyone"

are borne out by the available evidence. Furthermore, the review examined the extent to which current evidence addresses the overall managerial problem and research questions which were:

- i) Overall problem: "What factors should be focused on to enhance the performance of management teams?"
- ii) Research questions:
 - a) Is there a relationship between input, process and performance which can contribute to an understanding of the effectiveness of management teams?
 - b) How may this relationship be modelled? and
 - c) Which functions in an overall process have the greatest impact on the performance of management teams?

Before attempting to pull together the specific evidence from the literature which may be relevant to these questions it is important to reinforce the issue of definition of performance. The need to consider performance in terms of both "soft" and "hard" outcomes is emphasised in the literature (eg, Hackman, 1990; Eccles, 1991). Thus it may be more appropriate to substitute the word outcomes for performance in the phrasing of the core research questions.

From the previous chapters it is evident that the topic of teamworking is extremely broad and the subject of a vast amount of literature. Teamworking appears to be ascribed greater importance and prominence as organisations reach for new strategies to cope with change, build competitive advantage and find new ways of working in an increasingly volatile business

environment. However, much of the literature is in the realm of practitioner and popular writing and the nature and extent of academic research is somewhat limited. In order to examine the validity of a number of assertions about the effectiveness of teams and teamworking it has been necessary to revisit the extensive literature describing the results of studies of group behaviour and related group research.

What, hopefully, has been shown in the literature review is that the nature and value of teamworking is a complex area of study and that conclusions will depend on a range of considerations, including team type, appropriateness of a team-based approach to working, organisational context and environment, team design and process factors.

In examining the drivers of team outcomes it is evident that there is a range of input factors to be considered. These are concerned with how teams are structured, skill and personality mixes, individual characteristics, competences and the environment within which they operate. In addition to input factors, a second range of process factors needs to be examined. It is these factors which are concerned with the way in which the team operates in practice and which are the subject of much of the literature on team building and development processes.

It is, hopefully, evident from the review that there is no simple relationship between any single factor and effective team outcomes. Indeed, the difficulty of defining and measuring objectively team performance in itself makes it extremely difficult to establish causal relationships or isolate specific factors. The diverse range of factors have been examined within a structured framework proposed by Hackman and Morris (1975) and initially used for describing Group Interaction Processes.

From the review it appears that a number of factors are more likely to be dominant in explaining variation in team performance. These factors relate to: i) the nature and mix of individuals comprising the team (eg, Belbin et al, 1976; Belbin, 1981; Margerison & McCann, 1985; 1989; Schroeder, 1989; Blake et al, 1987; Larson & La Fasto, 1989); and ii) the processes employed within the team to convert these inputs to productive outputs (eg, McGrath, 1964; 1984; Hackman & Morris, 1975; Smith et al, 1994; Larson & La Fasto, 1989).

The available literature often tends to be fairly general and much of the case study and anecdotal evidence relating to team performance relates to non-managerial teams. Yet some of the most extensive academic work on teams (Belbin et al, 1976; 1981; Margerison & McCann, 1985) relates to managerial teams. It appears that it is, perhaps, important that this work is developed further and explored in more detail in a structured and rigorous manner within organisational settings.

Overall, from the review of the available literature, it would appear that Katzenbach and Smith's assertions are not borne out by the available evidence and the core managerial problem and research questions remain largely unanswered. However, it is evident that teams and building effective teamworking are important "real world" issues which warrant further research and

study in order to build and disseminate greater depth of understanding of the elements and facts which need to be managed to enhance organisational performance.

7.2 Summary of Literature Review and Research Evidence

In reviewing the literature and research evidence in relation to teams and teamworking the sheer range and diversity of variables impacting on team outcomes is notable (Hackman, 1990; West & Slater, 1995; Furnham, 1992). The overall potential complexities of the interrelationships between the variables described in the literature is summarised in figure 7.1 which uses the Hackman and Morris (1975) Group Interaction Process framework to provide the organising architecture for the synopsis. From this summary it is immediately evident that a number of variables encountered in the literature have been the subject of overlapping classification (ie, as input, process and outcome variables). For example, cohesion is described as a key variable in all three categories (eg, Hackman & Morris, 1975; McGrath & Altman, 1966; Seashore, 1954; Guzzo & Shea, 1992). In part, this particular variable is subject to different views pertaining to the nature and direction of causal relationships. Overall, the latest evidence (eg, Katzenbach & Smith, 1993) tends to position cohesion more clearly as an outcome factor. The above focus on cohesion is illustrative of the complexity and contradictions within the literature in relation to the interrelationships between variables in studying teams in terms of both power and causal direction. It is apparent that the complex interrelationships summarised within figure 7.1 would not form the basis for a feasible research study; any attempt to study the whole gamut of variables and relationships would be unfocused and unwieldy (Furnham, 1992).

Within the literature there is a growing amount of interest in both the impact on team outcomes of individual characteristics (and combinations of these) (eg, Furnham et al, 1993; Berry, 1995; Senior, 1996; Finn, 1993) and understanding how processes act as mediator variables (eg, Pettigrew, 1992; West & Anderson, 1996). With this focus in mind it is feasible to generate from the literature a more parsimonious model of interrelationships which, additionally, indicates predominantly reported causal directions. Such a model is presented in figure 7.2 below.

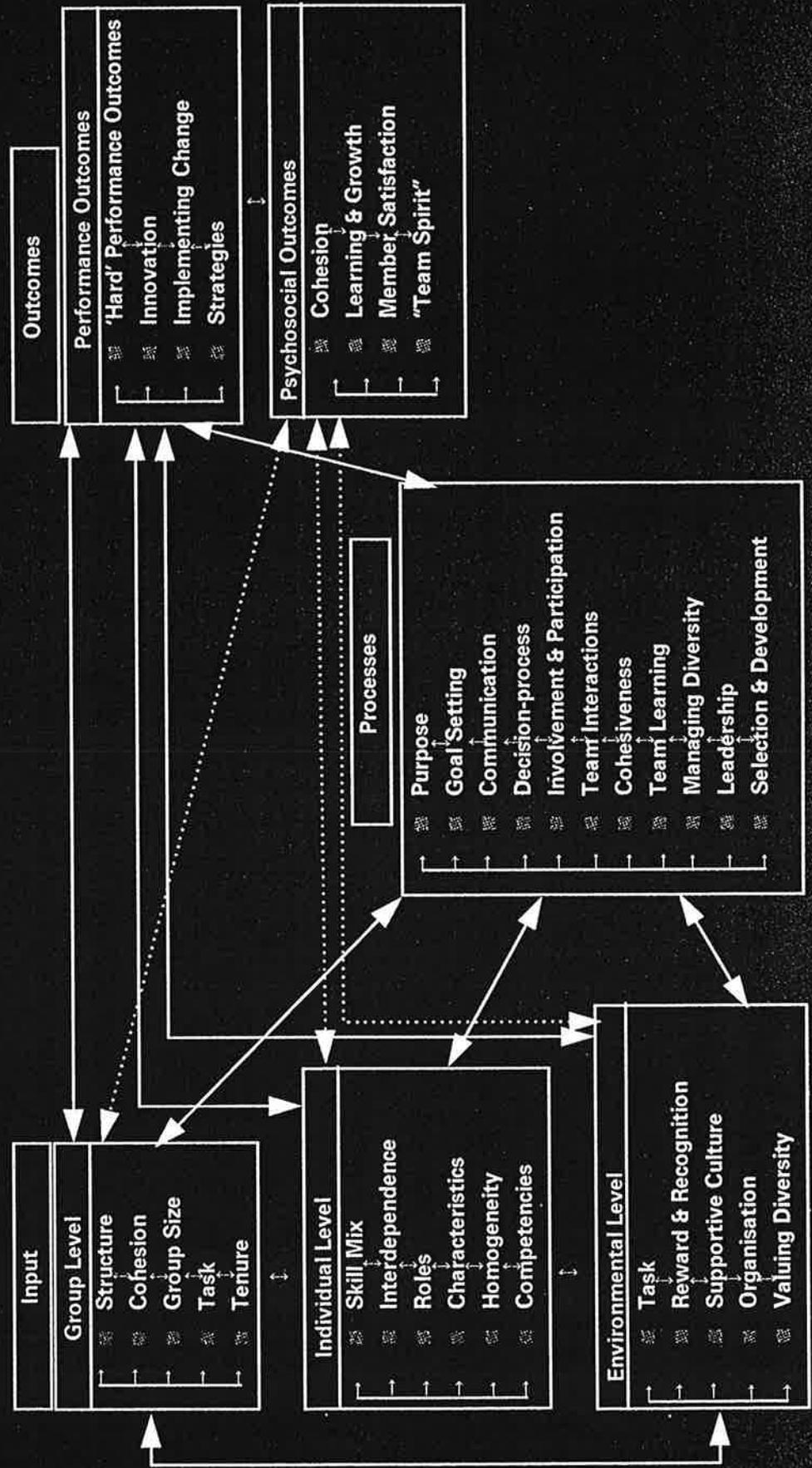
Even this reduced model represents too large a range of variables and relationships to be rigorously and manageably addressed in a single research project. It is, therefore, necessary to examine a part of this overall model. The selection of a reduced model for research purposes has been informed by both the identified needs for further research which emerge from the literature and the key research hypotheses which relate to the managerial problem and research questions. These two areas are examined in more detail in the following sections.

7.3 The Need for Further Research

There is little doubt that teamworking is high on the agenda for many organisations and yet there is limited sound research on which they can confidently base decisions and actions. As Tjosvold (1991) points out:

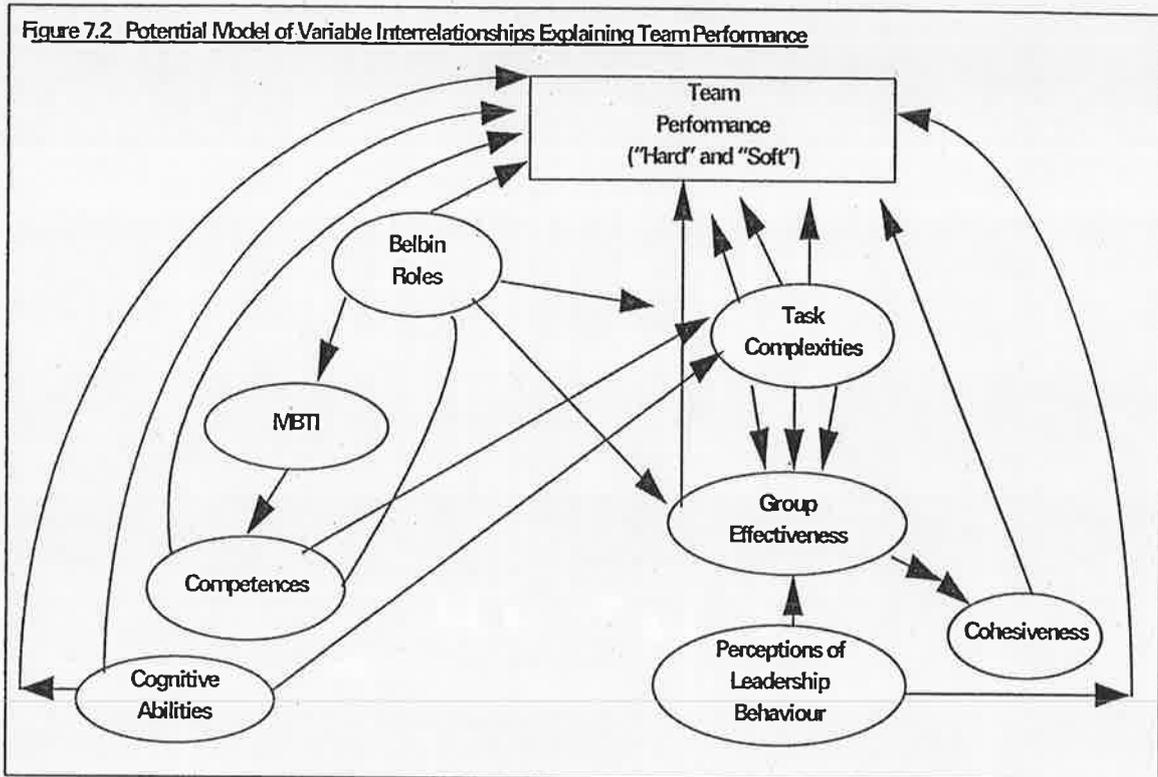
“... discussing relationships and teamwork can seem abstract and elusive”.

Figure 7.1 Overall Summary of Variable Interrelationships Indicated from Literature Review



"Original in colour"

Figure 7.2 Potential Model of Variable Interrelationships Explaining Team Performance



He goes on to point out that current research has failed to provide any clear “map” for organisations to follow in building effective team performance. In building a better understanding the current literature identifies a number of areas for further research and study. These may be summarised as follows:

Evidence for the Effectiveness of Teams

In a review of the evidence to sustain the hypothesis that teamworking leads to improved performance West and Slater (1995) comment that:

“Assumptions about the value of teams are plausible, but the research evidence shows this value is difficult to demonstrate”.

Perhaps the root of this problem is the difficulty of measuring team performance. Margerison and McCann (1985) highlight the problems relating to the lack of clarity in defining robust and objective team performance measures. Belbin (1993) also emphasises the performance measurement issue pointing to the need for further research into team roles and performance. The need to develop clear criteria based on an in-depth understanding of what constitutes effective team performance is identified as an area for further research by Dainty and Kakabadse (1992).

Furnham et al (1993) also highlight the need for empirical research on team performance and comment that:

“The difficulty in measuring salient, ecologically valid and reliable team dependant outcome variables have led to a paucity of (academic) studies attempting to systematically test team role theories in the context of real teams in organisations.”

Others have made similar points to Furnham et al (1993). Bushe (1986) highlights the lack of empirical data on teamworking in an organisational context. The need for measurement of teams in real as opposed to experimental settings is identified as an important area for further research by Senior (1996). West and Slater (1995) highlight the need for organisationally-based team research and point out that:

“Team performance and related factors are not adequately described by practitioners.”

Fisher et al (1994), having claimed to have produced validation of the Belbin Team Role model in an organisational context, point to the general dearth of organisationally-based team studies. Over-reliance on anecdotal evidence and the associated need for robust, organisationally-rooted research is a theme highlighted by many commentators (eg, Banker et al, 1996; Dulewicz, 1995(a); Larson & La Fasto, 1989; Maxon, 1986; Handy, 1985).

In a recent survey of teamwork practices in 100 UK organisations there was a consistent view expressed that, whilst the majority of participants believed that there were benefits to be obtained from teamworking they found difficulty in building teams and realising the potential benefits (Employment and Development Bulletin, 1995). In the conclusions from this survey the need for more research to both substantiate the benefits and illuminate the means of capturing these benefits was highlighted.

Whilst much of the evidence for overall performance benefits is based on case studies and anecdotes, at the more detailed level (particularly in relation to the elements of process) a considerable amount of the evidence is based on experiments and simulations (Nutt, 1990). There is seen to be a research need to study teams in action to offset the ‘laboratory’ bias in this aspect of teamworking (Nutt, 1990; Golambiewski & McConkie, 1975; Stott & Walker, 1995; McClure & Werther, 1993; Hackman, 1990). Stott and Walker (1995) capture the main thrust of the arguments in this area with their comment that:

“.....much of the research into teams and participative decision-making has been experimental and conducted with heterogeneous groups working under laboratory conditions”

Individual Characteristics and Team Roles

Whilst there is a significant body of literature relating to the impact of individual team member personality traits and characteristics on team processes and performance, the results are often contradictory or inconclusive (eg, Maxon, 1986; Hambrick, 1995; Golambiewski & McConkie, 1975). The general need for further research in this area is summarised by Furnham (1992):

“There is a surprising paucity of psychological and sociological studies that focus on individual differences in relation to teams, or role preferences in teams. This is reflected in the fact that so few measures exist to determine team-role behaviour. Very few tests attempt to ascertain how people characteristically behave in teams.”

It may well be that the absence of such research highlighted by Furnham accounts for the predominance of the Belbin Team Role model (Belbin et al, 1976; Belbin, 1981) and the Margerison and McCann Team Management Index (Margerison & McCann, 1985; 1989) in both practitioner and research literature. Of these two models the volume of research on the Team Management Index is far more limited (Berry, 1995; Higgs, 1996(b)). The research into the Belbin Team Role model is often somewhat confused with debates around the Self-Perception Inventory (BTRSPI) and its validity being interwoven with debates around the construct validity of the model (eg, Furnham et al, 1993; Belbin, 1993; Dulewicz, 1995(a)). In addition the stream of research associated with the BTRs is often insufficiently focused on managerial teams and thus moves away from the original Belbin context (Higgs, 1996(a)).

The means of operationalising Belbin's construct of a balanced team has been relatively rarely studied (Fisher et al, 1994; Berry, 1995; Senior, 1993; 1997). Berry (1995) produced an index calculation to measure BTR balance and found evidence that lack of balance was associated with inferior team outcomes. However, he did not produce compelling evidence to support the concept that good BTR balance produced superior team outcomes and highlighted the need for further research to explore this index further.

Whilst team roles and personality traits represent a relatively common way of trying to understand individual level input factors there is an emerging theoretical view that team competences (i.e. the balance of competences within a team) may be a fruitful way of examining individual differences in a team context. However, the need to explore this hypothesis through structured research has been highlighted in the literature (Finn, 1993; Schroeder, 1989; Kakabadse, 1991; Dulewicz, 1995(a)).

Process Factors

A considerable emphasis within the literature is placed on team processes and development. However, this appears to be an area within which more practically oriented research is required (eg, Hackman & Morris, 1975; Hackman, 1990; Hirschorn, 1991). Hirschorn (1991) comments both on this need and the over-reliance on the examination of the impact of individual characteristics:

"There is a great deal of emphasis on designing structure and developing teams through characteristic-based exercises. However, little appears to be written on the processes and day to day behaviour changes associated with these exercises."

Hambrick (1995) presents a similar view on the need for further research into team processes, commenting that:

"There has been a lot of research into teams, but it has not addressed the fundamental issues relating to what needs to be known about (top) teams and what are the critical problems for these teams."

This general need for developing a clearer understanding of the nature of team process variables and how they both impact on outcomes and moderate input:outcome relationships is

a recurring theme in the literature (eg, Guzzo & Shea, 1992; Larson & La Fasto, 1989; Berkowicz, 1978; Rogers et al, 1995; O'Leary et al, 1994). The research need has been highlighted as a major gap in the top team stream of demography-based research (Pettigrew, 1992; Lawrence, 1991; Eisenhardt, 1989).

Managerial Teams

Much of the literature on teamworking relating to effective performance and the development of an understanding of dynamics of teams has been rooted in non-managerial teams (Cook, 1993). In addition a high proportion of the research has been of an experimental nature within laboratory settings (Hackman, 1990; Stott & Walker, 1995; Nutt, 1990; Kakabadse, 1991). Belbin's original work (Belbin et al, 1976; Belbin, 1981) focused on managerial teams. However, this work fell clearly into the experimental design category and stimulated the identification of a need for more organisationally-based research which examines managerial teams in an organisational setting (eg, Dulewicz, 1995(a); Furnham et al, 1993; Senior, 1997; McClure & Werther, 1993; West & Slater, 1995; West, 1994). Cook (1993) summarises this need in the comment:

"There has been a great deal of material produced on team working and team development; little has covered the range and complexity of issues which are apparent in senior managerial teams."

The stream of top team research inspired by the "Upper Echelon" theory (Hambrick & Mason, 1984) has begun to bring more research into managerial teams to the notice of researchers. However, a key problem highlighted by researchers into top teams and senior managerial teams is that of gaining access to such teams for research purposes (Eisenhardt, 1989; Pettigrew, 1992; McClure & Werther, 1993; Higgs & Dulewicz, 1997(b)). The limitations of the demography-based approach to top team research (Pettigrew, 1992; Lawrence, 1991) have reinforced the need for further organisationally-based studies with active participation of senior managerial team members.

Process Models

Attempts to gain insights into the dynamics of complex variable interactions within teams have been made through the use of interaction process models (eg, Hackman & Morris, 1975; Greenbaum et al, 1988; West & Anderson, 1996). However, the results of this approach to research design have been somewhat mixed and, on occasions, contradictory (Hackman & Morris, 1975; Pettigrew, 1992). Rogers et al (1995) concluded, from their study of self-managed teams, that there is a need for more research into the nature of input:process:outcome paths and causal relationships in team settings. This reinforces the conclusions drawn by Greenbaum et al (1988) from their review of 16 published studies examining teams in a quality circle setting. The challenge, facing research using interaction process models, is seen as being one of designing the research to encompass a sufficient number of meaningful and measurable variables to enable the model to throw light on the input:process:outcome relationships in a

way which is generalisable and practically useful for both managerial application and conducting further research studies (Pettigrew, 1992; Cook, 1993; Rogers et al, 1995).

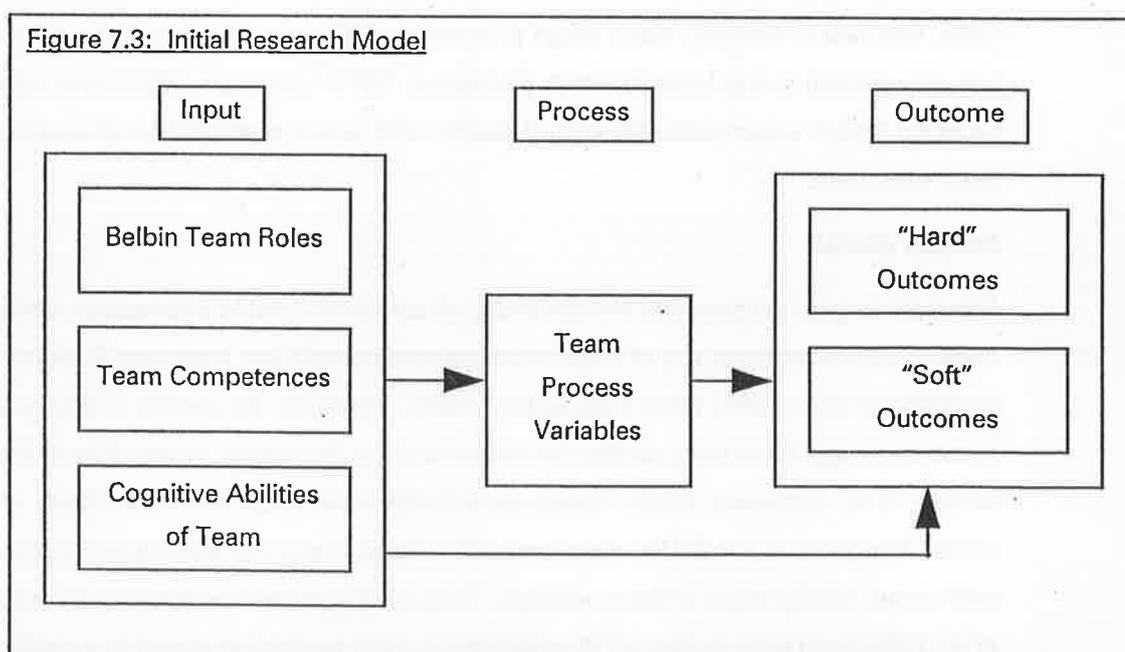
Summary of Further Research Needs

In reviewing the above summary of needs for further research identified in the literature it would appear that there is an important requirement in relation to intact managerial teams (particularly senior management teams). In addition there is a need for research in this context which sheds light on the relationships between input, process and outcome variables and identifies the extent to which process variables are moderators in the input:outcome relationships. Within the literature it is evident that there is a further need to understand the impact of individual level input factors (ie, characteristics) on both processes and team outcomes.

The hypotheses for the current research study have been developed with these research needs in mind, and from the review of the literature presented in chapters two to six. These hypotheses are outlined in the following section.

7.4 Hypotheses

The literature reviewed, and associated needs for research (summarised above), indicate that a research design which explores the individual level characteristics of managerial team members, the core team processes and the individual relationships of these (both singly and in conjunction) to team outcomes would contribute to a better understanding of teamworking. In the summary of the literature review (7.2 above) somewhat complex models of team interaction processes were presented. Given the opening observation in this section it would appear that a simplified model appropriate for research in this study is that shown in figure 7.3.



It is recognised that this more parsimonious model omits many variables, however, research design considerations preclude examining a more extensive model (Hair et al, 1995; Hurst et al 1989). The examination of elements of an overall larger model in considering group interaction

processes was a recommendation for advancing the understanding of complex dynamics by Hackman & Morris (1975) and has been commonly employed by many researchers applying the interaction process model framework to teams (eg, Greenbaum et al, 1988; Rogers et al, 1995; Eisenhardt, 1989; Pettigrew & Whipp, 1991).

The hypotheses examined within the current research study are described below. The descriptions are organised in the groupings commonly examined within interaction process framework studies (ie, input:outcome; input:process; process:outcome and input:process:outcome).

H.1 Input:Outcome

There is significant level of evidence that managerial teams with a "balanced" mix of Belbin Team Roles outperform "unbalanced" teams (eg, Belbin et al, 1976; 1981; Fisher et al, 1994; Senior, 1997; Berry, 1995; Proctor, 1995; Life, 1996). Although issues arise in terms of measurement of performance (see chapter 3 above) there is evidence that "balanced" teams are superior to other teams in terms of both "hard" and "soft" outcome measures (Berry, 1995; Belbin, 1981; Senior, 1997). However, challenges to the construct validity of the BTR model have been significant (eg, Furnham, 1992; Furnham et al, 1993; West 1994). Most of these challenges have entailed studies using the BTRSPI. When the 16PF (or OPQ) basis for calculating BTRs has been used there has been relatively good support for the original Belbin Role constructs (Dulewicz, 1995(a)). Reflecting on this stream of literature relating to the BTRs leads to the first hypothesis within this group:

H.1.1 Management teams with an "optimum" balance of Belbin Team Roles will be rated as higher performing teams in terms of both "hard" and "soft" outcomes.

The literature on competences contains a number of propositions, derived from extrapolation of research studies, to the effect that teams which have a good balance of competences will both perform more effectively and be more satisfying for members to work in (eg, Schroder, 1989; Finn, 1993; Kakabadse, 1991). Whilst there appears to be no direct research evidence to support this proposition, work carried out by Dulewicz and Herbert (1992) and Dulewicz (1995(a)) has demonstrated clear relationships between competences and many of the BTRs. This would tend to lend weight to the "competency mix" proposition and leads to the second hypothesis in the input:outcome group:

H.1.2 Management teams with a "balanced" mix of competences will be rated as higher performing teams in terms of both "hard" and "soft" outcomes.

In examining the cognitive abilities of team members it is necessary to think in terms of both convergent and divergent mental abilities (Belbin et al, 1976; Belbin, 1981; Higgs & Dulewicz, 1997(a)). In examining convergent or analytical thinking abilities a number of researchers and authors have pointed to a clear link between this facility and "hard" outcomes in an organisational context (eg, Nutt, 1990; Margerison & McCann, 1985; 1989; Isabella & Waddock, 1994). However, in the original Henley research the "high intelligence" teams (Apollo Teams)

failed to outperform all other teams on a relatively "hard" outcome criterion (Belbin et al, 1976; Belbin, 1981). In contrast to Belbin's findings, in a team context, others have highlighted the impact of critical reasoning and analytical abilities on the "hard" outcomes of team performance (eg, Sternberg, 1988; Isabella & Waddock, 1994; Hambrick, 1995; Eisenhardt, 1989; Orpen, 1995; Senior, 1996).

Belbin used the Watson Glaser Critical Thinking Appraisal (CTA) as one element in determining the cognitive abilities of the team and as a major determinant of the Monitor Evaluator role. The Monitor Evaluator in a team is seen as being a potential source of conflict and dampening the team's enthusiasm. Thus it may be that whilst teams with highly developed convergent mental abilities may perform well in terms of "hard" outcomes the evidence for the "soft" outcomes is not so clear. Given that "intelligence" is often measured in terms of convergent mental abilities (Guildford, 1959) the evidence presented by Goleman (1996) that only 20 per cent of variance in outcomes (at an individual level) can be accounted for by IQ would potentially add weight to a view that convergent cognitive abilities may only impact on the "hard" outcomes. Thus the third hypothesis in this group is:

H.1.3 Management teams with a higher average level of Critical Reasoning Ability (using the CTA as a measure) will be rated as higher performing teams in terms of "hard" outcomes.

In a study of managerial teams, Anderson et al (1990) demonstrated relationships between a team's propensity to innovation (measured as an aggregate of individual propensity to innovate) and both goal and satisfaction outcomes for the team. A number of studies and authors have identified relationships between creative/innovative member predispositions and the creativity of team results (eg, West & Anderson, 1996; Pearson, 1987; O'Reilly & Platt, 1989; Agrell & Gustafson, 1989; Hambrick, 1995; Maier, 1970; Hunter et al, 1989). In examining top teams the creativity of solutions and member satisfaction have been linked (Hurst et al, 1989; Eisenhardt & Cohen, 1990; Nutt, 1990; Smith et al, 1994; Smith, 1995). From this stream of literature a fourth hypothesis in this group emerges:

H.1.4 Management teams with a higher average level of divergent thinking ability will be rated as higher performing teams in terms of both "hard" and "soft" outcomes.

H.2 Input:Process

The descriptions of the Belbin Team Roles all contain implications (both positive and negative) in terms of the way in which each role will impact on other members of the team and the way in which the team members interact (Belbin et al, 1976; Belbin, 1981). In developing the 'balance' concept Belbin (Ibid) discussed how differing roles can contribute to enhancing the interactions between members and the team processes overall. This view of the benefits of "balance" is reinforced by others who have proposed Team Role models (eg, Mumma, 1992; Tjosvold, 1984; 1991; Margerison & McCann, 1985; 1989). In studies using the BTR model the impact of relative "imbalances" in role mix on the efficiency of processes has been reinforced (eg, Fisher et al,

1994; Berry, 1995; Senior, 1996). Reviewing these findings leads to the first hypothesis in this group:

H.2.1 Management teams with an “optimum” balance of Belbin Team Roles will have higher ratings on team process factors than other teams.

In research on competences there is evidence that appropriate combinations relate to both “hard” and “soft” outcomes at the individual level (eg, Boyatzis, 1982; Spencer & Spencer, 1993; Saraweno, 1995; Dulewicz & Herbert, 1992; Cook, 1993). There are also assertions that when competences are considered at a team level the appropriate mix may well impact on efficacy of team processes (eg, Finn, 1993; Cook, 1993; Kakabadse, 1991). Given the apparent linkages of competences and Belbin Team Roles (Dulewicz, 1995(a)) combined with the above observations a second hypothesis in this group emerges:

H.2.2 Management teams with an “optimum” balance of competences will have higher ratings on team process factors than other teams.

The preceding comments on convergent thinking within a team indicate that high levels of critical thinking may lead to a predominance of Monitor Evaluator roles (in BTR terms). In examining the characteristics and behaviours associated with this role (Belbin et al, 1976; Belbin, 1981) it appears possible that high levels of Critical Reasoning Ability may be damaging to team interaction processes. Evidence to support this assertion is provided by Argyris (1990) who comments that:

“... personalities in a group affect the processes within that group.”

Following this line a number of authors highlight the impact of critical evaluation, pointing out that, members of a group with highly developed critical reasoning skills, can impair interaction processes within the group (eg, Barrett-Lennard, 1975; Williams & Sternberg, 1988; Larson & La Fasto, 1989; Pearson, 1987). Following this line of argument leads to the third hypothesis in this group:

H.2.3 Management teams with higher than average levels of critical reasoning ability (measured using the CTA) will have lower ratings on team process factors than other teams.

In examining team processes Agrell and Gustafuson (1989) highlighted that the level of creativity within a team impacted on team processes. A study to examine product development in the high-technology sector provided evidence that levels of innovation within a team is as important to team processes as the ultimate outcomes (Meyer, 1994). In broader terms a number of researchers have shown that personal attributes (including cognitive style and focus) within a team have an impact on the interaction processes within the team (eg, Pearson, 1987; Maxon, 1986; Argyris, 1990; McClure & Werther, 1993; Nutt, 1990; Dulewicz et al, 1995). Furthermore, a number of authors have provided evidence (or hypothesised from existing data) to indicate that divergent or innovative thinking enhances team interaction processes (eg, Streufert & Swazey,

1986; Margerison & McCann, 1985; 1989; Likert, 1961; Larson & La Fasto, 1989; Pearson, 1987). These illustrations and propositions lead to the fourth hypothesis in this group:

H.2.4 Management teams with higher average levels of divergent thinking ability will have higher ratings than other teams on team process factors.

H.3 Process:Outcome

Within the literature on teams there is a significant level of both hypotheses and research evidence which indicate that there are clear relationships between the interaction processes and the results of the team (in terms of outcomes) as well as enduring satisfaction of team members and their willingness to learn and develop (eg, Hackman, 1990; Tjosvold, 1984; 1991; Blake et al, 1987; Adair, 1986; Guzzo & Shea, 1992; Mullen & Cooper, 1994). In the literature which explores interaction process models there is further supporting evidence for the relationships between team process functions and both "hard" and "soft" outcomes (eg, Greenbaum et al, 1988; West & Anderson, 1996; Hackman & Morris, 1975; Eisenhardt, 1989; Wickens, 1995; Higgs & Rowland, 1992; Smith et al, 1994; Pettigrew, 1992). This stream of research evidence leads to the hypothesis that:

H.3.1 Management teams with higher ratings on team process factors will be rated as higher performing teams in terms of both "hard" and "soft" outcomes.

H.4 Input:Process:Outcome

The literature and research which both follows the Hackman & Morris (1975) interaction process stream and the Hambrick and Mason (1984) demography-based "upper echelons" stream is designed to explore the mediating impact of group or team processes on the input:outcome and process:outcome relationships. Within both streams of research the findings have been less than conclusive.

In studying interaction processes Hackman and Morris (1975) found, from both a review of published research and their own direct studies, that evidence for the mediating role of process was somewhat weak. This has also been a finding common amongst many of the top team demography studies (eg, Eisenhardt, 1989; Eisenhardt & Schoonoven, 1990; Hurst et al, 1989; Gladstein, 1988; Pinto et al 1993). However, a number of studies have, without providing definitive evidence, at least provided a degree of support for the mediating role of process (eg, Porras & Berg, 1978; Rogers et al, 1995; Smith et al, 1994; Larson & La Fasto, 1989; Eisenhardt, 1989).

The drive to identify the mediating impact of process has, in part been a result of the inability of one stage input:outcome and process:outcome models to explain sufficient performance variance (eg, McGrath, 1964; Hackman & Morris, 1975; West & Anderson, 1996; Larson & La Fasto, 1989). From these points two hypotheses emerge which are:

H.4.1 A model which accounts for interactions between input and process factors will account for more variation than a main-effects model;

and

H.4.2 A model which accounts for interactions between input and process factors will provide evidence to show that team processes act as a mediator variable between input and outcome variables.

7.5 Summary

This chapter has attempted to pull together the diverse strands in the literature on teams and groups in order to provide a research model and set of hypotheses.

The literature leads to a complex and unmanageable potential model (see figures 7.1 and 7.2). In attempting to pull together the research a number of hypotheses have been formulated which lead to a more parsimonious and practically researchable model which is summarised in figure 7.4 below.

The directions and nature of the relationships between the variables which are implied in the research hypotheses H.1 to H.3 are summarised in figure 7.5.

The next chapter explores the research design which is required to examine this model and test the research hypotheses.

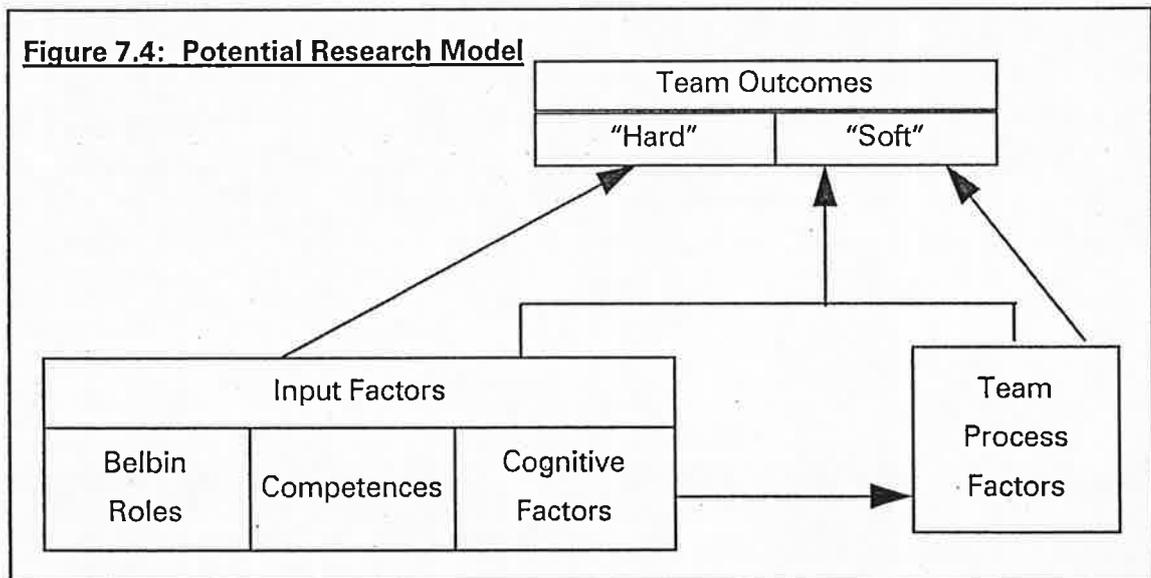
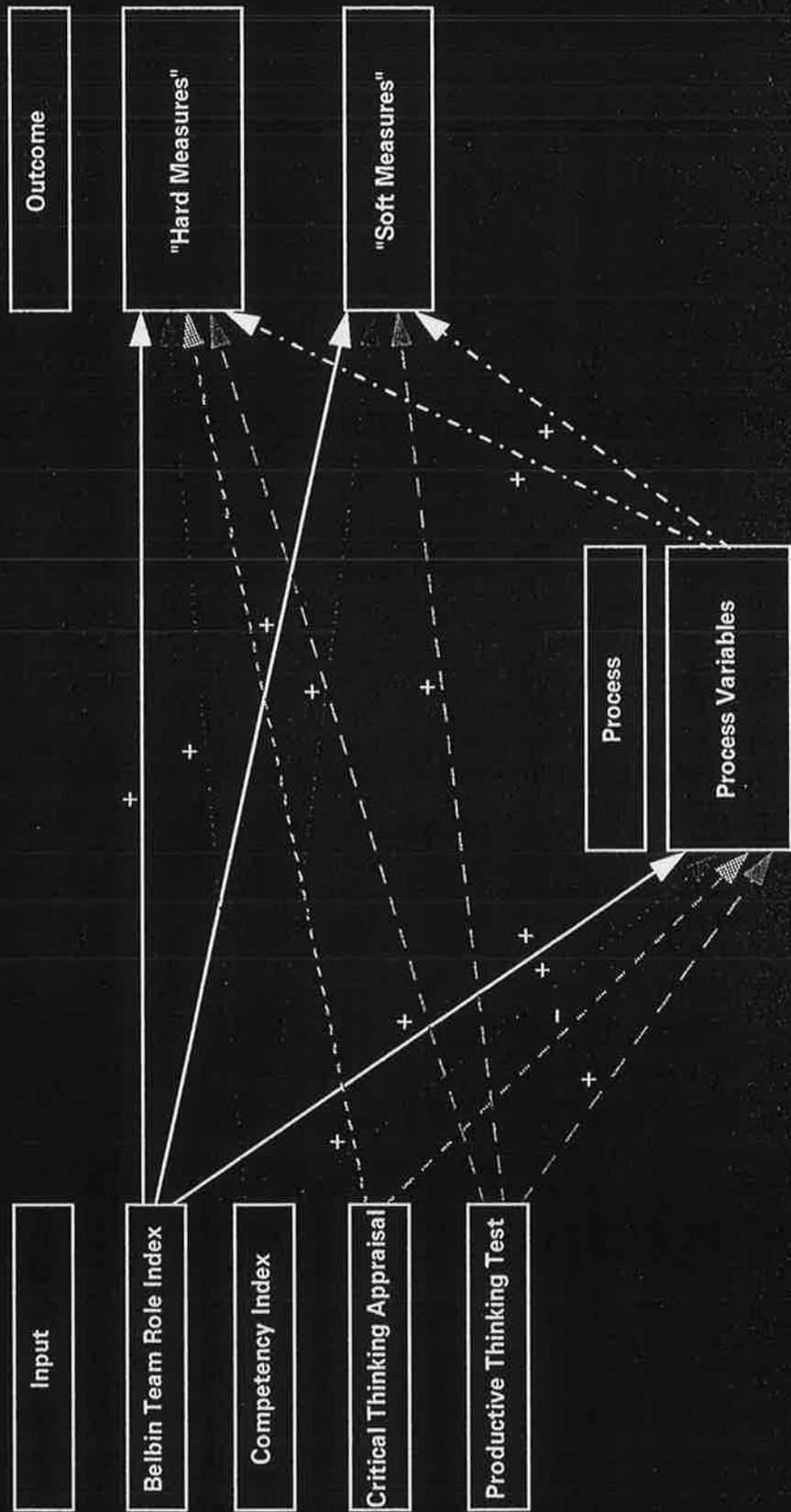


Figure 7.5: Map of Hypothesised Relationships between Variables



Chapter 8. Methodology and Research Design

"Axioms in philosophy are not axioms until they are proved on our pulses."

John Keats; Letter to J.H. Reynolds

In this chapter the approach to the design of the research to examine the hypotheses and the specific methodologies for data collection and analysis are reviewed. The chapter is organised as follows:

- 8.1 Overall philosophy and approach; a brief examination of the rationale for selection of the research methodology.
- 8.2 Research design issues; the key issues which need to be addressed in formulating the overall research design.
- 8.3 Design of the research and key research steps.
- 8.4 Operationalising the hypotheses; details of the research instruments and rationale for their selection.
- 8.5 Framework for analysis of the data.

8.1 Overall Philosophy and Approach

The range of hypotheses and nature of the proposed research outlined in the previous chapters tend to lend themselves to a positivist approach in terms of research methodology and design. It would be patently wrong to suggest that this is the only route which could have been employed to explore the overall research topic and questions. However, as Easterby-Smith, Thorpe and Lowe (1991) point out (referring to Morgan & Smircich, 1980):

"The appropriateness of a research approach derives from the nature of the phenomena to be explored."

They continue to suggest that:

"The extent to which the basic subject material is quantifiable exerts an influence on the methodology."

In addition as Wright and Fowler (1986) point out:

"Methodology decisions are, of necessity, influenced by the "tradition" in the field of study."

These considerations clearly point to the adoption of a positivist paradigm. In addition, particularly as a part-time DBA student, this methodological perspective had the advantage of being practical (in terms that information may be collected speedily and efficiently) and of producing a design which could be readily replicated and extended (Easterby-Smith, Thorpe & Lowe, 1991).

Having arrived at this overall decision it was equally important to be aware of the limitations of a positivist approach which, according to Easterby-Smith et al, include the following:

- i) relationships between variables may be established, but the causal direction of such relationships and their reasons for existence are not so readily or reliably uncovered; and
- ii) the overall contribution to knowledge may be relatively trivial.

However, in relation to the latter point it has been emphasised that doctoral research is something of a research "apprenticeship" and in learning to conduct research one should be thinking no more ambitiously than "placing a grain of sand on the mountain of knowledge" (Joynt, 1995).

In electing to follow a positivist research methodology it was important to be aware of the underlying implications and ensure that they were built into the design and that deviations from them were explicitly reviewed and taken into account in presenting and evaluating the findings. These implications are summarised by Easterby-Smith et al (1991) as being:

- i) the independence of the observer;
- ii) value free decisions; in that the choice of what to study and how it is studied is influenced only by objective criteria;
- iii) the research sets out to identify and explore causal explanations and fundamental laws;
- iv) by its nature the research should be hypothetico-deductive; that is hypotheses should be formulated and used to determine the kind of observations which will demonstrate their truth or falsity;
- v) constructs should be operationalised in order to measure facts quantitatively;
- vi) problems are effectively understood if they are reduced to the simplest possible elements (reductionism);
- vii) samples of sufficient size are used to enable results to be generalised; and
- viii) relationships are most easily identified by cross-sectional analysis (ie, comparing variations across samples).

Within this positivist framework a range of design options are possible. Wright and Fowler (1986) identify three broad research strategies, being:

- i) **Descriptive:** seeking to describe phenomena rather than explain relationships;
- ii) **Explanatory:** seeking to explain a phenomenon through data collection and analysis. This strategy commonly entails an experimental design; and
- iii) **Exploratory:** seeking to combine i) and ii) above, although not setting out to test **precise** predictions.

These strategies tend to be effected through either experimental or correlational research formats, with the latter being employed primarily for descriptive or exploratory strategies.

Wright and Fowler (1986) usefully point out that psychological studies involving personality factors commonly employ correlational formats, whereas studies relating to cognitive psychology more commonly use the experimental format.

In reviewing the literature on managerial teams there is a recurring theme relating to the need for organisationally-based evidence to illuminate the relationships between both team input and team process factors and team outcomes (eg, West & Slater, 1995; Furnham et al, 1993; Hackman, 1990; Senior, 1997; Furnham, 1992). The limitations of experimental studies in terms of the generalisability of the results in a managerial setting within an organisation is a major consideration in the approach to designing research which examines managerial teams (Furnham, 1992; West & Slater, 1995). Therefore, given the nature of the managerial problem and research questions outlined in Chapter 1 above, it was decided to adopt a predominantly correlational research strategy. It is recognised that this strategy, whilst effective in illuminating and examining relationships between variables, carries risks and limitations. The two main areas of concern are: i) possible confounding due to the influence of variables which are not being measured; and ii) lack of facility to establish causal relationships (Lehman, 1991). The limitations on drawing causal inference from correlational studies may be reduced if it is possible to: i) provide evidence of **time precedence** (for X to cause Y, X must precede Y in time); ii) there must be evidence of a relationship between the two variables; and iii) the association must be non-spurious (ie, an absence of confounding due to the impact of a third variable that causes both X and Y) (Wright & Fowler, 1986). These requirements to legitimise the drawing of causal inferences from correlational data present a high level of constraint. However, in practice it is often feasible to draw causal inferences from correlational data based on the application of logic rooted in established theory and previous related research (Lehman, 1991; Graziano & Raulin, 1989).

Drawing inferences in this way is aided by the formulation of clear hypotheses based on an understanding of the theories described in the literature (Medawar, 1972). Verma and Beard (1981) define an hypothesis as:

“ . . . a tentative proposition which is subject to verification. It may be seen as the guide to the researcher in that it depicts and describes the method to be followed in studying the problem.”

Thus the correlational data may be used to test the hypotheses developed from the literature. In this way causal inferences may be drawn subject to the limitations surrounding the potential confounding effects of other variables.

There is a strong view that an experimental design enables confounding variables to be controlled for and thus causal inferences to be drawn. However, the rigorous and high level constraints on such designs give rise to concerns over generalisability and meaningfulness of the results (Wright & Fowler, 1986; Graziano & Raulin, 1989). Indeed Wright and Fowler (1986) highlight the importance of the “Real-World validity” of a research design and that to meet this requirement experimenters frequently need to use less tightly controlled settings with more

heterogeneous subject groups. As a result competing attributions of causality are possible and, indeed likely. They point out that in the search for "Real-World validity" the distinctions between experimental and correlational design become somewhat blurred.

In the search for understanding, from a positivist perspective, the use of multivariate analysis is of value in overcoming some of the limitations of the correlational design (Hair et al, 1995; Wright & Fowler, 1986). Such approaches are particularly helpful in interpreting complex situations in which the impact of independent variables on a dependent variable may be mediated through another variable (Coovert et al, 1990). Indeed the use of multivariate techniques of analysis and the associated ability to manipulate complex data enable many of the constraints of correlational research design to be overcome (Hair et al, 1995). Hardyck and Petrinovich (1976) provide a good summary of the way in which multivariate techniques enable research designs to be developed and applied in organisational settings:

"These methods make it possible to ask specific and precise questions of considerable complexity in natural settings. This makes it possible to conduct theoretically significant research and to evaluate the effects of naturally occurring parametric variations in the context in which they normally occur. In this way, the natural correlations among the manifold influences on behaviour can be preserved and separate effects of these influences can be studied statistically without causing a typical isolation of either individuals or variables."

From the above discussion it is feasible to offset some of the limitations of a positivist paradigm by the adoption of a correlational design and application of multivariate analytical techniques.

Whilst the early considerations, outlined above, pointed to a positivist paradigm for the current study it was useful to consider to what extent the limitations of such an approach could be ameliorated by the combination of both quantitative and qualitative data collection and analysis in the study. Easterby-Smith et al (1991) suggest that there may be benefits to be obtained from employing several different methods in the same study. Abrahamson (1983) identifies clearly some of these benefits which are: i) a mixed method approach prevents the research becoming method-bound; and ii) the strength of almost every method is flawed in some way or other; thus research designs and strategies can be offset by counterbalancing strengths from one to another.

Todd (1979) advocates such methodological triangulation. In his research he has employed a diverse range of methods as an imaginative way of maximising the amount of data collected. This is a viewpoint reinforced by Whyte and Whyte (1984) who comment that: "one can enrich research by combining questionnaires with interviews and observation".

At the philosophical level there is a problem in combining methodologies from positivist and phenomenological paradigms (Burrell & Morgan, 1979). However, in the practical realities of research design these 'purist' distinctions tend to break down (Bulmer, 1988; Puch, 1986). Easterby-Smith et al (1991) suggest that there is an increasing tendency by researchers who are

working with managers in organisations to attempt a degree of methodological mixing because of the increase in perspectives provided on the phenomena being investigated. The field in which this methodological triangulation may, broadly, be seen as being appropriate is that of applied managerial research. Bryman and Burgess (1994) propose that in this field there is value in balancing qualitative and quantitative data in order to build up a rounded and credible overall picture. They comment that:

“Applied research can be broadly distinguished from basic or theoretical research through its requirements to meet specific information needs and its potential for actionable outcomes”.

The risk in adopting such an approach is that of qualitative and quantitative forms of data about the same phenomena providing opposing results. Thus, in mixing methods it is important to be clear as to the rationale and to have a theoretical underpinning which indicates that the overall direction and significance of the differing sources are likely to be fairly similar (Easterby-Smith et al, 1991).

Whilst the current study lent itself, both from the nature of phenomena and tradition in the field, to a positivist approach there was, within this overall framework, an opportunity to include an element of qualitative data. This opportunity was able to be realised at the stage of refining the instruments to be employed for examining Team Processes and Outcomes. The approach to this qualitative component and rationale for its inclusion is discussed in more detail below.

In summary, the overall approach to this study is predominantly positivist employing a correlational research design. The limitations of the correlational design are ameliorated through the use of multivariate analysis of the data. Furthermore, some of the limitations of the positivist paradigm are partially offset by the use of qualitative research during the early stages of the study. The qualitative stage is included in the design for the specific purpose of exploring the modification of Team Process and Outcome instruments, but the data obtained is examined in order to provide additional illumination of the phenomena being studied.

8.2 Research Design Issues

Whilst the preceding section (8.1) focused primarily on the research philosophy underpinning this study it raised issues relating to the design of the research. Although some issues related to the research paradigm others more specifically related to the design within an overall positivist approach. At the core of this latter range of issues was the use of a correlational design. In addition to this the other design issues which required consideration were:

- i) The selection of the sample;
- ii) The way in which Team Outcomes were to be measured;
- iii) The nature of Team Processes and how they were to be most appropriately operationalised.

These issues are explored in more detail in the remainder of this section. However, before examining them specifically it is useful to reflect on some of the general problems associated

with the study of teams. These have been highlighted in specific terms in Chapter 6 above. From an overall perspective Furnham (1992) produced a cogent and thought provoking summary of the key problems associated with team studies. These he identified as:

- i) Extreme difficulty in measuring **outcome** variables;
- ii) In the absence of a robust measure of outcome (performance) it is difficult to discover how the individual difference factors involved in the constitution of a team lead to team differences; and
- iii) The lack of psychometrically valid measures of how people behave in teams (for example, he points to the extensive use of the BTRSPI which is an instrument of questionable psychometric validity).

He also challenges the rigour of much of the research in this field (and within the broader field of personality variables and work-related behaviours) saying that:

“Much of the research literature in the field of personality and behaviour at work is theoretically naive and methodologically weak.”

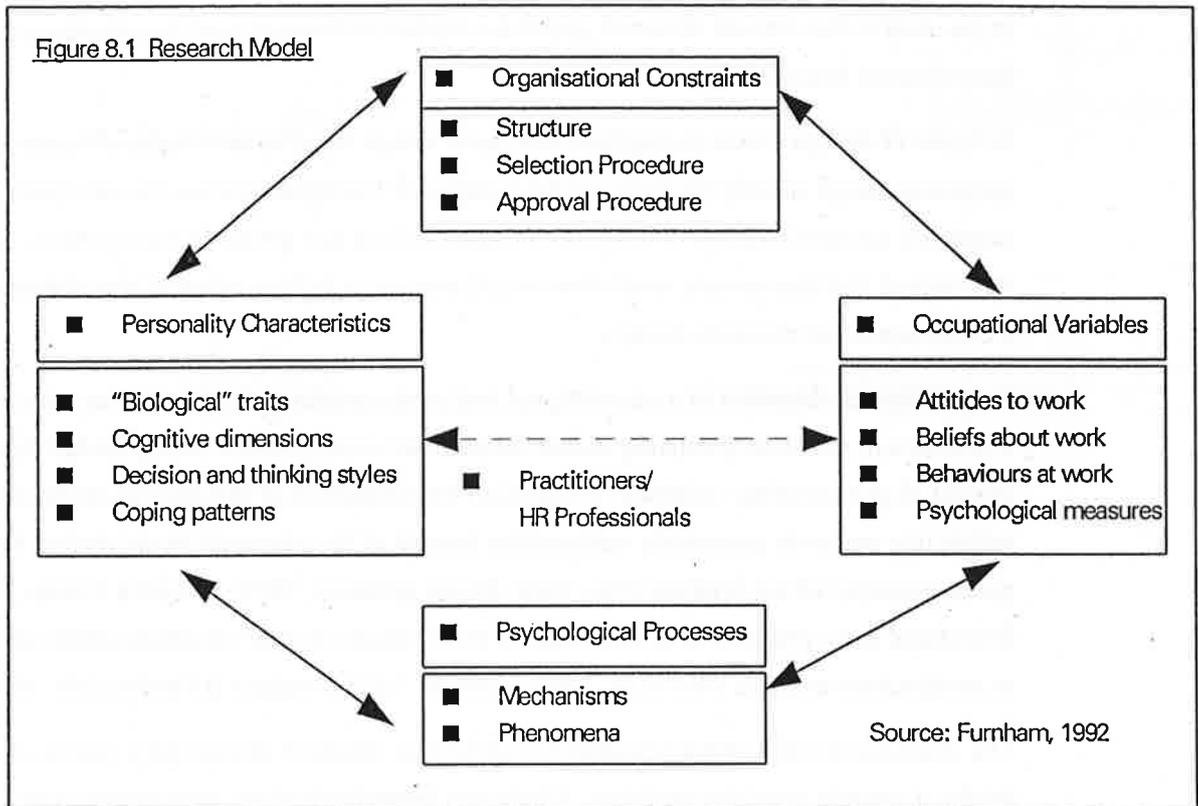
The research model which he proposes is shown in figure 8.1. This model helps to provide a framework for explaining a number of the variable interactions which affect the relationship between personality variables and work-related behaviours. The importance of methodological rigour is reinforced by Churchill (1979) who emphasises the importance of the data collection instruments. Jacoby (1978) summarises this issue well:

“What does it mean if a finding is significant or that the ultimate statistical analytical techniques have been applied, if the data instrument generated invalid data at the outset.”

Reflecting on Furnham’s comments (Ibid) led to a need to ensure that the research design for this study was clearly underpinned by a robust theoretical framework. To an extent this has been addressed in the preceding chapters with a strong emphasis in Chapter 6 on the interaction process model approach to examination of teams (eg, Hackman & Morris, 1975; West & Anderson, 1996; Smith et al, 1994; Pettigrew, 1992). The need for methodological rigour is, hopefully, addressed in the remainder of this chapter. Furthermore, Furnham’s observations highlight the pivotal role of developing a robust outcome measure as a part of an effective and valid team study. This issue is examined in more detail below.

Selection of the Sample

An important research design choice is whether to undertake a longitudinal study or a cross-sectional study (Easterby-Smith et al, 1991). Cross-sectional designs, employing questionnaires and survey techniques, have the ability to describe economically features of large numbers of people and organisations. The results (subject to sample structure and size) are capable of a reasonably high degree of generalisation (Lehman, 1991; Wright & Fowler, 1986).



However, cross-sectional designs have two major limitations which are: i) they do not provide explanations for the observed phenomena and relationships; and ii) within the design it is difficult to eliminate all of the confounding variables which could possibly have caused the observed relationships (Lehman, 1991; Easterby-Smith et al, 1991; Wright & Fowler, 1986). It has been proposed (Pettigrew, 1985) that a longitudinal design can remedy these disadvantages. However, as such a design tends to focus on relatively few organisations the generalisability of the findings is somewhat constrained (Wright & Fowler, 1986; Graziano & Raulin, 1989; Yin, 1989). Furthermore, whilst a longitudinal design has the advantage of producing potentially significant results from a relatively small number of cases it can be extremely time consuming and the complexity of the data sets can require the use of difficult analytical techniques (Pettigrew, 1985).

To an extent the design choice for the current study was influenced by the author's access to organisations and ability to sustain the commitment of these organisations to the provision of data and access to senior managers over time. Furthermore, the nature of the phenomena being investigated and the research hypotheses did not inherently require the study of the phenomena over time nor the impact of change on these phenomena. These considerations led to the decision to adopt a cross-sectional design. However, the number of organisations which were accessible to provide the range and depth of data required, combined with the need to obtain this data from intact managerial teams, from a practical stance, limited the representation of organisations within the sample. Whilst ideally the design should include representation from several organisations distributed across a range of sectors in order to be able to generalise the results (Moser & Kalton, 1971) the author recognised that access, given the range of instruments

to be used in the current research would be limited to three or four organisations with a strong bias towards financial sector organisations.

In terms of design it was recognised that there would need to be a trade-off between obtaining a potentially large sample (in terms of the number of management teams: see below) and restricted sample in terms of number of organisations and sector representation. It was recognised that the sample restriction would negate or reduce some of the potential benefits of a cross-sectional research design.

Overall the combination of a correlational and cross-sectional design carries with it potential limitations in terms of i) drawing causal inferences; and ii) results being diluted through the impact of confounding variables. In addition the restriction of the organisational representation within this research potentially reduced the benefit of the cross-sectional design and limited the generalisability of the findings (Yin, 1989; Moser & Kalton, 1971; Wright & Fowler, 1986). These limitations were planned to be reduced by the incorporation of variables which lent themselves to multivariate analysis (Hair et al, 1995; Lehman, 1991; Hardyck & Petrinovich, 1976).

The planned use of multivariate analysis within the research design gave rise to a further issue in terms of sample selection and size. Within the framework of the hypotheses (see Chapter 7 above) the application of multivariate analysis was planned to be in the area of examination of the alternative models to describe the team input:process:outcome relationships. In order to explore these it was necessary to focus on the team as the unit of analysis. At the same time the range of potential variables which could be involved in exploring these relationships was considerable (Hackman & Morris, 1975; Senior, 1997; McGrath & Altman, 1966). Within the model hypothesised in Chapter 7 above there are some four input and eight process factors. Combining these gives rise to some 32 interaction factors. In determining a sample size which would enable these interrelationships with the dependent variables using multivariate analysis (specifically by means of multiple regression) requires a minimum number of observations of between three and five per variable (Hair et al, 1995; Money, 1997). At this level, therefore, the sample size required would have needed to be between 104 and 220 managerial teams. Given the considerable problems in gaining access to managerial teams, particularly at a senior level, (Pettigrew, 1992; Hambrick & Mason, 1994; Hackman & Morris, 1975; Hackman, 1990; West & Slater, 1995) it was necessary to consider design strategies for dealing with a smaller sample of managerial teams. These strategies focused on striving for parsimony in the model which was being tested in terms of the range of variables which were to be examined (Hair et al, 1995). The need for parsimony is highlighted by many of the researchers who have examined team interaction process models (eg, Hackman & Morris, 1975; Pinto et al, 1973; Smith et al, 1994; Hambrick & Mason, 1984). Thus the envisaged research design needed to allow for the problems of securing a high level of managerial team participation. In broad terms achieving a sample of 50 or more managerial teams in an organisational context represented a significant challenge (Hackman & Morris, 1975; Greenbaum et al, 1988; Pettigrew, 1992; Larson & LaFasto, 1989). However, such a sample restricted the number of variables for analysis by means of

multiple regression to between 10 and 16. Achieving a level of participation of 50 teams would be likely to yield an individual level sample of around 200 participants (assuming that the average team size were to be around four members). This enabled correlational analysis to be used to explore a wide range of intervariable relationships (Hair et al, 1995; Lehman, 1991), albeit subject to the constraints of causal inference described above. The use of a relatively small sample (in terms of multivariate analysis) reinforced the limitation on the potential generalisability of the findings already evident through the use of a limited number of organisations in the study (Hair et al, 1995).

The third consideration in terms of sampling in the research design related to the identification of managerial teams within the organisations. Many authors, writing on teams, have pointed out that, in order to study teamworking, it is necessary that the participants do, in practice, work together as a team (eg, Tjosvold, 1991; Woodcock, 1989; Smith et al, 1994; Hackman, 1990; Higgs & Rowland, 1992). Within an organisational context, particularly in relation to managerial teams, this implied that the team to select for a study would not necessarily comprise all of the direct reports of an Executive or senior manager (Smith et al, 1994). Likert (1961; 1967) in propounding his systems approach to management put forward two key suggestions which were: i) organisations can be conceptualised as systems of overlapping groups; and ii) these groups are connected by individuals who occupy key positions of dual membership, serving as **linking pins** between the groups. Given that the focus of this study was senior level management teams it appeared reasonable to build from Likert's perspective and to look for senior management teams as comprising groups of "linking pin" individuals who were working together in practice. This model is considered by some (eg, Kahn et al, 1964) to be closer to organisational reality than the more structured reporting level descriptions as represented by organograms. However, he does point out that Likert's model does not allow for the differences between psychological and formal groupings. Higgs & Rowland (1992) proposed a team type model which differentiated between formal and informal teams, but highlighted the research difficulties of incorporating informal (ie, psychological) groupings into a structured (ie, positivistic) research study. In debating the distinctions between formal and informal team (group) structures, Leavitt et al (1973) made the observation that:

"A good way to think about the differences between a structural and systems point of view is to consider the difference in usefulness between an organisation chart of a [American] football team and the team's book of plays. The chart will tell you something about authority and function, but not very much about other matters."

Building from the above it seemed that an appropriate and pragmatic way to identify the "real" management teams for inclusion within the study was to ask the Executive to whom the members reported to nominate those who worked together as a team. This process has been adopted in other team studies, particularly those focusing on examination of interaction models (eg, Smith et al, 1994). In adopting this approach it was recognised that a risk of sampling bias had been introduced (Moser & Kalton, 1971). However, on balance this risk was considered to

be offset by the potentially more valid data in terms of team processes and behaviours (Smith et al, 1994).

Measuring Team Outcomes

In the introduction to this section the importance of developing a robust measure of team outcomes was highlighted (Furnham, 1992). This represents a problematic area, particularly if outcomes are perceived as being primarily concerned with performance. There are such a range of potential variables involved in the consideration of team performance that the identification of a completely reliable and objective measure of team performance has become something akin to the "quest for the Holy Grail" (Higgs, 1996(b)). In the context of both team performance and managerial competences the problems of finding objective measures have been highlighted by many authors (eg, Furnham et al, 1993; Senior, 1997; Dulewicz, 1992; Fisher & Macrossan, 1994; Thornton & Byham, 1982). In broad terms one of the most commonly employed measures is that of **superior rating** (in spite of its limitations) (Dulewicz, 1992; Senior, 1996; Furnham et al, 1993; Thornton & Byham, 1982). In a number of studies the use of combined perception measures from a range of perspectives (eg, managers, team members, customers, etc) has been employed. The use of this measure, entailing assessment by "significant others", has become generally accepted as being the best approximation to an objective performance measure (Hackman, 1976; Cohen & Ledford, 1994; Senior, 1996; Dulewicz, 1992; Higgs & Rowland, 1992). This viewpoint is particularly relevant when considering assessment of the performance of management teams (Blake et al, 1987; Hastings et al, 1986; Katzenbach & Smith, 1993). However, as Higgs and Rowland (1992) point out there can be significant logistical problems in obtaining input from 'customers' of managerial teams.

In much of the experimental work involving teams and small groups the use of decision simulations has been widely employed in order to establish an objective measure of team performance (eg, Hall, 1971). However, in examining the performance measurement issue Leavitt and Bahami (1988) comment that the decision simulation approach has a fundamental weakness in that the teams being studied are examined in isolation. They point out that in real organisations people are members of a number of groups, the purposes and goals of which may be in conflict. Thus an apparently objective experimental performance criterion has relatively little value in a real world setting.

In addressing the question of team performance Hackman (1990) talks in terms of effectiveness and identifies the following components of group effectiveness: i) the degree to which the group's output meets requirements in terms of quantity, quality and timeliness; ii) the extent to which the group experience improves its members' ability to work as a group in the future; and iii) the extent to which the group experience contributes to individual satisfaction. This definition covers both "hard" and "soft" outcome measures and, additionally, implies measurement by both group members and recipients of delivered performance. However, the elements within this definition are phrased in a way which implies group member measurement could be seen as confounding team outcome and team process (Hackman & Morris, 1975).

The overlap between outcome and process measures is common within the literature (eg, Hackman & Morris, 1975; Katzenbach & Smith, 1993; Tjosvold, 1991; Higgs & Rowland, 1992). It was therefore decided within the current study design to separate the process and outcome measures in terms of source of assessment (as well as design of the measures). Thus the executives to whom the team report made the outcome assessment and the team members the process assessment. Whilst the design to separate assessment may contribute to the separation of outcome and process measure the issue of composition of the outcome measure still needed to be addressed. Hackman (1990) in proposing a combination of "hard" and "soft" data to assess outcomes is strongly supported by Furnham (1992) who comments that:

"It is frequently and erroneously assumed that hard data is better because it is easier to measure reliably and less prone to human error. It may, indeed, be more reliable but it is not at all clear that it is more valid. Hard data may be influenced by different sources of noise and, on occasions, also be less reliable."

In the broader area of occupational psychology there is some significant support for this viewpoint. For example, Nathan and Alexander (1988) conducted a meta-analytic study of the assessment of personality factors and found no differences between the results when objective and subjective criteria had been employed. In fact they found that true score correlations were generally higher for subjective than objective criteria.

At the "hard" end of the team measurement spectrum there is emerging evidence of a linkage between the very top teams and overall organisational performance (eg, Pettigrew, 1992; Hambrick & Mason, 1984). However, this linkage is difficult to sustain in a direct manner as one moves below the level of the upper most organisational team (Pettigrew, 1992). The lower level (frequently non-managerial) team research also provides a range of evidence of hard performance outcomes (eg, Meyer, 1994; Leigh & Maynard, 1994; Lawson, 1995; Chance, 1989; Johnson & Johnson, 1989). At this level much of the evidence is anecdotal and not based on rigorous research methodologies (West & Slater, 1995).

The core issue faced, in terms of research design, was to identify a robust measure of team outcomes to be applied to managerial teams (Senior, 1997; Katzenbach & Smith, 1993). Overall it appeared from the above review that the research design could address the outcome measurement issues by: i) using Executive assessment to measure outcomes; and ii) using a measure of outcome which blended both "hard" and "soft" elements of team performance.

The Nature of Team Processes

Whilst many authors emphasise the importance of process in accounting for variation in the performance of groups and teams (eg, Tjosvold, 1991; Katzenbach & Smith, 1993; Hackman & Morris, 1975; Pinto et al, 1993; Gladstein, 1984) there is frequently lack of clarity over the elements which comprise the construct of process. In many studies process focuses on the interactions between group or team members (eg, Hackman & Morris, 1975; Stott & Walker, 1995; McGrath, 1964). From this frame of reference, process is seen as a mediator variable

between input and outcome. In other studies, although process is still perceived as a mediator variable, it is defined in much broader terms. For example, Greenbaum et al (1988) define process as encompassing problem-solving procedures, individual behaviours, group interaction and organisational influences. Dulewicz et al (1995) in their model of Board effectiveness use a similar broad view of process to that of Greenbaum et al (1988). The problems of focusing the process dimension on group interaction relate to the operationalisation of the construct and the consequent constraints in research design leading to predominantly experimental designs (Hackman & Morris, 1975). In spite of differences in interpretation and definition of the process construct there is clear agreement on the need to study process and its interrelationships with input and outcome in order to develop a better understanding of the determinants of effective team performance (McGrath, 1984; Hackman & Morris, 1975; Hackman, 1990). The problems in arriving at a clear and shared view of the nature of team processes may, in part, be due to the complexity of the construct (Hackman, 1990; Shaw, 1971; Schein, 1988). Indeed Douglas (1983) questions whether group processes exist in their own right or are merely names or labels intended to help us make some sense of what appears to be happening when groups work together and perform tasks or functions. Building from this premise, Douglas (Ibid) goes on to point out:

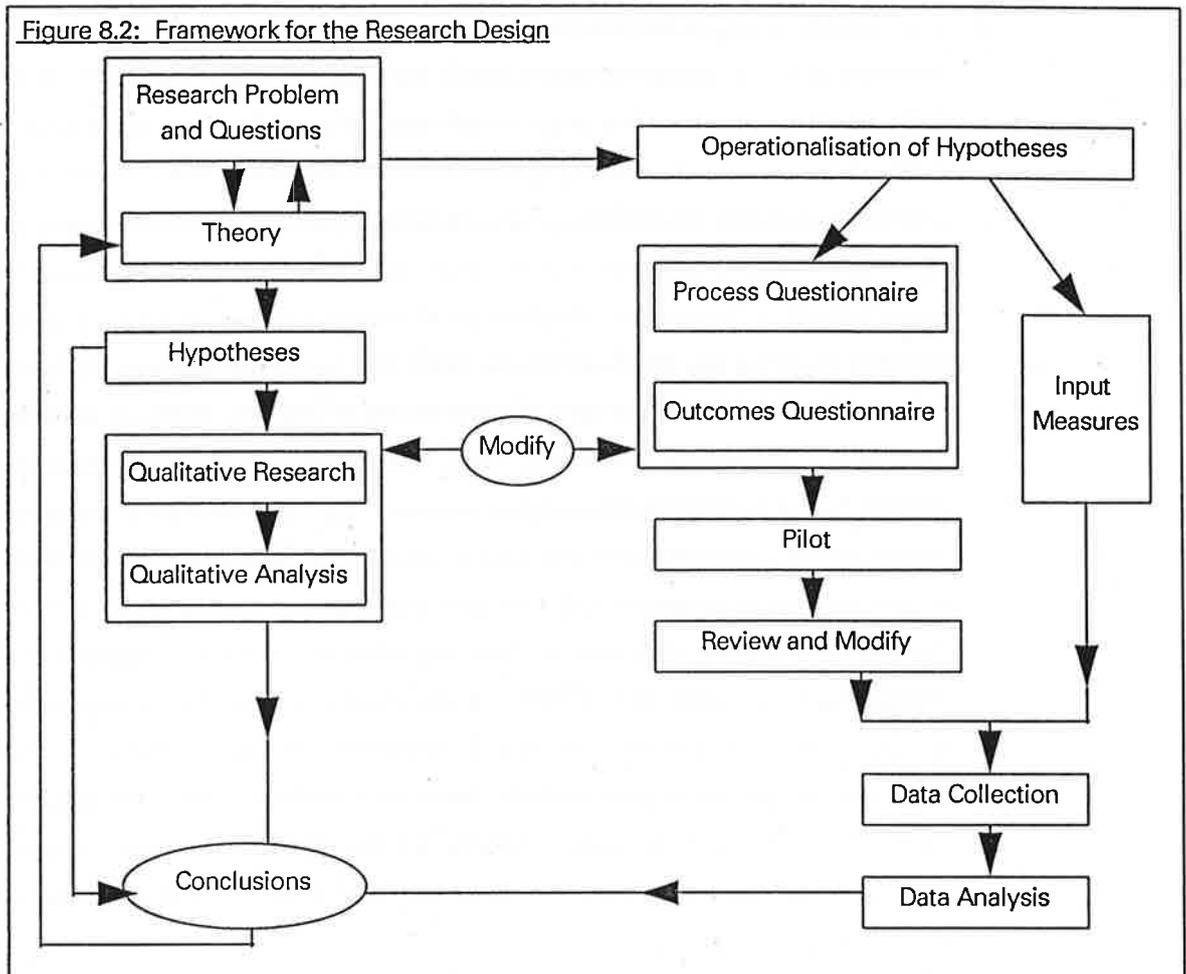
“Group processes are not orthogonal. They overlap; parts of some are identical to parts of others - they are not mutually exclusive.”

This view is helpful in interpreting apparent contradictions in research findings and confusion surrounding the labelling of process factors or items (Greenbaum et al, 1988). It does, however, have implications for both the design of research to examine team input, process and outcome relationships and for the interpretation of the results. Indeed the issues surrounding the operationalisation of the process construct may limit the generalisability of the findings of a study to the specific definitional framework employed for process within that study.

In reviewing the process debate it was decided to adopt the broader item view of process used by authors such as Greenbaum et al (1988) and Dulewicz et al (1995). Indeed the Greenbaum approach to defining process is based on an extensive literature review and thus may be seen to synthesise the views of a range of researchers and authors. In order to address Douglas's comments on the non-orthogonal nature of process (Douglas, 1983) it was seen to be important to use a factor analytic approach to the items comprising the dimensions of process and accept the limitations of conceptual overlap between factors whilst working in the analysis stage with the statistical distinctions between the factors.

8.3 Research Design and Key Research Steps

Reviewing the comments on team research made by Furnham (1992) suggested that the research should be designed on a systematic basis to build from theory and employ sound methodologies. The overall framework for the research design employed in the current study is summarised in figure 8.2.



Within this framework the role of the qualitative research was specified in terms of both contributing to the adaptation of selected process and outcome instruments and to the illumination of findings from the quantitative data analysis. In this way it was hoped to realise some of the benefits of methodological triangulation (Abrahamson, 1983; Todd, 1979). However, it is important to emphasise that the main thrust of the design was within the positivist paradigm as this appeared most appropriate for both the research questions and the 'tradition' within this field of study (Easterby-Smith et al, 1991).

The decision was made to employ a cross-sectional, correlational design with the use of multivariate analysis in order to overcome the constraints of causal inference associated with correlational designs (Hair et al, 1995; Wright & Fowler, 1986; Lehman, 1991). To an extent the design has been influenced by a number of factors identified by Forcese and Richer (1993) as being "extra-scientific". These are seen as being inevitable in conducting organisationally-based managerial work and are: i) the range of potential research sites and organisational constraints imposed; ii) the availability of data and nature of the population to be studied; and iii) the likely levels of interest in the study by organisations in general and potential participants in particular.

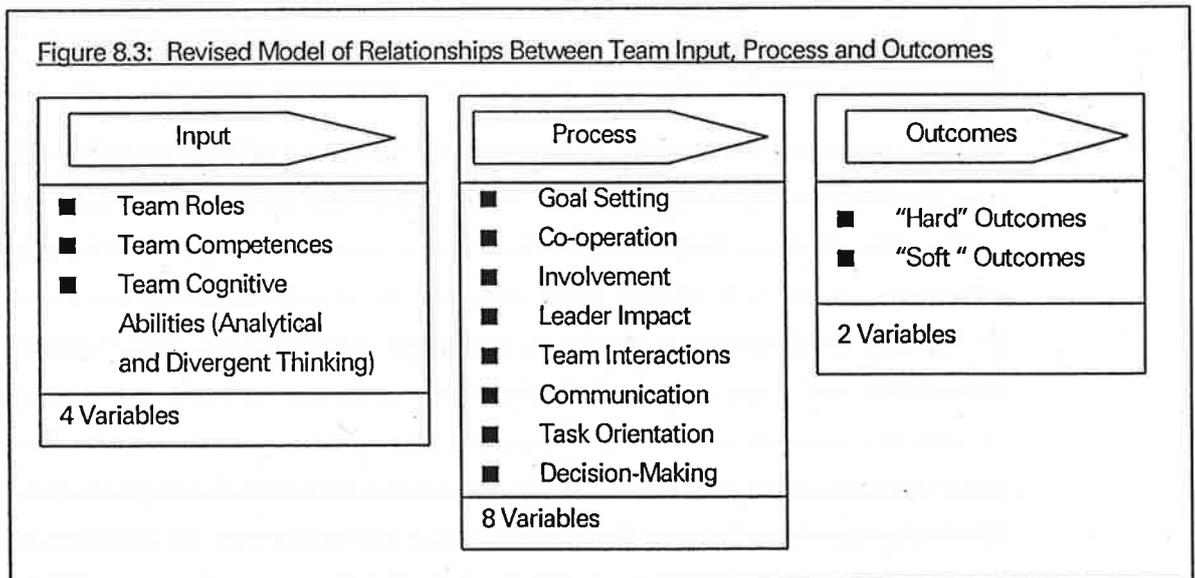
In implementing this design a number of issues were identified which were associated with these "extra-scientific" factors. These issues give rise to limitations on the research. The issues were:

- i) **The number of organisations to be included in the study:** The design imposed significant requirements on managerial teams within the organisations. The ability to engage the interest of organisations in a study which entailed some three or more hours involvement from each member of relatively senior management teams was somewhat limited. The process was eased by including in the sample organisations which already possessed some of the team input data which was required. In practice it was necessary to be somewhat opportunistic in the sample selection. Whilst opportunism is seen as creating potential benefits by some (eg, Whyte & Whyte, 1984) this has to be balanced against possible research limitations and dangers of "data trawling" (Barber, 1976), or undertaking "fishing expeditions" (Blinkhorn & Johnson, 1990). In this case the latter dangers may be guarded against by the hypothesis formulation process. The opportunism in the current study related to the availability and willingness of one organisation (NatWest Life) to provide access to existing psychometric and assessment centre data on in excess of 100 senior managers. In addition the organisation was willing to make management team time available for the completion of further input measures as well as process and outcome questionnaires. In practice, from within the author's consulting client base, another two organisations agreed to participate in the study (Canada Life and Surrey County Council). The nature of these organisations (predominantly UK financial sector), and their relatively limited number for a cross-sectional study, imposed some limitation on the generalisability of the findings.
- ii) **The number of management teams available within the participating organisations:** It was reasonably estimated, from data available on the participating organisations, that the number of potential senior level managerial teams which could be available would be unlikely to exceed 56. This, as outlined in 8.2 above, limited the number of variables which could be considered in the multivariate analysis to no more than 16. Therefore, it was necessary to devise a strategy to determine which variables would be included in the final multivariate analysis.
- In searching for a more parsimonious model the factors shown in figure 7.1 were examined to determine whether it was more appropriate to reduce the number of input variables or the process variables. In addition to examination of the literature the data was to be examined to identify those variables which appeared to be clearly independent. This entailed examining the intercorrelations between the variables with the aim of focusing on those where intercorrelations are below 0.50 (Hair et al, 1995).
- iii) **The sample for qualitative research:** In order to conduct the qualitative research, to ascertain management team member views on team processes and the measurement of team performance, it was evident that a significant time commitment on the part of senior level managers and Executives would be required. In practice only one of the participating organisations was willing, and able, to provide such a level of commitment (NatWest Life).

Whilst they were willing to provide a reasonably large sample the single organisation used for this aspect of the research limits the generalisability of the findings (Yin, 1989).

Even before considering the design constraints associated with a sample of around 56 teams it was evident that the overall process model shown in Chapter 7 above (figure 7.1) would need to be significantly reduced for the purposes of multivariate analysis within this research. Using the three to five observation per variable guidelines (Hair et al, 1995; Money, 1997) a full examination of this model would have entailed a sample in excess of 138 management teams. Figure 8.3 below provides a more parsimonious model which addresses the core research questions (highlighted in Chapter 7 above) which are:

- i) What are the competences and qualities which are associated with the effective performance of management teams?
- ii) What are the key processes associated with the effective performance of management teams?
- iii) To what extent does the interaction between competences and qualities and processes impact on the variation in senior managerial team performance?



The selection of the factors to include under the process heading was derived from an analysis of the literature relating to Group and Team effectiveness and a grouping of items (based on content descriptions) into the apparently related factors. The results of this preliminary content analysis of the literature are summarised in table 8.1.

Employing this reduced model would have given rise to a need for a minimum of 132 managerial teams if all input, process and interaction variables were to be examined against each outcome (dependent) variable. As the available sample was below this level the data obtained needed to be studied to identify an appropriate more parsimonious model. Within the literature it is evident that the complexity of team interaction processes is such that specific research studies typically examine only a part of the overall hypothesised model (Greenbaum et

al, 1988; Hackman & Morris, 1975; Barrett-Lennard, 1975). Thus this decision to focus on partial model examination has precedents in other research designs.

Table 8.1 Grouping of Process Items from Literature Review

Process Factors From Literature on Team/Group Process Models	
<p>1. Goals, Purpose and Objectives Pinto et al 1993, Hackman & Walton 1986; West & Anderson, 1996.</p>	<p>5. Team Interactions Greenbaum et al, 1988; Hackman & Morris, 1975; McGrath, 1964; Smith et al, 1994; Gladstein, 1984; Amason, 1996.</p>
<p>2. Co-operation/Cohesiveness Pinto et al, 1993; Hackman & Morris, 1975; McGrath, 1984; Shaw, 1971.</p>	<p>6. Communication Hackman & Morris, 1975; McGrath, 1964; Smith et al, 1994.</p>
<p>3. Involvement/Participation West & Anderson, 1996; Barrett-Lennard, 1975.</p>	<p>7. Task Orientation Hackman & Morris, 1975; West, 1990; West & Anderson, 1996; Gladstein, 1984.</p>
<p>4. Impact of Leader Barrett-Lennard, 1975; Cooper, 1975; Thomas, 1988; Korsgaard et al, 1995.</p>	<p>8. Decision-Making Eisenhardt, 1990; Amason, 1996; Greenbaum et al, 1988.</p>

In order to address the need for methodological rigour in the research design (Furnham, 1992) one important step is to ensure that all of the instruments employed are valid and reliable. To achieve this wherever feasible, established instruments with published validity were employed. Whilst this was feasible with the input measures, the process and outcome instruments were based upon modifications to previously published questionnaires. The modification of these instruments was based upon both the literature review and results of the qualitative study. As modified instruments were being employed it was necessary to examine them carefully using factor analysis. Items with factor loadings above 0.4 were included in the final data analyses. Whilst some authors indicate that loadings of 0.3 and above may be used with samples in excess of 100 (Money, 1997) it was felt that 0.4 offered a more robust cut-off (Hair et al, 1995). The factor analysed instruments were further examined to establish the Cronbach Alphas for each factor. Alphas of 0.7 and above were taken as indicative of a good level of reliability (Graziano & Raulin, 1989; Hair et al, 1995). Further details of the selection of instruments used to operationalise the research hypotheses are provided in 8.4 below.

The overall research design may be summarised as being cross-sectional and correlational with the use of multivariate analysis to develop insights into causal relationships and the interaction effects of team Input and Process. The key steps to execute this research design are summarised in table 8.2.

Table 8.2 Key Research Steps

Step	Purpose and Comments
1. Conduct Qualitative Study	<ul style="list-style-type: none"> ■ Overall purpose to provide input to the modification of the Process and Outcome questionnaires. To obtain optimum coverage a combination of individual interviews and focus group discussions to be employed.
2. Analyse Results from Qualitative Study	<ul style="list-style-type: none"> ■ Use general content analysis (Easterby-Smith, 1991). Examine responses against i) Outcome and Process Instruments; and ii) literature to identify new views or perceptions for consideration.
3. Modify Outcome and Process Questionnaires	<ul style="list-style-type: none"> ■ Include items which have emerged from analysis of content of interviews and focus group discussions.
4. Pilot Outcome and Process Questionnaires	<ul style="list-style-type: none"> ■ Identify a small sample (10 to 12) of senior managers in a services related organisation. Pilot questionnaire obtaining completed samples supported by follow-up interviews. Main purposes of this piloting are to i) examine practical issues; ii) to test for comprehensibility of questions; iii) to identify contentious or ambiguous questions; and iv) to review completed questionnaires to assess data analysis issues (Easterby-Smith et al, 1991; Bell, 1992).
5. Modify Questionnaires	<ul style="list-style-type: none"> ■ Purpose to obtain instruments which link established questionnaires to both current literature and data from qualitative stage.
6. Finalise Sample and Begin Data Collection	<ul style="list-style-type: none"> ■ Ensure that all participants are clear on the selection process for inclusion in the sample. ■ Obtain clearer estimate of likely number of teams in ultimate sample. ■ Establish processes to optimise follow-up and ultimate response rates. ■ Administer instruments to obtain Input data ■ Distribute questionnaires.
7. Review Initial Data Returns	<ul style="list-style-type: none"> ■ Broad review of data returned by the first 5 to 10 teams to ensure that no problems which require intervention to improve data quality. Purpose of this stage is to minimise the fall out from sample due to incomplete or incorrect data provision.
8. Data Entry	<ul style="list-style-type: none"> ■ Ensure that all data is correctly entered. Arrange for checking of all data entry. Aim to minimise subsequent analysis problems through accurate entry.
9. Initial Data Analysis	<ul style="list-style-type: none"> ■ Screening of data at individual level to examine distributions and identify area for corrective action.
10. Conduct Team Data Analysis	<ul style="list-style-type: none"> ■ Aggregation of data to team level. Conduct checks, where required, for validity of aggregation (James et al, 1984) ■ Correlational analysis prior to multivariate analysis (having screened data to check for violations of multi-variate assumptions: Hair et al, 1995).
11. Compare Results with Hypotheses and Literature	<ul style="list-style-type: none"> ■ Test hypotheses and develop general conclusions from the research study.

8.4 Operationalising the Hypotheses

Before actually beginning to collect data, the exact operations to be used in conducting the research needed to be specified. The variables had to be defined clearly, not only descriptively but also through a specification of just how they were to be manipulated (Lehman, 1991). It was also important to ensure that the operationalisation of the variables was meaningful as well as manipulable (Graziano & Raulin, 1989; Lehman, 1991). Schewart (1986) emphasised that:

“An operational definition is one that reasonable men can agree on”

He positions the operational definition as being a means of communicating a construct. More specifically, within the research design context of a positivist paradigm, Wright and Fowler (1986) describe operationalisation as an attempt to define a theoretical concept by isolating empirical indicators. Peter and Churchill (1986) point out that hypothetical constructs are unobservable and cannot be measured directly, but that operationalisation entails developing measures which can at least partially represent the constructs. An important element in research design is the operationalisation of hypotheses. This process serves a similar purpose to the operational definition of a concept. Verma and Beard (1981) define an hypothesis as:

“... a tentative proposition which is subject to verification. It may be seen as a guide to the researcher in that it depicts and describes the method to be followed in studying the problem”.

The operationalisation of the hypothesis provided the basis for the collection, measurement and analysis of the data to enable the hypothesis to be tested (Easterby-Smith et al, 1991; Wright & Fowler, 1986). The concepts which needed to be operationalised within the current research design were: i) Input Factors (Team Roles, Competences and Cognitive Abilities; ii) Process Factors; and iii) Outcome Factors. The instruments which were used to operationalise each of these concepts are described briefly below.

Team Roles

The Team Roles were operationalised using the Belbin Team Role Model. Whilst the construct validity of this model has been challenged (Furnham et al, 1992) it is important to be aware that the basis of this challenge has been on the use of the Belbin Team Role Self Perception Inventory (BTRSPI) as a means of identifying the individual Team Role. Dulewicz (1995(a)) has provided evidence to support Belbin's constructs when Team Roles are calculated from the Cattell 16PF questionnaire or Saville and Holdsworth OPQ. Belbin's original research employed the 16PF as a basis for the identification of Team Roles (Belbin, 1976; 1981). From a review of Belbin's work it is evident that he also employed the Watson-Glaser Critical Thinking Appraisal in order to identify the Monitor Evaluator role. However, in recent discussions with one of Belbin's initial collaborators (Life, 1996) it became apparent that this aspect of the methodology would be difficult to emulate. Higgs (1996(a)) demonstrated that the substitution of the CTA score for the 16PF factor B score in the BTR equations had the effect of reducing the incidence of the Plant and Monitor Evaluator roles. However, in the light of the information provided by Life (1996) it

was evident that Belbin did not use the overall CTA score, but rather one of the five sub-scale scores. This use of sub-scale scores is not recommended for the CTA (Watson & Glaser, 1991). Therefore it was decided to use the 16PF alone and the Team Role conversion formula reported by Dulewicz (1995(a)). There are a range of norms available for the 16PF. In the early work to use factor B from the 16PF the North American norms were used (Life, 1996). However, more recently the UK general population norms have been employed (Dulewicz, 1995(a)). Bartram (1992) published a study of UK managers in which he demonstrated significant differences in norms for this population. This led to the consideration of the possibility of using Henley data on more than 1000 managers to construct 16PF norms relevant to the type of population with which Belbin originally worked. The norms based on this population showed significant differences from both the UK population norms (Saville, 1967) and the managerial norms (Bartram, 1992). The Bartram and Henley norms are shown in Appendix V together with an analysis of the significant differences between them and between both of them and the UK norms. Overall, it seemed safest to retain the use of the UK norms for this study given that these were employed in the study which demonstrated the construct validity of the BTRs derived from the 16PF (Dulewicz, 1995(a)).

Thus the individual level BTRs were calculated from the 16PF, using the UK population norms and the established formula derived from Belbin's original work. However, given that the unit of analysis for much of the research is the managerial team there is a requirement to identify a means of operationalising Belbin's construct of team balance. Belbin's concept, based on his research, was that a successful team should, ideally, contain one (and preferably no more than one), of each of the eight identified Team Roles. He also identified the necessity of the presence within the team of certain Team Roles (notably that of Plant). Furthermore, he identified the detrimental effect on performance of duplication of certain roles (particularly those of Shaper and Plant) and the importance of inter-relationships between roles (specifically those of Co-ordinator and Monitor Evaluator).

Having identified the potential benefits of a "perfectly balanced" eight person team (demonstrated in an experimental setting) Belbin failed to provide specific guidance as to: i) how this might be translated into a practical environment; and ii) how "balance" might be consistently determined in teams comprising less than eight members. Furthermore, Berry (1995) points out that, although Belbin highlighted the inadequacies of imbalanced teams "little, if any, consideration has been made of the relative demerits of such imbalances, and no attempt has been made to provide an objective index of these relationships". In general, based on his research with samples of firemen and officers, students and participants on the Henley Senior Management Programme, Berry maintains that "Belbin's definition of Team Balance is somewhat simplistic." He highlights, from his research that there are considerable difficulties in highlighting what "balance" really means.

Having identified the shortfalls of Belbin's work in providing clear guidance on practical and robust ways of measuring the "balance" of a team, in terms of Team Roles, Berry proposed (and

provided evidence for) the value of an index approach. From analysis of the available research Berry (1995) demonstrated the potentially vast (if not infinite) number of combinations of Team Roles which may be considered if all potential weighting and interactions are considered. He contrasted to this with what he referred to as Belbin's simplistic approach, and proposed the formulation of a "Balance Index". He identified the requirements of such an index or indicator as being:

- i) Single index number which allows Teams to be compared for "balance";
- ii) Index range 1 = perfect balance to 0 when members unable to match any TR's;
- iii) Index to work for Teams with any number of members and roles;
- iv) No substitution effects should be possible. For example, a high PL in a team does not compensate for low TW;
- v) Relative importance of presence or absence of particular roles may be reflected by weights.

In order to develop a means of building an indicator which met these requirements, Berry described the components of a team by means of a two-dimensional array. Within this array each cell comprises a combination of team member and their Belbin Team Role (the combination being termed a "Talent"). For example, a team member who has Team Roles of both Plant and Resource Investigator is identified as having two "Talents". The constitution of a team is defined as number of "Talents" required irrespective of who possesses them. Therefore, two "Talents" possessed by one team member is the same as one "Talent" possessed by each of two team members (such "Talents" not being the same). "Talents" are equally beneficial regardless of the team members who possess them. This is a practical assumption (implied by Belbin) if the number of team members is less than eight.

In attempting to provide a more structured and usable means of measuring "balance" (in terms of Belbin Team Roles) Berry explored a number of alternatives. The first alternative was to attempt to address the issues relating to **substitution effects**. In order to address this he proposed the use of the "True or False" determinants employed in **Boolean equations**. However, although addressing the substitution effect this approach produced an index which was of limited practical value and failed to produce a means of testing the number of "Talents" per role (eg, addressing the desirability of having one, and only one, Shaper per Team). He identified that the way to address this element of balance required the use of **Binary equations** which could, through the use of weighting, provide a means of reflecting the diminishing input of additions of specific "Talents". For this approach to be effective it is necessary to develop a means of weighting the respective input of "surplus Talents". Belbin's research does not provide any guidance on such weighting. He was unable to find any research evidence which related to the relative importance of all of the different Team Roles. In consequence he concluded that the development of appropriate weighting would require a combination of a very large sample of teams (presumably exceeding his already large sample), combined with direct observations of team member behaviour and performance.

The third approach to developing a Team Role Index, explored by Berry, was the use of a **statistically driven index**. His initial derivation of such an index entailed comparing the sum of squares and squares of sums of rows and columns in a "Talent Matrix". In this way he maintained that the index would account for the presence of duplicate talents. However, this model violated the substitution criterion and resulted in a maximum score in excess of 1.0. However, he found that interpreting Team Role scores' significance by use of a sten score cut-off (using sten 7 or sten 8) addressed these issues. Berry maintained that the index derived from this approach, whilst being less rigorous than that using Boolean equations, was more comprehensive, practical and flexible.

From his research Berry did not find incontrovertible evidence to support the superiority of "balanced" teams using any of the proposed indices. However, using all indices he did find considerable evidence of the disadvantages of "unbalanced" teams. Furthermore, due to the lack of objective data to support the weighting to realise the benefits of a Binary index, he proposed that the use of a **statistical index**, with an appropriate sten cut-off, provided an effective **balance** measure. On the basis of the above discussion it appeared that the use of the statistical index developed by Berry (1995) would be an effective way within this research study to operationalise the Team Balance construct.

Team Competences

In examining the competences of team members it seemed to be appropriate to adopt an instrument used in previous research. Such an instrument was provided in the form of the Job Competences Survey. This has been applied in a range of published studies and research applications during the last few years (eg, Dulewicz, 1995(a); Saraweno, 1995; Gay, 1995). The Job Competences Survey (JCS) identifies some forty managerial competences based on research conducted with participants attending the Henley General Management Course (Dulewicz, 1995(a)). Appendix VI provides descriptions of the competences covered by the JCS. The assessment of an individual's rating against these competences is arrived at by averaging the self-assessment of the individual and the assessment of these competences provided by the immediate manager (Dulewicz, 1995(a); Saraweno, 1995). In combining the self-assessment with the managerial assessment a number (albeit not all) of the assessment improvements from multi-rater assessment are realised (Handyside, 1989; Williams, 1989). Further analysis of the JCS data by means of factor analysis led to the identification of twelve Supra-Competences (see Appendix VII) which were found to be associated with high performing managers (Dulewicz & Herbert, 1992) and have subsequently been confirmed in a seven-year follow-up study of the Henley General Management Programme participants (Dulewicz & Herbert, 1997). The use of the JCS as a basis for the calculation of the Supra-Competences seemed to be appropriate as a base level competence operationalisation in this study. There is increasing evidence of the significance of competences in explaining variations of managerial performance (Finn, 1993; Kakabadse, 1991) and the Supra-Competence model provides a validated means of measuring managerial competences. The formula reported by Dulewicz (1995(a)) for calculating the Supra-

Competences from the JCS will be used in this study. Details of this formula are provided in Appendix VIII.

Within this study a large number of the teams have been drawn from NatWest Life (around 30 teams). NatWest Life have their own competence framework and all participants have been assessed against this framework using a structured assessment centre methodology (Thornton & Byham, 1982; Higgs, 1996(c)). The competence rating scale in this process of assessment is provided in Appendix IX. The organisation was reluctant to put more than 30 managers through the JCS and therefore a means of validly equating the NatWest Life Competences with the JCS and Supra-Competences needed to be determined. Initial content analysis demonstrated a certain degree of overlap with not only the JCS, but also the Spencer and Spencer (1993) competence models. These relationships are shown in summary form in table 8.3. A more detailed description of the NatWest Life competences is provided in Appendix X.

Determining relationships between the NatWest Life and the Supra-Competences based on content analysis alone was not sufficiently robust for subsequent equivalence in the data analyses. The process for developing a more robust basis for conversion entailed obtaining JCS questionnaires for a sub-sample of the NatWest Life participants (the sample to exceed 20 participants) and conducting a multiple regression of the NatWest Life Competence scores on the Supra-Competence scores. Whilst providing a potential weakness in the competence input factor for this study, if the regressions proved to be sufficiently strong (in terms of R^2) subsequent analysis of this factor could be treated as being reasonably robust.

Data on the Supra-Competences was gathered at the individual level. However, as the core unit of analysis for this research was the team, it was necessary to consider an approach to the aggregation of individual scores to the team level. Finn (1993) in his review of research into competences indicated the possibilities of mix or 'balance' of competences in a team impacting on team outcomes or performance.

Table 8.3 Comparison of NatWest Life Core Senior Management Competences with other Established Models

Competences	Competency Models			
	JCS Dulewicz (1995(a))	SupraComps Dulewicz & Herbert (1992)	Spencer & Spencer (1993)	NatWest Life Core Senior Management
<u>Cognitive</u> Conceptual Thinking			√	
Information Collection and Diagnosis	√			
Application: Problem-Solving, Judgement and Analysis	√	√	√	√
Functional: Technical Expertise			√	

Table 8.3 Comparison of NatWest Life Core Senior Management Competences with other Established Models (Continued)

Competences	Competency Models			
	JCS Dulewicz (1995(a))	SupraComps Dulewicz & Herbert (1992)	Spencer & Spencer (1993)	NatWest Life Core Senior Management
<u>Interpersonal</u>				
Communication	√	√	√	√
Achieving Change and Action	√	√	√	√
Sensitivity to Others	√	√	√	√
Motivational Focus				√
<u>Personal</u>				
Motivational			√	
Self-Perception			√	
Resilience	√	√	√	
Personal Drivers			√	
Styles			√	
Outcomes: Impact, Decisiveness, Initiative				√
<u>Managerial</u>				
Task/Activity Focus				√
Group/People Focus			√	√
<u>Environmental</u>				
Contextual Awareness				√
Internal Awareness			√	
External Awareness	√		√	
<u>Achievement</u>				
Achievement Orientation			√	√
Focus of Achievement: Proactivity	√		√	

This hypothesis receives further support from Kakabadse (1991) who pointed out that both managers who display high levels of managerial competences and teams comprising such managers produce superior performance. Dulewicz (1995(a)) published the results of a study which examined relationships between the Belbin Team Roles, derived from both the 16PF and the OPQ, and the Supra-Competences derived the Job Competences Survey. These results are summarised in Table 8.4. In this research Dulewicz found support for 11 of the hypothesised

BTR relationships from both the 16PF and OPQ. In very broad terms, the research demonstrated that the Supra-Competences bore a clear relationship to the majority of the Belbin Team Roles.

Table 8.4 Summary of Significant Relationships between BTRs and Supra-Competences

Supra-Competency	BTR							
	PL	SH	CO	RI	TW	I	CF	ME
1. Strategic Perspective					+			
2. Analysis and Judgement		-			+	+	+	+
3. Planning and Organising								
4. Managing Staff			+		+			
5. Persuasiveness			+	+	+			-
6. Assertiveness and Decisiveness		+						
7. Interpersonal Sensitivity		-	+		+	-		-
8. Oral Communication				+			-	
9. Resilience and Adaptability	-				+			
10. Energy and Initiative	+	+		+				
11. Achievement Motivation		+				+	+	-
12. Business Sense			-			-		

Source: Dulewicz, 1995(a)

There appears to be no research which directly examines the relationships between the mix of Supra-Competences in a team and the performance effectiveness of the team. However, given the relationships identified above it would not seem unreasonable to hypothesise that a "balance" of Supra-Competences in the team may well be associated with effective performance which is in line with the views of both Finn (1993) and Kakabadse (1991).

In considering the means of measuring balance there would appear to be two main options. These are:

- i) Mirroring the Belbin Team Role Index;
- ii) Constructing a balance index based on an "ideal" in which all members possess all Supra-Competences.

In considering the first of these options the relationships identified by Dulewicz (1995(a)) would indicate that, for the majority of Team Roles, the Supra-Competences have a clear relationship to the BTRs. Therefore, using the Berry statistical model may produce an effective measure of team competence. There is, in practice, less evidence of the contra effects of surpluses of any of the competences than for surpluses of Team Roles. From an analysis of the components of the Supra-Competences it would only appear that an "excess" of assertiveness may produce interaction dysfunctions (somewhat analogous to the Shaper excess in the Team Role model). However, as with Team Roles there is insufficient evidence to warrant any weighting of

“excess” or “surplus” competences. Therefore, given the relationships between the Team roles and the Supra-Competences it may be appropriate to use the Berry statistical model to calculate a Supra-Competence Team Index. To address the substitution effect it would appear to be appropriate to use a Supra-Competence score cut-off of 4 (on a 5 point scale), as has been commonly used in Supra-Competence studies (Dulewicz 1995(a), Saraweno 1995). An alternative approach to building such an index is to work on the premise that no research has directly examined the interaction of competences within a team context. The overall evidence (Dulewicz 1995(a), Dulewicz et al, 1997) does, however, indicate that the Supra-Competences are all associated with individual performance. Given this assumption the agglomeration of all competences of members of a team might indicate that the ideally “balanced team” is one in which all team members possess all 12 Supra-Competences (SC’s). From this a “Competency Balance Index” could be calculated as follows:

$$\text{Index} = \frac{\sum_{i=1}^n \text{SC}}{n \times 12}$$

where SC’s are entered on a 1 or 0 basis (where 1 = SC’s are of 4 and above). The mechanics of this calculation may be simplified, without any loss of discrimination, by entering all of the Supra-Competence actual scores and modifying the denominator to $n \times 12 \times 5$ (given that 5 equates with the highest level Supra-Competence score). In reflecting on these two options there would seem to be a somewhat stronger case for developing the Supra-Competence Index from the Berry Team Role Index than employing a totally new index which has only theoretical underpinnings.

Critical Thinking Appraisal (CTA)

Whilst Belbin’s original work (Belbin, 1976; 1981) did indicate that a team comprised of all “very intelligent” members (the “Appollo” teams) did not out perform differently constituted teams, other literature does indicate that a team’s cognitive abilities do impact on elements of the team’s performance (eg, Larson & La Fasto, 1989; West & Anderson, 1996; Katzenbach & Smith, 1993). These cognitive abilities tend to relate to both convergent/evaluative and divergent thinking styles. In order to examine the team’s convergent/evaluative abilities the Watson-Glaser Critical Thinking Appraisal (CTA) was used as a measure of convergent ability. Indeed, as was mentioned above, this instrument was used by Belbin in his original research (Belbin, 1976; 1981).

Watson and Glaser (1964) define critical thinking as a composite of attitude, knowledge and skills. These are further clarified as follows:

- i) attitudes of enquiry that involve an ability to recognise the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true;

- ii) knowledge of the nature of valid inferences, abstractions and generalisations in which the weight or accuracy of different kinds of evidence is logically determined; and
- iii) skills in employing and applying the above attitudes and knowledge.

The CTA is a test designed to measure critical thinking and its origins date back to 1937 (Watson & Glaser, 1991). The test comprises five sub-tests which relate to: i) inference; ii) recognition of assumptions; iii) deduction; iv) interpretation; and v) evaluation of arguments. Each of the sub-tests requires the application of analytic reasoning skills. During the test these skills have to be applied to statements which reflect the wide variety of written and spoken material frequently encountered in a range of work or study situations. The current test manual (Watson & Glaser, 1991) provides extensive validity and reliability data. Published studies show alphas ranging from 0.69 to 0.88. The range of construct validity data shows high correlations with other tests of mental ability (eg, with Otis Mental Ability Tests 0.66; with the California Test of Mental Maturity 0.70; with the Wechler Adult Intelligence Scale 0.55). Watson and Glaser (1964) found a correlation between the CTA and measures of intelligence. However, factor analysis has demonstrated that critical thinking is a discrete ability (Follman et al, 1969). A number of studies have demonstrated that there are no significant differences between test performance of males and females (eg, Hoogstraten & Christiaans, 1975). A number of forms of the test are available with a range of norms derived from different populations. For the current study it appeared to be appropriate to use the Anglicised version of the test (Form C). The norm table which appeared most appropriate was table 37 which is based on applicants for Executive positions tested by a recruitment consulting firm. The total sample, for this table, was 111 (10 female; 101 male) and the age range was 26 to 56 years.

Data was collected on the CTA at the individual team member level. To calculate a team CTA value the mean of the individual team member scores was employed. In this process raw scores were converted to sten scores from table 37 and the stens were used in subsequent analyses.

Productive Thinking Test (PTT)

Whilst the CTA clearly provides a measure of analytical/evaluative thinking no relationships have been established between it and divergent or creative thinking (Watson & Glaser, 1991). However, within the literature on teams there is evidence that a team's propensity for innovation is linked to team outcomes (West & Anderson, 1996). It was, therefore decided to include divergent thinking as a cognitive element in this study. The test selected to explore divergent thinking is the Productive Thinking Test (Dulewicz & Fletcher, 1986). This test has been developed to examine two components of divergent thinking initially proposed by Guilford (1959). These are: i) ideational fluency; and ii) ideational flexibility. Within the Productive Thinking Test (PTT) these constructs are operationalised through two scales. Ideational fluency is examined by counting the number of ideas produced in response to two situations in a set time (eight minutes for each situation). Ideational flexibility is assessed by counting the number of distinct themes encompassed within the responses to the two situations. In order to manage

the objectivity of the flexibility assessment the test is marked independently by two trained assessors. Results are compared and differences resolved through discussion between the two assessors. This process is somewhat similar (albeit with fewer assessors) to that employed in assessment centre assessor conferences (Thornton & Byham, 1982).

Whilst some norm data is available for the test there are no published reliability and validity data. However, the test's antecedents (ie, Guilford's 1959 work) have been extensively explored within the literature (eg, Wallach, 1988; Bennet, 1972; Gronhaugh & Kaufman, 1988). The norm data for the PTT scales (Dulewicz, 1996) do not provide sten scores, but rather broad percentile ranges. Given this constraint the two scale scores for this test will be converted to standard scores. These standard scores were added (using addition of standardised scores) to produce an overall PTT score. The aggregation of individual scores to a team level PTT score was achieved by taking the mean PTT score for individual team members.

Process Factors

In reviewing the Process Factors identified from the literature (see Chapter 3 above) it was found that a considerable number of these were covered in the Dimensions of Board Effectiveness Questionnaire developed by Dulewicz and Herbert (1995). This questionnaire was developed from the research carried out between 1992 and 1995 on management standards applied at the board level. The results were published by the Institute of Directors (1995). Further work was carried out and published by Dulewicz, MacMillan and Herbert (1995). The research findings, especially the views received from directors of high performing companies, indicated the need for the Standards to address, *inter alia*, the processes by which the Board functions as a group, or team, of individuals.

A number of Directors interviewed in the Standards Study were aware of, or had had first hand experience of group process matters, and firmly believed that it was a critical determinant of success. Based on discussions with them, and with experts (specialist consultants working with Boards on process), the Standards Study identified a number of dimensions of group process which were believed to be relevant to effective group performance. These fell under the four main headings identified in 5.4 above (ie, predispositions of the board; climate of the board; relationships between board members and quality of decision-making).

Whilst this questionnaire had been developed for board level application it appeared to provide a particularly relevant starting point for building a process instrument for this study, given its focus on relatively senior managerial teams. A full copy of the questionnaire developed by Dulewicz and Herbert (1995) is provided in Appendix XI.

The questionnaire (amended following qualitative research) was factor analysed to identify the Team Process Factors for use in final analyses. Given that the questionnaire contained a range of new items it was important to identify the Cronbach Alpha values for the factors emerging from the factor analysis. In designing the final format of the questionnaire it was important to bear in mind that, for team members, self-reporting by participants would be required. In using

self-reported survey questionnaires Moser and Kalton (1971) highlight the point that questions must be practical and capable of being answered by the intended respondents. They emphasise the value of exploratory research, through interviews and focus groups, in establishing the issues in terms that respondents can relate to and in identifying meaningful language which will enable respondents to identify with the questions.

In using questionnaires in a self-reporting context, Moser and Kalton (1971) identify a number of potential problems:

- a) avoidance of respondents of extreme answers (error of central tendency);
- b) tendency for leniency and/or severity in responses;
- c) "halo" effect (ie, classifying objects on each scale according to respondents' general impressions rather than the measuring of specific scales).

Overall, particularly in relation to items concerned with opinions, there are concerns over subjectivity, bias and lack of differentiation. (Moser & Kalton, 1971; Oppenheim, 1966; Easterby-Smith et al, 1991). However, these may be addressed through attention to questionnaire design and scaling of questions (Moser & Kalton, 1971; Easterby-Smith et al, 1991; Wright & Fowler, 1986). A major issue associated with self-reported questionnaires is that of bias or attempts to provide "perceived correct" or "desirable" responses (Moser & Kalton, 1971; Easterby-Smith et al, 1991; Schwartz, 1990). However, as Schwartz (1990) points out:

". . . self-presentation concerns do not seem to play a major role with non-threatening questions".

Overall, it would seem to be important that questionnaire design is based on, and responds to, an awareness of the potential problems that may arise and incorporates strategies to deal with these problems. In general terms the response rate and motivation of respondents is affected by the size of the questionnaire in terms of the number of items (Moser & Kalton, 1971; Oppenheim, 1966; Youngman, 1984). However it is necessary to balance the need for brevity with the breadth of the topic being covered and the need to establish a reliable instrument (Moser & Kalton, 1971).

The Dulewicz and Herbert Questionnaire uses semantic differential scales. These entail the use of bipolar statements which are evaluated by respondents (Osgood et al, 1957). Such scales are similar to Likert scales in that they are summated rating scales and can be subjected to factor analysis. Such scales have higher reliability than Thurstone scales and require fewer items. However, they do have lower reproducibility (ie, ability to reproduce a respondent's individual item score from the total score). Whilst this can be an issue it is not an expected requirement from the analysis in this research. The scales in the Dulewicz and Herbert Questionnaire have the poles reversed periodically. This can prevent respondent bias resulting from a response set towards either agreement or disagreement (Shepherd et al, 1966; Youngman, 1984; Wright & Fowler, 1986; Moser & Kalton, 1971). In order to maintain consistency in the format of the additional process questions it was decided that they would be presented in the same format as

the Dulewicz and Herbert questions. The decision-context questions, from the work of Berthon, Pitt and Money (1994), are in a different format. However, as Easterby-Smith et al (1991) point out, it is feasible to vary the question type occasionally as long as similar types of question are grouped together.

It was possible to change the question style of the **performance items** and present these as a Likert scale. However, there would have been advantages to be gained in the analysis from continuing the "as is: as should be" format Dulewicz and Herbert used with their semantic differential scales. It was, however, important to use a consistent format for these items in constructing the team manager questionnaire since one overall performance measure entailed combining team member and team manager ratings.

In designing questions the range of requirements which emerge are identified (Moser & Kalton, 1971; Bell, 1992; Oppenheim, 1966; Youngman, 1984). These may be summarised as: i) clarity of questions, ii) simplicity of language/language related to the population being studied, iii) unambiguous questions, iv) avoidance of leading questions, v) avoid the use of double negatives. David (1952) points out that research has shown the use of personalised, rather than impersonal, questions can obtain more accurate responses. Easterby-Smith et al (1991) point to the importance of avoiding asking two questions in one question statement. These comments have all been taken into account in the design of the questionnaires for this study. In addition to question structure the sequencing of questions is important. Whitfield (1950) demonstrated that the order of questions can affect the response rate and influence the answers. Kahn and Cannell (1957) recommended employing a "Funnel Sequence", that is to say start with broad questions and narrow them down as the questionnaire proceeds. Although not precisely endorsing this approach it has become generally accepted 'good practice' to begin with the simpler/factual items and move later to those items dealing with opinions and values (Oppenheim, 1966; Youngman, 1984; Easterby-Smith et al, 1991). It is generally recognised that questions relating to opinion or values are fundamentally more difficult to deal with (Moser & Kalton, 1971; Osgood et al, 1957). Such questions require thought and/or self-analysis on the part of the respondent. In addition, opinions are many-sided with no one "correct" answer and this needs to be explored via more items (Moser & Kalton, 1971). Such questions are additionally more sensitive to wording (David, 1952) and it is not possible to make assumptions about the underlying correctness of answers (Easterby-Smith et al, 1991).

Given the nature of items relating to opinion or values it is inevitable that scales are required to reflect differences in degree of opinion or value. Some would argue that such areas should be explored via open rather than closed questions (Moser & Kalton, 1971). This requirement may be met, to an extent, by the use of scales, such as Likert or Semantic Differential scales, which provide an open format but with structure provided for the answers (Easterby-Smith et al, 1991). The advantages of open rather than closed questions needs to be balanced by considerations of ease of analysis. The more structured a question is the easier it is to analyse (Youngman, 1986).

Again the use of Likert or Semantic Differential scales combine a more open format with structure and, therefore, are more amenable to structured analysis.

Comprehension of questions is particularly important in dealing with items relating to opinions or values. As Schwarz (1990) points out:

“The key issue at the question-comprehension stage is whether the behaviour that the respondent identifies as the referent of the question does or does not match what the researcher had in mind”.

Belson (1981) points out that, in general, question comprehension is much poorer than most researchers would like to believe; even for apparently simple questions. He concludes that respondents who find a question difficult to answer are likely to modify it in such a way that it becomes easier to answer. Respondents are often found to use response alternatives, presented in the questionnaire, to determine the meaning of a question and, in particular, in relation to estimating behavioural frequencies will use them to provide a frame of reference (Schwartz, 1990; Belson, 1981).

The Team Process questionnaire was intended to be completed by team members. To develop a team level measurement it was necessary to aggregate team member scores. This raised issues in relation to the validity of aggregating individual scores to produce a group score (Handyside, 1989; Pinto et al, 1993). The core of this issue relates to the extent to which an aggregate score represents a close approximation to the group perception or masks a range of significantly divergent perceptions (Sniezek & Henry, 1989; Bourgeois, 1980; Cohen & Cohen, 1983; West & Anderson, 1996). Sniezek and Henry (1989) highlight the need to identify the convergence of scores of individuals in order to test for the level of intragroup agreement. However, Pinto et al (1993) point out that there are few recognised techniques to analyse multiple responses in order to justify their aggregation into a group response. Handyside (1989) highlights the potential of using techniques of measuring interrater agreement as a basis for making such a judgement. James et al (1984) published a formula for calculating interrater reliability which was used in a management team process study by West and Anderson (1996). It is this formula which will be used with the Team Process questionnaire in the current study in order to determine the validity of aggregating individual scores to produce a team score.

Outcome Factors

Furnham (1992), in commenting on the problems encountered in team studies, highlighted the difficulties in measuring outcome variables, and the limitations of their findings, in the absence of robust measures. In looking for an appropriate outcome measure the need to consider “hard” and “soft” components has already been discussed (see Chapter 7 above). In the current study an initial attempt was made to identify an objective “hard” measure of team performance. NatWest Life had introduced a Balanced Business Scorecard (Kaplan & Norton, 1992) approach to measuring performance at the organisational level. It was hoped that this might provide a basis for developing an objective measure at the team level. However, on investigating this

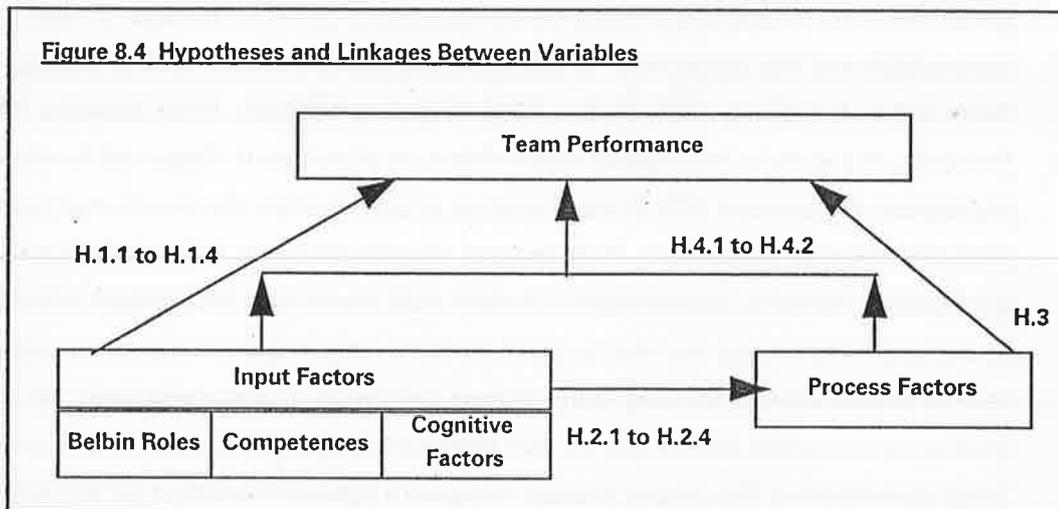
possibility it was found that the cascading of the scorecard measures would not be introduced in time to be used for this study. A further problem had already been identified in the use of a 'Scorecard' measure. Any such measure would be organisation-specific and thus preclude the development of a common outcome measure across organisations. Indeed the differences between the nature of the team's purposes, functional areas of focus combined with differences between organisations made the identification of any completely objective measure extremely difficult.

In the absence of a truly objective outcome measure it has been suggested that the assessment of outcomes by means of gathering the perceptions of both the manager to whom the team is accountable and the "customers" of the team may provide an appropriate strategy (Hackman, 1976; Cohen & Ledford, 1994; Senior, 1996; Thornton & Byham, 1982; Williams, 1989). However, in a study of managerial teams within an oil company Higgs and Rowland (1992) highlighted the practical difficulties of such an approach when the team's customers are primarily "internal customers". Furthermore, they found that in many situations the "customer" perceptions related to specific team members with whom they had contact rather than the team as a whole. Thus it was decided to use the judgement of the Executive or manager to whom the team is accountable as the sole rating of team outcomes. It was recognised that multi-rater assessment provides more accurate data (Handyside, 1989; Williams, 1989; Thornton & Byham, 1982) and therefore the chosen strategy imposed a potential limitation on the study.

On the basis that using a questionnaire instrument to measure single rater perceptions of team outcomes would have some limitations, due to differing standards by which judgements would be made (Williams, 1989; Handyside, 1989), consideration was given to having the raters score the "team now" against the items, and the "team as should be". The gap scores would then represent a measure of the rater's satisfaction with the team. However, Parasuraman et al (1994) have identified significant limitations on using gap scores in the analysis of survey instruments. Their conclusion and findings were further supported by Hemmasi et al (1994). In the light of these cautions it was decided that the team outcome measure would need to be a questionnaire to obtain single rater perceptions of outcome items based on a view of the team as it is currently functioning.

In looking at existing instruments for measuring team outcomes it appeared that one employed by Higgs and Rowland (1992) in a study of managerial level teams in an oil company covered many of the outcome factors identified within the literature (see Chapter 4 above). The instrument identified two outcome factors (Team Atmosphere and Team Results). The Cronbach Alphas for these factor scales were 0.68 and 0.71 respectively. The final questionnaire used in measuring team outcomes was based on this instrument, with the potential for items to be added in the light of the interviews and focus group discussions with the NatWest Life sub-sample of senior managers. The amended questionnaire was factor analysed to identify the final outcome factors. As new items were likely to be added Cronbach Alphas for the identified factor scales would be calculated to ensure reliability of the scales.

In summary, the operationalisation of the hypotheses entailed using: i) the 16PF to calculate Belbin Team Roles; ii) the JCS to calculate Supra-Competences; iii) the CTA and PTT to measure cognitive abilities; iv) a questionnaire, based on the Dulewicz and Herbert (1995) Dimensions of Board Effectiveness Questionnaire, to measure team Process factors; and v) a questionnaire, based on the Higgs and Rowland (1992) team performance questionnaire, to measure Outcome factors. Appendix XII provides a summary illustrating the relationships between the research instruments and the research hypotheses. Figure 8.4 shows the interrelationships between the research variables as linked through the hypotheses.



8.5 Framework for Analysis of the Data

One of the core purposes of this research study is to examine the interrelationships between team Input, Process and Outcome factors using a model developed from earlier work in this field by Hackman and Morris (1975). Within the literature the difficulty and complexity of these interactions is identified frequently, and the issues associated with such a study are aptly summarised by Hackman (1990):

"Influences on group effectiveness do not come in separate, easily distinguishable packages . . . to try to sort out the effects of each possible determinant of team effectiveness can lead to the conclusion that no single factor has a very powerful effect - a conclusion reached by more than one reviewer of the group performance literature".

In the preceding sections of this chapter the overall research design has been debated and described. The design is primarily a correlational, cross-sectional study in which multivariate analysis is to be used in order to address the limitations of causal inference in such studies. The hypotheses which have been developed from the literature in part lend themselves to examination through correlational analysis (Lehman, 1991; Wright & Fowler, 1986; Graziano & Raulin, 1989), and in part require multivariate analysis. Those hypotheses which may be tested by correlation alone can be examined more thoroughly through the subsequent use of multivariate analysis. Given this, the strategy for data analysis may be broken into a number of distinct parts which are: i) development of measures and aggregation of individual data to team

level; ii) correlational analysis of the key variables; iii) analysis of differences between high and low performing teams (ie, those with high and low outcome scores); and iv) multivariate analysis of proposed input:process:outcome models. The approach to each of these four areas is described briefly below.

Development of Measures and Aggregation

To a large extent the development of the measures and aggregation of individual scores on these measures to the team level has been discussed in 8.4 above. The team process and outcome questionnaires were both factor analysed in order to identify the scales to be employed in the subsequent analysis of the data. This factor analysis employed a Principal Components approach with a Varimax rotation. An Eigen value of 1.0 was used as the cut-off point for the analysis. In determining the questionnaire items for inclusion in the factor an initial screening was conducted to exclude items with a factor loading of less than 0.30 (Hair et al, 1995). Hackman (1990) highlights the importance of a robust outcome measure for effective team research. The factor analysis of the outcome questionnaire included Oblimin, Equamax and Quartimax rotations in order to fully explore options for the factor structure and ensure that the most robust was selected.

Cronbach Alphas were calculated for the factor scales for both the outcome and process questionnaires. These were examined to determine the reliabilities of the scales, looking for Alphas in excess of 0.60 and preferably greater than 0.70 (Lehman, 1991; Graziano & Raulin, 1989; Hair et al, 1995).

In considering the validity of aggregating individual scores on the team process questionnaire to form a team score the James et al (1984) formula was to be employed. Those scales for which the interrater reliability was in excess of 0.70 were to be taken as appropriate for aggregation (Handyside, 1989; James et al, 1984; West & Anderson, 1996).

Correlational Analysis of Key Variables

The data (aggregated to team level) was initially be explored through correlational analysis. The purposes of this were two fold, viz:

- i) To identify significant and high level (0.5 and above) intercorrelations amongst Input and Process factors in order to identify which variables might prove to be most appropriate for inclusion in the subsequent multivariate analysis and model examination; and
- ii) To identify significant interrelationships amongst the variables in order to examine a number of the research hypotheses and identify a preliminary model of interrelationships.

The correlational data was examined for Input:Input, Input:Process, Input:Outcome and Process:Outcome relationships.

Analysis of Differences Between High and Low Performing Teams

The team outcome scores were to be used as a basis for dividing the sample into high and low performing teams. The high performing teams were to be those who scored above 3.0 (on a 1.0

to 6.0 scale) on all outcome factors (it was anticipated that there would be at least two outcome factors).

Similarly low performing teams would be those scoring less than 3.0 on all outcome factor scales. The input and process data for the two groups would be examined using t-tests for individual samples (Norusis, 1994) applied to each variable. In this step of the analysis the average scores for each Belbin Team Role and Supra-Competence within the team would be included in the analysis as well as the Team Role Index and Supra-Competence Index. The overall purpose of this step in the analysis was to provide potential additional insights which would help with the interpretation of the results which emerged from the correlational analysis.

In Chapter 7 above it was explained that not all possible variables identified from the literature could feasibly be included in this study. However, data on team size and team tenure would be available. It was felt to be useful to explore differences between high and low performing teams using the t-test for independence in order to establish whether or not these variables could be impacting on the relationships encountered in the correlational analysis. Furthermore the broader use of the high and low performing team analysis of the data would enable further evidence to be obtained to either support or contradict the relationships encountered in the correlational analyses (Wright & Fowler, 1986; Graziano & Raulin, 1989; Downie & Heath, 1974). Within the literature (see chapters three, six and seven) the issues concerning the positioning of variables as both outcome and process factors has been highlighted (eg, Hackman & Morris, 1975). Whilst the design of the outcome and process instruments has attempted to minimise overlap the use of a difference analysis on a compound performance measure (ie, all outcome factors) has been included to provide supportive evidence to ameliorate the risks of measures overlapping and potentially distorting relationships (Downie & Heath, 1974; Hays, 1981). In addition, as there were three distinct organisations in the study conducting a t-test for high and low performing teams based on company as a variable would identify whether or not this could be a confounding variable which would need to be addressed in subsequent analyses.

Multivariate Analysis of Proposed Models

Many authors have highlighted the problems associated with studying teams arising from the range and complexity of variables which interact to influence eventual performance or outcomes (eg, Schein, 1988; Hackman, 1990; Pinto et al, 1993; Abell, 1976; Cooper, 1975; West & Slater, 1995; Barrett-Lennard, 1975). In Chapter 6 above the growing attempts to shed light on these complex interrelationship by means of modelling parts of the overall interaction process have been described. Indeed Argote and McGrath (1993) have commented on the trends in research in the field of groups and teams away from examination of a few variables to a more complex multivariate approach. They express the view that this trend is particularly important in the design of field studies. In part this trend is addressing the observation that Furnham (1992) made about the paucity of good research into the relationship between personality traits and organisational behaviour in the 1970s and 1980s. Whilst his comments related to individual traits they are equally applicable to team studies. He identified a need to understand the range

of potential relationships between personality and organisational behaviour and be clear in research design as to the type of relationship being examined. The six types of relationship he identified were:

- i) $P \times OB$: no relationship between personality and organisational behaviour;
- ii) $P \rightarrow OB$: personality (or at least some traits) determine organisational behaviour;
- iii) $OB \rightarrow P$: organisational behaviour determines personality (a structuralist-determinist position);
- iv) $P \leftrightarrow OB$: personality and organisational behaviour are reciprocally determined;
- v) $P_1 \rightarrow OB; P_2 \rightarrow OB; P_3 \rightarrow OB \dots$: a mixed relationship (both personality and organisational behaviour are multi-faceted);
- vi) $P \times OB$: personality and organisational behaviour are moderated by other variables.

It is this last proposition which is increasingly being explored in team studies.

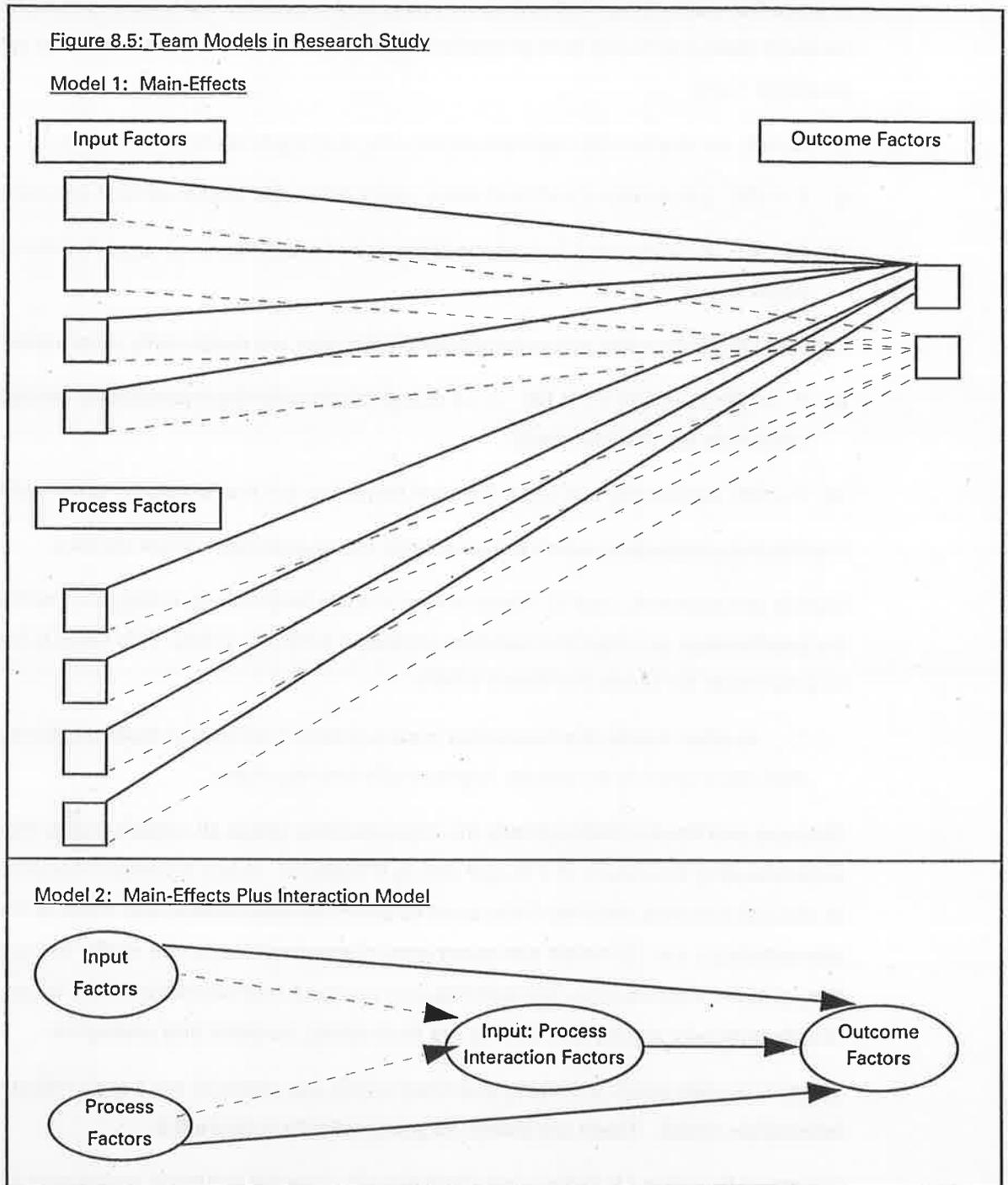
Models are extremely useful. Manipulating models helps in organising information to illustrate the relationships amongst the variables (Graziano & Raulin, 1989). This value is further illustrated in a comment by Verma and Beard (1981):

“... in other words, the researcher must produce a concept or build a theoretical structure that can explain facts and the relationships between them.”

Graziano and Raulin (1989) identify the characteristics which all models share; this is useful in understanding the nature of a model and its limitations. These common characteristics are parts of the real universe, and they have point-to-point correspondence and some of the characteristics are: i) models are constructed representations of the reality being represented; ii) they provide a convenient, manageable, and compact representation of the larger, complex and mostly unknown reality; and iii) they are incomplete, tentative and analogical.

The two models which are being examined within this research are a main-effects model and an interaction model. These are shown diagrammatically in figure 8.5.

Structural Equation Modelling and MANOVA are potential statistical techniques for handling multiple dependent variables. Structural Equation Modelling is effective in: i) the estimation of multiple and interrelated dependence relationships; and ii) the ability to represent unobserved concepts in these relationships and account for the measurement error in the estimation process (Hair et al, 1995). In broad terms the approach to using Structural Equation Modelling is by means of available statistical software, one of the most common of these programs is LISREL which is available within SPSS. However, to use structural equation modelling (SEM) it is necessary to achieve a minimum sample size. It is generally accepted that the minimum sample for this application is 100 (Breckler, 1990). As the unit of analysis for this study is the management team the use of SEM would require a minimum of 100 teams. It is unlikely that a sample in excess of 50 to 55 teams would be achievable within the current research.



However, sample size is not the only limiting condition for the use of LISREL. Smith et al (1994) highlight a number of further limiting conditions which prevent the appropriate use of LISREL. These are: i) the aggregation of individual responses to the group level within the data set; and ii) the inability of LISREL to deal with two different levels of analysis in a single simultaneous step (eg, scales derived through factor analysis of individual scores). Since both of these conditions apply within the current study and the sample is below the generally accepted minimum size LISREL would not be an appropriate methodology to employ in the analysis. In the absence of being able to effectively utilise SEM in the analysis of the data it would seem appropriate to employ a multiple regression approach to the examination of the two models.

This is a strategy relatively commonly employed in examining team interaction models with relatively small samples (in terms of SEM requirements) (eg, Smith et al, 1994; West & Anderson, 1996) and entails examining the regressions on each variate (dependent variable) separately.

In order to apply multiple regression it is important to check the data to ensure that the assumptions which underly multivariate analysis have not been violated (Hair et al, 1995). In doing this within the current study normality of the data was tested using the Kolmogorov-Smirnov test (Norusis, 1994; Hair et al, 1995). If no statistically significant results are encountered in applying this test the data may be treated as being normal for subsequent multivariate analysis. The homoscedasticity of the data was examined by applying the Levene test (Norusis, 1994; Hair et al, 1995). Once again the absence of statistically significant test results would mean that the data may be treated as homoscedastic for the purposes of subsequent multivariate analysis. Should either non-normality or heteroscedasticity be found in the data the relevant transformations described by Hair et al (1995) would need to be applied to the data prior to further stages in the multivariate analysis.

When the regressions had been computed the results were examined for collinearity. The most common measures for assessing both pairwise and multiple variable collinearity are the tolerance factor and the variance inflation factor (VIF) (Norusis, 1994; Hair et al, 1995). High tolerance (and low VIF) results indicate that there is a high degree of collinearity. The regression analyses were initially to be conducted using the 'Enter' option within SPSS (Norusis, 1994). The results were examined for collinearity. If the 'Enter' method produced a high level of evidence of collinearity a more parsimonious model would be examined by employing the 'stepwise' option (Norusis, 1994).

In order to examine the proposed models it was necessary to select a smaller number of variables than are actually available within the data set. This was due to the requirement, in the application of multiple regression, for a minimum number of observations per item in the regression model equation. This selection was based on an analysis of the correlation amongst the independent variables, combined with an examination of the literature to determine the theoretically most appropriate variables to include (particularly in the course of selecting the interaction variables). The two models were compared by examining the R^2 produced in the analysis. The larger the value of the R^2 the greater is the amount of the variance in the regression the variate accounted for by the independent variables (Lehman, 1991; Norusis, 1994; Fox & Long, 1990; Hair et al, 1995). The respective impact of each variable in the regression equations was identified by examining the standardised betas of the variables. The standardisation of the betas eliminates the problems of differences in units of measurement and thus reflects the relative impact of the independent variables on the criterion variable (Hair et al, 1995). The overall relationship of the data analysis steps to the research hypotheses are shown in Appendix XII.

8.6 Summary

This chapter has described the methodology which was employed in order to examine the research hypotheses presented in Chapter 7 above. The overall approach to the research design was essentially within a positivist paradigm, although a degree of methodological triangulation was employed (Todd, 1989) through the undertaking of initial interviews and focus group discussions with a small sample of senior managers.

The design of the research was correlational and cross-sectional. The limitations of such a design in terms of causal inference did, to an extent, need to be offset by the incorporation of multivariate analysis of the data. However, the expected sample structure, in terms of participating organisations, reduced a number of the benefits of a cross-sectional design and placed a limitation on the generalisability of the findings.

The complexities involved in the study of teams was tackled by the use of a model which examined a limited number of independent variables and interactions drawn from the very extensive range of variables identified in the literature. Throughout the design of the research the comments of Furnham (1992) in terms of the need for sound theoretical underpinnings and methodological rigour have been to the fore.

Chapter 9. Results and Discussion 1: Sample, Qualitative Data and Measures

"They are ill discoverers that think there is no land, when they can see nothing but sea."

Francis Bacon; *The Advancement of Learning*, 1605

9.1 Introduction

The results chapters of this thesis has been organised in a way which mirrors the sequence of analysis which was followed in the research. The overall framework for the study has been one adapted from the Hackman and Morris (1975) Group Interaction Model. The components within the model are input, process and outcome variables. This chapter begins with an overview and discussion of the sample (9.2). Following this there is an analysis of the **qualitative data** collected during the initial interviews and focus group discussions (9.3).

Data relating to the measures are presented in terms of analyses of the information collected from the 54 management teams participating in the main research study. These analyses are discussed in the following sequence:

- 9.4 **Input Measures:** Descriptions of the four input measures employed together with an analysis of the interactions between these variables.
- 9.5 **Process Measures:** An analysis of the team process questionnaire and identification of the factors emerging from this instrument and their reliability.
- 9.6 **Outcome Measures:** An analysis of the team outcome questionnaire and identification of the factors emerging from this instrument and their reliability.

9.2 Sample

Three organisations agreed to participate in this research study. These were: i) NatWest Life; the UK Life Assurance subsidiary of the NatWest Group; ii) Canada Life Assurance; the UK subsidiary of a Canadian-based life assurance company; and iii) Surrey County Council. A major challenge in obtaining participation was that of gaining access to senior management teams (particularly given the volume and range of data that needed to be obtained from each team member). Pettigrew (1992) highlights the difficulties in gaining access to senior managerial teams. However, as research on linkages between top teams and organisational performance are becoming established (Hambrick & Mason, 1984; Pfeffer, 1983; O'Reilly et al, 1993) there is growing evidence that researchers in this field are becoming able to move from archival to more direct research with top teams (Eisenhardt, 1989; Eisenhardt & Schoonhoven, 1990; Pettigrew & Whipp, 1991).

In addition to problems of access to senior management teams there was a further challenge in terms of the number of teams that would be required in order to be able to test the model

described in Chapter 8. Given that the proposed analyses would be using the team as the unit of measurement, the research design required a sample size of no less than 50 teams. In effect this required access to all of the senior level management teams in the participating organisations. The level of interest in this study was such that the organisations agreed to provide the required access resulting in an initial sample of 56 teams. Ultimately data could not be obtained in relation to two teams due to organisational changes. This resulted in a final sample of 54 teams. In the context of organisational studies of managerial teams this sample represents one at the higher end of those encountered (see table 9.1). In looking at process model structures that examine more senior level management teams the current sample represents a relatively large number of such teams.

Table 9.1 Illustration of Managerial Team Study Samples

Reference	Sample Size (number of teams)	Focus of Study
Larson & La Fasto, 1989	31	Managerial Teams
Pinto et al, 1993	62	Senior Management Teams
Smith et al, 1994	53	Managerial Teams
Amason, 1996	48	Managerial Teams
Prussia & Kinicki, 1996	81	Teams in general
Gladstein, 1984	100	Teams in general
Thompson et al, 1996	30	Senior Management Teams
Korsgaard et al, 1996	20	Senior Management Teams
West & Anderson, 1996	27	Senior Management Teams

An issue which needed to be resolved in structuring the sample was that pertaining to the identification of members of a management team. A number of authors (eg, Tjosvold, 1991; Hackman, 1990; Higgs & Rowland, 1992; Woodcock, 1989; Smith 1995) have pointed out that, in order to study teamworking, it is necessary that the participants do, in practice, work together as a team. For the purposes of this study the approach to dealing with this issue, employed by Smith et al (1994), was adopted. This entailed asking the Executive to whom the team reported to identify the effective working team. In practice this meant that all direct reports were not necessarily included in the designated team. Whilst this introduced a risk of sampling bias (Moser & Kalton, 1971) it was believed that it could lead to more valid data in terms of team processes and behaviours (Smith et al, 1994). In the process of identifying members of the management teams, the Executives involved tended to identify individuals for inclusion who were, in effect, interfacing between the strategic direction of the organisation and the direction of groups concerned with tactical and operational issues. In this way it might be argued that

members included in the study were in the nature of "linking pins" in the systems view of an organisation (Likert, 1961; 1967).

Initially there was some concern at including a local government organisation in the sample. Stewart (1989) had argued that management in local government is significantly different from that in the private sector. It was proposed that such differences arose from the impact of the political context and the need to blend service provision and control functions. However, a more recent study to compare teams in the public and private sectors (Arroba & Wedgewood-Oppenheim, 1994) found that differences were somewhat minimal. They pointed out that, in government organisations, individuals are promoted to general management based on professional rather than managerial competence. However, Higgs (1988), in a study of the UK financial sector made precisely the same point in relation to promotional practices within that sector. On balance it was decided that the inclusion of local government senior management teams could be acceptable. The end results of the study could be examined to test for any differences based on type of organisation.

Within the overall sample there was very little representation of sales functions. This was primarily as a result of NatWest Life being a "manufacturer" of life assurance which is distributed through the parent bank's sales operations. The effective exclusion of the sales function from the selected managerial teams may limit the generalisability of the results, as may the relatively small number of organisations covered (Yin, 1989). Details of the final sample are summarised in table 9.2.

Table 9.2 Sample Description

Number of Teams: 54			Number of teams members: 196	
	Mean	Standard Deviation	Range	
			Minimum	Maximum
Age	38.36	6.06	28.0	53.0
Level ⁽¹⁾	2.12	0.70	3.0	1.0
Team Size	3.63	1.61	2.0	10.0
Tenure	1.31	0.96	0.27	3.59

Note ⁽¹⁾ Level denotes reporting levels below the CEO of the organisation (in line with methodology reported by Dulewicz, 1995(a) and Sarawano 1995).

The gender composition of the sample was 146 males (74.5 per cent) and 50 females (25.5 per cent). There is little data presented on the general composition of samples in the reported team and group interaction process models which examine managerial and senior managerial teams. It is, therefore, difficult to comment directly on the implications of the gender structure on the results from the current study. Belbin (1976; 1981) used a sample of managers participating in the Henley Senior Management programme in developing his team role model. An analysis of

the available Henley data on historic gender composition of participants (Dulewicz, 1996) was made available for use in this study. As the 16PF is the basis of calculation of the Belbin Team Roles (Belbin, 1976; 1981; Dulewicz, 1995(a)) it may be instructive to look at the gender structure of the UK 16PF norms in order to provide a basis for considering the implications of the gender structure of the sample used in the current study. A study which specifically examined the 16PF norms for UK Managers conducted by Bartram (1992) also provides a useful 'benchmark' for examining gender composition in managerial roles in UK organisations. The gender distributions from these three sources are compared with the distribution in the current sample in table 9.3. Although the current study provides a significantly smaller sample than those outlined in table 9.3, it is considerably closer to the distribution on a gender basis presented by Bartram (1992) than other 'benchmarks'. This indicates that the sample may be reasonably representative of management team populations within the UK.

Table 9.3 16PF Gender Distribution and Current Study Gender Distribution

	Male		Female	
	n	%	n	%
Henley Sample ¹	1104	96.3	38	3.7
Bartram Sample ²	1441	80.2	355	19.8
UK 16PF General Population Norms ³	1107	49.9	1113	50.1
Current Study	146	74.5	50	25.5

Notes: ¹ Dulewicz 1996 ² Bartram 1992 ³ Saville 1994

The team size represented in the sample had a range of 2 to 10 (see Appendix XIII for further details of the sample distribution). This range is smaller than that represented in a number of Senior Management team studies (eg, West & Anderson, 1996). However, the upper end of the range in this study is within the team size limit (11 managers) indicated by Thomas and Fink (1963) beyond which some benefits of teamworking begin to decrease.

9.3 Results from Initial Interviews and Focus Group Discussions

Purpose of Interviews and Focus Group Discussions

The main purposes of undertaking a series of interviews and focus group discussions with Executives and Senior Managers from organisations participating in this research study were:

- i) to identify the need and scope for refining the instruments to be used in collecting quantitative data relating to team processes and team outcomes;
- ii) to develop an understanding of the issues which may need to be addressed in employing the team process and team outcome instruments within the participating organisations;

- iii) to provide a qualitative insight which would help to validate the selection of the core instruments which was informed by the initial literature review.

Methodology Employed in Interview and Focus Group Discussions

This qualitative element of the study was initially intended purely to obtain information to inform the development of questionnaires. As Moser and Kalton (1971) point out "any survey is only as good as the questionnaire on which it is based". Furthermore, Oppenheim (1966) and Youngman (1984) highlight the value of interviews in developing effective questionnaires. Whilst questionnaire development was, initially, the main purpose of this stage of the research, the process of obtaining qualitative data for such a purpose offered somewhat broader possibilities. Obtaining qualitative data provides the possibility of answering questions relating to the formulation of understanding and meaning in relation to the phenomena being studied (Robson & Foster, 1989) and can, to an extent, offset the charges made against positivism that the contribution from the paradigm can be "trivial and fail to answer the question 'why?'" (Easterby-Smith et al, 1991).

Without wishing to embark upon a lengthy debate around the respective merits and contributions of differing research philosophies and paradigms, the pragmatic opportunity of using the qualitative element of the research has been identified to, at least, touch upon some broader interpretive issues. It is increasingly clear that the research process is by no means a "clean" one in terms of methodology. As Beckhofer (1974) points out:

"The research process, then, is not a clear cut sequence of procedures following a neat pattern, but a messy interaction between the conceptual and empirical world, deduction and induction occurring at the same time."

In general there is a growth in the recognition of the contribution of qualitative methodology to sociologically-based research (Bryman & Burgess, 1994; Easterby-Smith et al, 1991). Bryman and Burgess (1994) highlight the value of balancing qualitative and quantitative data to build up a "rounded and credible" overall picture of the phenomena under investigation. They provide an interesting framework for considering the respective contribution of qualitative and quantitative data which is summarised in figure 9.1.

Figure 9.1 Research Model

	Research Paradigm	
	Qualitative	Quantitative
Data Based On:	■ Specific illustrations	■ Normative Statements
Claims Based On:	■ Inductive, qualitative logic ■ Process Analysis	■ Statistical logic ■ Sample Structure

Source: Bryman and Burgess (1994)

Against the background, outlined above, it was possible to obtain access to executives and managers within one of the participating organisations (NatWest Life) to conduct interviews and focus group discussions. Ideally a sample from all three of the participating organisations should have been included in this element of the study. However, it was not possible to gain access to Executives and managers in the two other organisations. This does provide a limitation on the qualitative data. Nevertheless, this was a particularly important opportunity as NatWest Life provided a high proportion of the managerial teams to be included in the overall study (see sample section above). Whilst the organisation was willing to co-operate extensively with the research it was necessary to be aware that it would be difficult to obtain sustained access to executives and senior managers, and that time would have to be used as effectively as possible. An important element in the interview and focus group process would be that of enabling questions (within the ultimate questionnaires) to be developed and phrased in a way which would be both relevant to the model and meaningful to the participants in the context in which they would be responding.

Before embarking on an interview schedule a meeting was held with the HR Resourcing and Development manager to ascertain the predominant values within the organisation and develop an understanding of the context within which teamworking should be explored.

From this meeting the following main points emerged:

- i) NatWest Life is a very flat organisation with only **five** hierarchical levels;
- ii) There is a significant step, in hierarchical terms, between managerial and non-managerial employees;
- iii) The organisation considers itself to be values driven - not for altruistic purposes, but to build competitive advantage. The core organisational values relate to: empowerment, openness in communication, teamworking, self-development; customer focus; and continuous improvement.

Following this meeting it was agreed that access to executives and senior managers could be obtained both individually and in groups. In order to obtain the maximum coverage in the time available, it was decided to conduct a mixture of individual interviews and focus group discussions. The structure of the sample is summarised in Table 9.4.

Within this sample the mix between interviews and focus group discussions was as follows:

- | | |
|---|---|
| i) Interviews (with Executives and Senior Managers) | 9 |
| ii) Focus Group discussions (with managerial, staff and mixed groups) | 6 |

In planning the interviews it was important to be aware that this is a time consuming process and one which can be highly subjective and present problems in analysing the data obtained. However, these inputs could add value to the process by "putting flesh on the bones of questionnaire responses" (Bell, 1992). One to one and a half hours was allowed for each interview.

Table 9.4 Structure of Sample for Interviews and Focus Group Discussions

■ Executives (including Chief Executive)	4
■ Senior Managers	11
■ Managers	16
■ Other Staff	9
TOTAL	40

In preparing for the interviews the dangers of bias and subjectivity were considered (Moser & Kalton, 1971; Oppenheim, 1966) and also the potential response to this by introducing a higher degree of structure and formality (Grebenik & Moser, 1962). On balance an open style interview approach was adopted using a very broad range of headings rather than a highly structured approach (Youngman, 1984; Easterby-Smith et al, 1991). This could act as a risk to reliability (Bell, 1992) but would provide potentially "richer" data (Blyth & Robson, 1981) by following an approach in which questions, in detail, would be dependent on the content of previous answers and the interviewer's perceived meaning of that answer. In terms of overall interview structure the broad areas to explore were determined by the overall research hypotheses. These areas were adjusted as responses were reviewed (Blyth & Robson, 1981; Verma & Beard, 1981).

The focus group discussions were approached on a similar basis to the interviews. However, more time was allowed for these discussions to take account of the need for more effort in building a trusting relationship and to allow for the group dynamics (Fuller, 1984). The groups had been selected to comprise some five participants as this appears to be an optimum number (Robson & Foster, 1989) and two hours were allowed for each session. In conducting these focus group meetings it was important to be conscious of the group's sensitivity to the interviewer, particularly during the introductory phase, and to emphasise that the main goal was to gain understanding (Robson & Foster, 1989). In conducting the meetings it was important to: i) use open questions; ii) use non-directive questions; iii) reveal little of personal views and biases in the phrasing of the questions; iv) avoid interrupting the group; and v) follow up on group comments to obtain clarification or illustration.

Notes were taken during all of the interviews and group discussions. These were written up immediately after the meetings. As this stage of the research study was largely exploratory the interview notes were not reviewed by the participants (a step which would have been necessary in a full qualitative study - Easterby-Smith et al, 1991).

Analysis of Interview and Focus Group Data

The overall approach to analysing the data obtained from the NatWest Life interviews and focus group discussion was designed to: i) explore the organisational implications and support for the findings from the literature review and decisions on overall research model; ii) develop insights

into the format for measurement/assessment of team performance; and iii) provide input into the design of an instrument to assess process factors impacting on team performance.

The data provided from qualitative research is not objective and exterior, but is constructed and given meaning by the participants (Husserl, 1946). Whilst this is valuable in terms of the predominant aim of developing questionnaires which are meaningful to potential respondents it does make the analysis of the data somewhat difficult. The problem of analysis is compounded when seeking explanation from a large volume of "rich data" (Barber, 1976). However, the process of analysis is eased when using a clear framework determined with a specific perspective in mind (Easterby-Smith et al, 1991). Given the overall aims of the research and the specific purpose which the qualitative phase was designed to serve (ie, to develop and/or refine questionnaires and relate the organisational realities to the literature) a framework for the analysis of the interview and focus group data became evident. This framework may be summarised as follows: i) Assessment of team performance (benefits of teamworking); ii) performance measures (using the outcomes components of the Hackman-Morris model); iii) effectiveness factors (using the Hackman-Morris model); and iv) analysis of team processes. Within this framework the main points to have emerged from the analysis of the interviews and focus groups are explored in the following sections.

Assessment of Team Outcomes

The main points, in relation to team outcomes, which emerged from this stage of the research were as outlined below.

i) Benefits of teamworking

From an analysis of the literature on teams and teamworking the main identified benefits would appear to be:

- a) **Performance:** i) Teams tend to be more productive than individuals operating independently (Tjosvold, 1991); ii) Teams can achieve results more rapidly (Blake et al, 1987); iii) Teamworking can facilitate organisational change and corporate renewal (Ghoshal & Bartlett, 1995); iv) Teams tend to outperform individuals in terms of problem-solving and cognitive tasks (Hill, 1982); v) Teamworking unlocks the potential within groups (Woodman & Sherwood, 1990); vi) Teamworking is an important variable in all organisational performance (Likert, 1961).

Within the NatWest Life Study many of these performance-related benefits were reinforced. However, some additional performance-related benefits were identified which were: i) building organisational capability; and ii) developing required organisational culture. These additional elements were illustrated by the following quotation from a manager in the NatWest Life study which underpins the competitive advantage issue raised by Ulrich and Lake (1990):

"At the end of the day our main capability as an organisation is built from our people. If we develop our people through good teamworking then we can increase our capability as an organisation; and our ability to compete".

ii) Impact on Morale and Motivation of Team Members

The key benefits, indicated in the literature, of teamworking in terms of its impact on team members may be summarised as: a) Teamworking leads to greater satisfaction amongst team members (McGrath, 1984, Woodman & Sherwood, 1990; Margerison & McCann, 1985; Adair, 1986; Arkin, 1995); and b) Interventions to build teamworking invariably have a positive impact on the attitudes and perceptions of team members (Tannenbaum et al, 1992). Again these points were borne out by the information obtained from the NatWest Life interviews and focus groups.

iii) Benefits in Terms of Processes and Team Roles

The major benefits, identified in the literature, relating to team processes and roles are:

a) Teams pool information to solve effectively a variety of intellectual tasks (Laughlin, 1988); b) Within a team the facility to express differences and the discussion of minority views leads to improved quality of decisions (Maier, 1970); and c) High commitment of team members leads to the stimulation of greater effort and output (Katz, 1982). Interviews and focus group discussions with the NatWest Life participants provided support for these benefits. As one executive explained:

“It’s all about diversity. If we respect everyone’s contribution, whatever their discipline or experience, we can get a better result.”

In addition to the above benefits the interview and focus group participants identified process and role benefits relating to: a) Problem-solving and decision-making: *“Teams produce better decisions than individuals. They are easier to implement and have fewer ‘holes’ in them”*; *“Teamworking helps us to see old problems in totally new ways.”*; b) Commitment to decisions and plans: *“If we have all been involved in a plan or decision then we are much more willing to pull together and achieve results when we face a crisis or things go wrong”*; *“Its not just the complex decisions which teams are good at. Working as a team we can make the ‘hard’ decisions like those involved in downsizing to meet market challenges.”*; c) Improving communication: *“Working through teams we can improve communication. Talking to the team as a whole increases our chances of getting clear and consistent messages across.”*

Measuring Outcomes

In attempting to measure team performance objectively there are a large number of variables which are potentially involved. The problems of isolating the impact of individual variables on performance are highlighted by McGrath (1984). Many authors have identified the problems of establishing truly objective measures of performance (Furnham et al, 1993; Senior, 1997; Dulewicz, 1992; Fisher & Macrosson, 1994; Thornton & Byham, 1992). In attempting to overcome this difficulty, assessment of performance from a number of perspectives has become a common practice (Hackman, 1976; Cohen & Ledford, 1994; Senior, 1996; Dulewicz, 1992; Thornton & Byham, 1982).

The Hackman-Morris model (1975) describes **outcomes** as performance outcomes and “other” outcomes. This seems to align with the points made by other authors in terms of the complexity of team performance measurement. In reviewing the information obtained from interviews and focus group discussions with NatWest Life executives and managers the complexity of measuring team performance is reinforced. A range of “hard” measures was identified including achievement of objectives, delivery against plan and achievement of agreed standards. However, the data highlighted the importance of the “other” outcomes (Hackman & Morris, 1975). Quotes from participants in the study which reinforced this point included:

“Its wrong just to focus on ‘hard’ results. A good team is one that gives you a feeling that they are committed to delivery against the odds.”

“Its not just **what** a team delivers, its more about **how** they deliver results.”

“The only way to look at a team’s performance is to consider how good they are at managing both ‘hard’ and ‘soft’ performance issues.”

In terms of the “other” outcomes, the discussions with NatWest Life Executives and managers identified a number of dimensions which have not been seen within the literature when mapped on to the Hackman-Morris model. These are:

- a) Ability to make change happen: *“I judge a team by their ability to make change happen”;*
- b) Ability to handle crises: *“How a team works in a crisis is the litmus test of teamworking”;*
- c) Adaptability: *“I look to see how ‘fleet of foot’ a team is. Can they adapt and work effectively in a variety of situations”.*

Review of Team Input Factors

The Hackman-Morris Group Interaction Process Model (Hackman & Morris, 1975) categorises effectiveness factors as follows: a) input factors: individual, group and environmental level factors; and b) process factors. In exploring the input factors in the initial qualitative research the main points, in line with the Hackman and Morris classification, are summarised in the following sections.

i) Individual Level Input Factors

Analysis of the NatWest Life data showed that most of the individual level factors mapped from the literature onto the Hackman-Morris model were identified by participants as being important team effectiveness factors. Whilst the mix of skills and personalities of team members was seen as a critical factor the difficulty in identifying what that mix should be was highlighted by NatWest Life participants.

“In terms of mix there are no absolute formulae. Each team has to have the right mix of skills and experience to fit it for its purpose”.

The mix was often expressed by participants as being concerned with the balance of technical expertise and having members able to deal with interpersonal and process issues.

"It is critical that we have some people in the team who are good at dealing with the 'soft stuff' - that can often make such a difference".

Differences in terms of skill and competency mix between the NWL participants' views and the points highlighted by the literature related to: a) the importance of technical competences: "*Technical or functional excellence is a given in a good team*"; and b) the overriding need for all members to have a high level of **achievement orientation**: "*Whatever the individual differences are, it is critical that everyone in the team is driven to perform*".

As with the evidence from the literature (Tjosvold, 1991; Blake et al, 1987; Margerison & McCann, 1985; Nixon, 1990; Higgs & Rowland, 1992) the NatWest Life participants emphasised the importance of clarity over roles and expectations:

"It is important to sit down with the team and agree what it is that we can all expect each member to contribute."

"If everyone knows what their role is and how it helps the others then the team will work well."

In addition, the data from this qualitative stage of the research endorsed the view (Tjosvold, 1991; Bushe, 1986; Drucker, 1988; Tannebaum et al, 1992; West & Slater, 1995) that the team need to see a value in working together and feel that their individual contributions are valued:

"Teamwork will only happen if everyone believes that their contribution is important and will really be recognised."

ii) **Group Level Input Factors**

As with the individual level factors, there appeared to be a high degree of convergence between the views of NatWest Life interview and focus groups participants and the factors identified from the review of the literature. In particular the interviews and focus group discussions highlighted the need for a non-hierarchical structure to support effective implementation of teamworking.

"Your chance to make a difference depends on what you say not what your title or grade is."

"Our boss is one of us. Not in an artificial way - he really is. He pulls his weight, finds out where we need help and then gets it. If he can't get help he will always tell us."

iii) **Environmental Level Input Factors**

The nature of the **tasks** performed by teams is seen as an important effectiveness factor (Tjosvold, 1991; Higgs & Rowland, 1992; Deutsch, 1985; Belbin, 1981). With management teams the focus which optimises effectiveness is on complex and strategic tasks involving high levels of ambiguity and uncertainty (Critchley & Casey, 1984). This point was certainly underlined by the NatWest Life managerial participants.

"Sometimes it is a waste of time going to team meetings or working together - it just takes twice as long to sort things out. Where working together really makes a difference is when the job is so difficult, or no-one knows quite what to do."

From the interviews and focus group discussions there was a high level of consensus on the importance of the **reward structure** in reinforcing teamworking (Brown, 1995):

"What you get paid for is what is important."

The environmental level factor relating to organisational culture is a fairly broad one. Within the literature, however, there appears a significant degree of agreement relating to the importance of the organisational culture and climate in supporting and promoting effective teamworking (Ray & Bronstein, 1995; Tjosvold, 1991; Deutsch, 1985; Bushe, 1986; Blake et al, 1987; Katzenbach & Smith, 1993). The data from the NWL interviews and focus groups provides strong illustrations of, and support for, the contention that organisational culture is a significant teamwork effectiveness factor:

"Teamwork only really took hold around here when people stopped being blamed for mistakes."

"The real difference here is that we can question the way things are done. No, it's more than that - you aren't really contributing unless you challenge ideas. And, if you can come up with some really 'off the wall' idea then that's a real 'Brownie point'."

In addition the discussions with participants reinforced the importance of a clear example from the top (Ray & Bronstein, 1995; Tjosvold, 1991; Woodcock, 1986).

"If the Chief Executive says teamwork is important, but doesn't listen to his other executives, then we won't believe him. Simple as that - do what you say."

The data from the interviews and focus group discussions revealed one dimension which may be considered as an environmental level factor, but does not appear to be covered in the literature. This dimension related to the perceived threat to the organisation and/or individuals arising from the nature of the external environment. Many participants perceived the **highly challenging** (and for some, threatening) **competitive environment** as a **stimulus** for teamworking.

"It's us against the rest of the financial sector. That's what generates teamwork - 'us against them'. Compete with another company not with each other."

An overall review of the data from the NatWest Life study indicates that most of the **input factors** identified from the literature and grouped within the Hackman-Morris model are relevant to teamworking within the company. However, the additional factors which emerge from an analysis of all of the interviews and group discussions are: i) Willingness to accept challenge from others; ii) Achievement orientation; iii) Breadth of perspective; iv) All understand required competences; v) Need for 'universal' technical excellence; vi) Need for a mix of 'hard' and 'soft' skills; vii) Clarity of roles; viii) Explicit identification of required contributions; ix) Roles understood by all members of team; x) Leader as a team member; xi) Need to reward appropriate behaviour; xii) Demonstration of the business need for teams.

Team Processes

From a review of the literature a wide range of factors, impacting on team performance, were identified which could be categorised within the Hackman-Morris model as **process factors**. These factors are grouped under three main process headings: Objectives, Interaction and Management/Leadership.

i) Objectives

The information obtained from the NatWest Life participants coincided with, and reinforced the importance of, the role of objectives, goals and clarity of purpose in facilitating and enabling effective team performance (Katzenbach & Smith, 1993; Tjosvold, 1991; Ray & Bronstein, 1995; Blake et al, 1987; Nixon, 1990; Deutsch, 1985):

“We all need to know what we are trying to do as a team and how that will make a difference to the business. Also we need to have a chance to say what we think we should be doing.”

There was a strong sense amongst participants that NatWest Life has a dominant **performance culture** and, it was, therefore, perhaps unsurprising that such a high level of alignment was encountered between participants' views and those encountered in the literature on the factor of purpose and objectives. However, in spite of the strength of emphasis on performance within NatWest Life there emerged a clear endorsement, by participants, of the need to balance **challenge and achievability** in the teams' goals and objectives (Katzenbach & Smith, 1993; Hastings et al, 1986):

“If you want to kill a team give them some totally impossible goals and timescales.”

The data from NatWest Life does indicate a potential dimension under the heading of 'objectives' which did not appear to emerge from the literature. Participants consistently emphasised the importance of **monitoring progress and performance** and keeping track of the extent to which goals and objectives were likely to be achieved:

“We need to keep on top of how we are doing. That doesn't mean just giving us the financials. We need to keep track of the other indicators, such as how customers see us. It is also really good when we keep track of how well we are working together.”

Implied in this comment is that objectives should relate to both 'hard' and 'soft' areas of performance. Within NatWest Life a structured team development process (known as 'Cascade') is used at all managerial levels. An important element in this process is the agreement and monitoring of personal behaviour goals within the team. This is achieved through a mechanism which they refer to as “PEGS” [Personal Expectation Graphs].

The participants in the study provided information indicating that the majority of the factors under the process heading of **Objectives** were likely to apply within their organisation. However, the following potential additional factors emerged from the responses of the participants: a) Clarity of vision and purpose; b) Processes for regular performance monitoring; c) Need for a 'balanced' range of objectives (ie, both 'hard' and 'soft' objectives).

The very wide range of interaction dimensions identified from a review of the teamworking literature may be condensed under the following broad headings: a) Building cohesiveness; b) Decision processes; c) Communication processes; and d) Team learning.

The data from the NatWest Life study provides evidence to indicate that many of the dimensions highlighted in the literature were perceived as important to building effective teams by the participants. A lot of emphasis was placed, during the interviews and focus groups discussions, on **decision processes**:

"Exploring ideas before making decisions is helpful. It is fun to challenge suggestions when we all accept that there is nothing personal in it. We all know that any idea which survives our challenges is likely to be a good one."

"Nothing is impossible. If we face a problem then we try to look at it in a new way or challenge existing rules and ways of working."

Participants highlighted the importance, for them, of **meetings** in building effective teamworking.

"You can only work as a team if you spend time together. I don't just mean in formal settings. You also need to get together just to talk, or even just to socialise. Some of our best team discussions happen in the pub after work."

The 'Cascade' process referred to above together with the process of obtaining behavioural feedback from multi-sources (PEGS) was seen by many participants as being core to facilitating effective team interactions. These processes were seen as important in establishing **behavioural ground rules**:

"We only really started working as a team when we established some ground rules. It was hard to do, but we sat down and discussed the sorts of behaviour we wanted and the behaviour we would not accept. The most difficult part was telling someone that they had broken the rules."

The range of items under the heading **Interactions** in the Hackman-Morris model is considerable. From an analysis of the NatWest Life interviews and focus group discussions it appears that many of these are endorsed. In addition the following possible items are suggested: a) Importance of regular feedback; b) Role of multi-source (360°) feedback; c) Avoiding blame in dealing with each other; d) Regular reviews of team learning; e) Non-judgemental decision-making; f) Focusing on results and action; g) Balancing achieving consensus with delivering results; h) Agreed standards of behaviour; i) Mutual clarification of expectations; j) Understanding of each others' skills and contribution; k) Reflecting on both process and content; l) Need for social as well as business meetings and contact.

The role, style and behaviours of the team leader are seen by a number of authors and researchers as being important process factors impacting on effective team performance (Tjosvold, 1991; Woodcock & Francis, 1981; Robinson, 1991; Adair, 1986).

This was certainly borne out by the participants in the qualitative study interviews and focus group discussions. In particular they highlighted: a) Adaptability: *"A good team leader has to be a chameleon. When we want clear direction he should provide it. When we want to be left alone he should back off"*; b) Providing support and trusting members: *"There is no set profile for a good (team) leader. If the leader understands, supports and trusts the team, then the team will work well. It is like steering a ship - a gentle hand on the rudder is all that is needed - as long as we all agree where we are trying to get to"*; c) Encourage improvement: *"The most important thing a team leader can do is to encourage us to find better ways of doing things. At the same time it is important that the leader accepts we may find better ways of leading the team"*; and d) Openness: *"It is important that the team leader is completely open with the team. We should get the bad news straight - we don't need protecting and we are all in it together."*

Overall this element of the research study produces a range of possible managerial/leadership factors which are broadly similar to those mapped on to the Hackman-Morris model from a review of the literature on teams and teamworking. However, a number of additional factors appear to emerge which are: a) Rotation of leadership; b) Provision of a clear example; c) Commitment to continuous improvement; d) Willingness to receive and confront feedback; and e) Acting as a coach to team members.

Conclusions from Interviews and Focus Groups

Reviewing the information obtained from the interviews and focus group discussions conducted within NatWest Life indicates that, in practice, within a specific organisation, the literature (organised within the Hackman-Morris model framework) identifies effectiveness factors which appear to make sense. However, some further factors emerge. Some of these appear to warrant different classification within the model (for example, team leader providing an example is discussed in NatWest Life as a leadership/process factor and within the literature the classification emerges as an input/environmental factor). Others do appear to be either additional factors or sub-sets/examples of factors identified from the literature review. Overall, it would seem that the model appears to offer a reasonable starting point for developing a questionnaire to be used in exploring teamwork effectiveness factors.

In examining team outcome measurement the NatWest Life study has highlighted and reinforced the problems of arriving at clear and purely objective measures of performance. The conversion of the feedback from this study into the development of questionnaires to be used in the more detailed quantitative study within this research project is examined below.

Impact of Interviews and Focus Group Discussions on Questionnaire Design

Before examining the development of specific questionnaires for use in this research project it would be valuable to reflect on a number of the basic issues associated with the use and design of questionnaires in quantitative research. Some of the major issues and considerations are examined below.

i) **General Considerations**

The overall aim of a questionnaire has been summarised by Wright and Fowler (1986) as:

“To provide an **observable** empirical measurement of an **unobservable** concept that underlies the measured response.”

This presents a problem in terms of evaluating how well a questionnaire represents the underlying theoretical concept (Oppenheim, 1966). The problem tends to be addressed by designing questionnaires in a way which will maximise their reliability and validity (Moser & Kalton, 1971; Easterby-Smith et al, 1991). In social research the term ‘questionnaire’ is used fairly broadly and can be applied to instruments which are administered by an interviewer and those completed by the respondent unaided. Within the context of this research the questionnaires to be completed by team-members and team-mangers are to be completed by respondents unaided by an administrator or interviewer. Thus the specific issues relating to such questionnaires need to be considered. In general questionnaires are used in “survey research” and need to be considered within the parameters which apply to such research.

Graziano and Raulin (1989) have identified some broad and practical considerations relating to questionnaire design which are: i) have a clear view of the general area of information that is to be obtained and identify the population from whom to obtain it; ii) determine exactly what questions are to be asked and what scales will be used in recording responses; and iii) ensure that the survey instrument adequately covers the area in which information is sought and is designed so that information can be reliably and validly obtained. The overall design options can be seen as cross-sectional or longitudinal and the option selected will impact on the survey design (Graziano & Raulin, 1989).

ii) **Self-Reported Questionnaires**

The overall design for this research is cross-sectional. Within that design questionnaires will provide input in relation to respondents self-reported opinions and views as well as assessment of performance data. In using self-reported survey questionnaires Moser and Kalton (1971) highlight the point that questions must be practicable and capable of being answered by the intended respondents. They emphasise the value of exploratory research through interviews and focus groups in establishing the issues in terms that respondents can relate to and in identifying meaningful language which will enable respondents to identify with the questions. In using questionnaires in a self-reporting context, Moser and Kalton (1971) identify a number of potential problems: i) avoidance of respondents extreme answers (error of central tendency); ii) tendency for leniency and/or severity in responses; and iii) “halo” effect (ie, classifying objects on each scale according to respondents’ general impressions rather than the measuring of specific scales).

Overall, particularly in relation to items concerned with opinions, there are concerns over subjectivity, bias and lack of differentiation (Moser & Kalton, 1971; Oppenheim, 1966; Easterby-Smith et al, 1991). However, these may be addressed through attention to questionnaire design

and scaling of questions (Moser & Kalton, 1971; Easterby-Smith et al, 1991; Wright & Fowler, 1986). A major issue associated with self-reported questionnaires is that of bias or attempts to provide "perceived correct" or "desirable" responses (Moser & Kalton, 1971; Easterby-Smith et al, 1991; Schwartz, 1990). However, as Schwartz (1990) points out:

"... self-presentation concerns do not seem to play a major role with non-threatening questions."

In general, it would seem to be important that questionnaire design is based on, and responds to, an awareness of the potential problems that may arise and incorporates strategies to deal with these problems.

In order to identify the modifications required to the Dulewicz and Herbert questionnaire, the factors emerging from the literature have been mapped onto the Hackman-Morris model (details are provided in Appendix XIV) and compared with the NatWest Life interview and focus group themes. The identification of the main interview and focus group themes was established on the basis of the relatively simple content analysis of the meeting notes. This comparison provides a basis for: a) Identifying gaps which would appear to warrant the inclusion of further items; b) Identifying items in the Dulewicz and Herbert questionnaire which do not appear relevant to the senior management group; and c) Identifying where items in the Dulewicz and Herbert questionnaire may require modification to the wording in order to apply to the target population for this study. The results of this comparison are discussed below.

The items which are indicated from analysis of the NatWest Life focus groups and interviews and Hackman-Morris model which are not covered in Dulewicz and Herbert questionnaire may be summarised as follows: a) Existence of measurable and achievable goals and objectives; b) Clarity and reality of timescales for tasks; c) Existence of feedback from a number of different sources; d) Decision-making processes are non-judgemental; e) Team agree on standards of behaviour to be applied; f) Mutual clarification of expectations; g) Members understand each others skills and contributions; h) Leader effectively manages interfaces; i) Leader effectively removes barriers to team's performance; j) Leader structures roles and contribution of team membership; k) Leadership of the team is rotated amongst members; l) Team leader sets a clear example of behaviour; m) Leader acts as a coach to team members; n) All have clear roles; o) All understand roles of other members; p) Mix of skills is important; q) Need for technical excellence; r) Explicit identification of required contribution of each member; s) Different individual personalities/styles is important; t) Need for supportive recognition/reward structure; u) Recognition of team's success is important; v) Leader also acts as a team member; w) Members of the team are selected specifically rather than inherited; and x) Team are involved in establishing the team's goals and objectives.

A number of the items in the Dulewicz and Herbert Board Effectiveness Questionnaire relate specifically to Boards and the wording would require modification for application to management teams. Furthermore, a number of items do not relate specifically to the factors identified either from the team literature review or the NatWest Life interviews and focus groups.

However, the number of such items is relatively small and it may be worth retaining them for examination in comparing management teams with boards in subsequent research. (Items in the Dulewicz & Herbert Questionnaire not directly required are numbers 4, 9 and 14).

In exploring the type of decisions and tasks handled by the team, the Dulewicz and Herbert Questionnaire has one item (number 1) examining task type. The field research within NatWest Life, as well as the literature, indicates that task and decision complexity and type may be related to team effectiveness and performance (Tjosvold, 1991; Higgs & Rowland, 1992; Deutch, 1985; Margerison & McCann, 1985; Belbin, 1981; Woodcock & Francis, 1981; Lawrence, 1994). The decision-making context of managerial teams was examined by Berthon, Money and Pitt (1994) using questions designed to rate their jobs in terms of the percentage of types of decision they encountered. Respondents were provided with definitions of strategic operational, structured and unstructured decisions. However, interview and focus discussions identified that such distinction would be difficult to make in practice.

The Hackman-Morris Model identifies both performance outcomes and "other" outcomes, from the application of the input and process factors. Within the NatWest Life study the need to balance both "hard" and "soft" performance measures was identified. This finding aligns with the model and with the general conclusions from the literature (Ray & Bronstein, 1995; Tjosvold, 1991; Adair, 1986; Belbin, 1981; Margerison & McCann, 1985; Higgs & Rowland, 1992).

From the analysis of the NatWest Life interviews, and focus group discussions, the items to explore in terms of performance would seem to be: a) Achievement of team goals and objectives; b) Achievement of individual goals and objectives; c) Customer satisfaction; d) Change focus; ability to make change happen; e) Innovation/generation of ideas; f) Commitment of team members; g) Team learning and development; h) Individual learning and development; i) Team cohesiveness; j) Ability to manage conflict constructively; k) Motivation of team members; l) Team's ability to cope with crises; m) Ability to turn decisions into action; and n) Team is proactive rather than reactive. Based on this list it is evident that a number of "performance" items are covered in the Dulewicz and Herbert Questionnaire. These are summarised in table 9.6 below. The items relating to the assessment of outcomes which are included in the outcome questionnaire cover the major 'hard' and 'soft' elements of team performance which emerged from the NatWest Life interviews and focus group discussions.

In addition to the specific performance items in the questionnaire a number of the items in other sections relate to assessment of 'other outcomes' (using the Hackman-Morris terminology). These specific items relate to cohesiveness and skill mix within the teams. These items taken together can be used for obtaining the perceptions of the teams' performance from the managers responsible for the teams.

In addition it would be helpful to obtain team-managers' perceptions of the extent to which the team handle unstructured and strategic tasks and problems. Using all of these items produces a relatively short questionnaire (17 items). This will be helpful in achieving a high level of

response, particularly as managers will need to complete a questionnaire in respect of all teams for which they are responsible.

Table 9.6 Performance Items from Dulewicz & Herbert Questionnaire

Item Required	Item in Dulewicz and Herbert Questionnaire
Managing change	13
Commitment of team members	40
Team cohesion	25

9.4 Input Measures

This section examines the results found from the use of quantitative elements relating to the input factors in the overall model. In particular the individual factors are discussed and the interrelationship between these factors are examined to identify the implications of these on the overall model. The input factors in the study are:

- i) Belbin Team Roles;
- ii) Supra-Competences;
- iii) Watson-Glaser Critical Thinking Appraisal;
- iv) Productive Thinking Test (developed by Dulewicz & Fletcher, 1986).

Belbin Team Roles

All participants in the study completed a 16PF questionnaire. The Belbin Team Roles for each member were calculated from the 16PF using the formula published by Dulewicz (1995(a)) which was that originally employed by Belbin (1976; 1981). This formula produces a sten score for each Team Role for each individual. In determining dominant Team Roles for individuals Belbin (1976) selected those with a sten score of eight and above. This cut-off for determining Team Roles has been used in a number of subsequent studies (eg, Senior, 1997; Fisher, Macrosson & Walker, 1994; Dulewicz, 1995(a); Berry, 1995). In some studies a lower level cut-off of sten 7 has been employed (eg, Senior 1993, Higgs, 1996(a)). Employing the lower sten cut-off produces a higher proportion of Plant and Monitor Evaluator roles (which are reputed as being relatively under-represented roles in many studies as quoted above). However, as Belbin (1976, 1981) did not explore the implications of this, it was decided in this study to retain the 8 sten as the cut-off for determining a dominant Team Role.

The Monitor Evaluator role is often found to present difficulties in Team Role studies (Dulewicz, 1995(a); Furnham & Stringfield, 1993; Senior, 1997) as it is relatively rarely encountered and presents some problems in terms of construct validity. This is, no doubt, due to the

combination of underlying personality traits which, from the 16PF, are required in order to lead to the emergence of this as a dominant role (Dulewicz, 1995(a)).

In order to examine the representativeness of the sample in the current study, in terms of the distribution of team roles, the data were compared with the distribution reported for participants in the General Management Course (Herbert, 1990). This comparison would seem particularly pertinent as the original Belbin research was conducted with participants on this programme (Belbin, 1976; 1981). Table 9.7 shows this comparison. Examination of this table shows that the sample in the current study is considerably different from the Henley data in a number of important respects. These are:

- i) There is a large difference in the levels of Monitor Evaluator role (36.95 percent versus 4.0 percent);
- ii) There are notably lower level representations, in the study sample, of the Roles of Implementer, Plant, Completer Finisher, Resource Investigator & Team Worker;
- iii) There is a degree of under-representation of the Roles of Shaper and Co-ordinator.

These differences may be due to the somewhat specific nature of the sample, with a relatively high proportion of actuarial and financial specialists, and an effective absence of participants with sales and people-focused roles.

Table 9.7: Distribution of Team Roles: Study Sample Versus Henley Senior Management Programme Participants

Belbin Team Role	Percentage in Current Sample ①	Percentage in Current Sample ②	Percentage in Henley Senior Management Programme ①③
Co-ordinator	14.73	14.87	19.0
Shaper	2.84	6.81	4.0
Implementer	1.81	4.84	12.0
Monitor Evaluator	36.95	28.14	4.0
Team Worker	13.95	13.80	17.0
Resource Investigator	19.90	18.64	26.0
Completer Finisher	8.79	10.04	12.0
Plant	1.03	1.97	6.0

Notes: ① Based on 8.0 sten cut-off ② Using a 7.0 sten cut-off ③ As reported by Herbert 1990

The use of a 7 sten cut-off in calculating Team Roles produces a distribution which moves more towards that provided by the Henley data. However, given the decision (see above) to use the 8 sten cut-off there is an implication that this sample (for whatever reason) appears somewhat unusual. Therefore, the ultimate generalisability of the results and conclusions maybe somewhat limited.

In Belbin's original work (Belbin, 1976; 1981) he reported that he used the Watson-Glaser Critical Thinking Appraisal (CTA), together with behavioural observation, to finalise the allocation of a Team Role to an individual. The basis on which the CTA was employed has not been publicly reported. However, as the Plant and Monitor Evaluator roles are dependent on "intelligence" (as indicated by Factor B in the 16PF) it could be hypothesised that the CTA was used to link to these Team Roles. Indeed these hypotheses are borne out by the information provided by Life (1996).

Given the debate around the reliability of 16PF Factor B (Morgan & Morgan, 1990) it is conceivable that replacing these values with CTA scores in the Team Role equations (Dulewicz, 1995(a)) could produce a more accurate identification of the Plant and Monitor Evaluator Team Roles. A direct substitution of the 16PF Factor B sten score with a CTA sten score in the calculation of Belbin Team Roles was explored by Higgs (Ibid). He identified that the impact of such a change was to reduce the occurrence of the Monitor Evaluator and Plant Team Roles. However, as Higgs (1996(a)) points out the changes in the "intelligence" factor do not address the wider concerns and needs for further research into the roles dependent on this factor identified by others (eg, Dulewicz 1995(a)).

In an attempt to establish Team Role scores which were based as closely as possible on the original research conducted by Belbin, and further understand the use of the CTA, a co-researcher of Belbin's (Andrew Life) was contacted. In correspondence (Life, 1996) pointed out that in the original research the 16PF scores were to be used with a CTA raw score of 80 and above combined with a high score (unspecified) on the Evaluation of arguments scale in the CTA. Belbin proceeded to develop norms for each of the five scales in the CTA, based on a population of 337 members of the Henley General Management Course. Belbin subsequently developed his own instruments (including a Constructive Interpretation Test; CIT) to replace the CTA in his calculation of Monitor Evaluator roles. The CIT was used (along with other tests devised by Belbin) from around the mid 1970's onwards. Life (1996) does point out that the use of the CTA could lead to greater precision in the identification of the Team Roles of Plant and Monitor Evaluator. However, it is evident that Belbin did not employ a direct substitution of the CTA score for the 16PF factor B in his calculation of the Monitor Evaluator role. Furthermore, his development of norms for component scales in the CTA is in direct contradiction to the comments on such an adaptation in the Watson-Glaser CTA manual (Watson & Glaser, 1991).

"... (we) do not encourage efforts to utilise the part-scores on the test to evaluate individual attainment in the several sub-skills, since the part-scores are based on a relatively small number of items and, therefore, lack sufficient reliability for this purpose."

Finally it is reported, in a later section in this chapter, that there is no correlation (within the sample used in this study) between the CTA and 16PF Factor B. Within the literature no evidence of relationship has been reported (Life, 1996) and thus the lack of association is unlikely to be specific to the current sample. This could mean that two different constructs are being measured by the two instruments.

Overall, from the foregoing discussion, it appeared to be safer to adopt the more widely reported and employed formulae for the calculation of Belbin Team roles. However, investigation into the calculation of both the roles of Plant and Monitor Evaluator using alternative and combined measures of mental abilities would seem to be a fruitful area for further research.

The Belbin Team Role Formulae (Dulewicz, 1995(a)) are derived from 16PF profiles calculated using a general population norm base (Belbin, 1976). However, Bartram (1992) demonstrated clearly that the norms for the 16PF are significantly different when employing a managerial sample. Given these findings it would seem advisable to use 16PF norms derived from Bartram's findings in order to calculate the Team Roles for participants in this study. However, in doing this there would be a danger of either challenging or supporting established Team Role relationships on the basis of a differing underlying norm population. This might distort and complicate the interpretation of the overall findings of this study. It was therefore, decided for the purposes of this research to retain the use of the established general population 16PF norms. The significant 16PF norm differences reported by Bartram (1992) do, however, raise the possibility of further research into the Belbin Team Role constructs. Such research may contribute usefully to the prevailing debate on the validity of Belbin's model and move the focus from the Belbin Team Role Self-Perception Inventory (BTRSPI) to the roles as derived from the 16PF (Furnham et al, 1993; Senior, 1996; Dulewicz, 1995(a)).

The ultimate aim of the research, in terms of testing team process interaction models, requires parsimony in identifying the number of independent variables to be tested for a sample of 54 teams. The essence of Belbin's work (Belbin, 1976; 1981) was the identification of the significance of the mix of Roles in a team and the relationship between a "balanced" mix of Team Roles and the performance of a team. Berry (1995) pointed out the difficulties, in practical applications, of operationalising the construct of "balance". He developed the statistical Team Role Index model (which is described in more detail in Chapter 10) and provided a framework for the calculation of this Index. In the current study a Team Role Index score was calculated for each of the 54 management teams using the methodology reported by Berry (1995). The mean index score for the sample was 0.06 with a standard deviation of 0.02. The index scores ranged from a minimum of 0.01 to a maximum of 0.10 (a range of 0.09). The distribution of the scores was examined to test for normality. The Kolmogorov-Smirnov test was used for this purpose (Hair et al, 1995; Norusis, 1994) and produced a score of 0.8113 with a significance (two-tail) of 0.5258. Thus the distribution may be treated as normal.

Supra-Competences

In exploring potential input factors a mixture of personality characteristics associated with effective team performance and other elements were examined. It was decided to use the Supra-Competence model as a separate input factor given the emerging and growing evidence of relationships between competences and performance (see Chapter 8). Data on Supra-Competences of participants from Canada Life and Surrey County Council were collected using

the Job Competences Survey (Dulewicz, 1992). Scores on each of the 40 items in the questionnaire were obtained from both the individual participant and the executive to whom they reported. The overall score for each of the items was calculated on the same basis as in other research studies employing the JCS (ie, by averaging the participant and executive score - Dulewicz, 1992; 1994; 1995(a); Sarawano, 1995). The items in the JCS were converted into the twelve Supra-Competences employing the formulae reported by Dulewicz and Herbert (1992). Details of the formulae are provided in Appendix VIII.

Competence data for NatWest Life participants was available from recent assessment centres conducted by the company. However, NatWest Life used a competence model which differed from the JCS and Supra-Competence model. In chapter 8 the apparent similarity between the underlying constructs in the two models was discussed. In order to develop a consistent competence input measure for this study it was necessary to statistically examine the relationships between the two competence models and identify a basis for converting the NatWest Life competences to Supra-Competences. (Appendix X provides descriptions of the NatWest Life Competences employed in the assessment centres). The initial step in developing a basis for conversion of the NatWest Life competences was to obtain a sample of managers who had attended the assessment centre and arrange for them, and the executives to whom they reported, to complete the JCS. Agreement to participate was obtained from 38 managers. Completed usable questionnaires were obtained from 32 managers in this sample. The average age of managers in the final sample was 36.36 years (standard deviation 5.08 years). The mean level of the participants (level being measured as reporting level below the Chief Executive - Dulewicz, 1995(a)) was 2.34 (standard deviation 0.68). There were 24 men in the sample (75.0 percent) and 8 women (25.0 percent). For all participants the JCS scores were compared to the assessor rated competency scores in the assessment centre through multiple correlation. The results of this analysis are summarised in table 9.8. This table only shows the significant correlations, full correlations are shown in Appendix XXII. A review of the results of this analysis suggests that there are clearly a number of significant relationships between the scores on the two sets of competence data. However, given the ultimate aim of arriving at a Supra-Competence conversion, it was not possible to establish a clear linkage on the basis of correlations alone. It was decided that the level of interrelationship appeared sufficient to warrant conducting a multiple regression analysis using the calculated Supra-Competence scores as the dependent variables.

The NatWest Life competency data was reviewed to test for normality of the independent variables as a pre-requisite for multivariate analysis (Hair et al, 1995; Norusis, 1994) and no statistically significant results were found for any of the variables. Thus the assumption of normality was not being violated. A multiple regression analysis using a step-wise entry was conducted on SPSS. Default PIN and POUT settings (0.05 and 0.1) were used. The results were examined to establish whether or not the R^2 produced would be acceptable in using the regression equations generated in a conversion of the NatWest Life competences to Supra-Competences. The R^2 s associated with each Supra-Competence relationships resulting from

this analysis are shown in table 9.9. On first inspection these results did not appear too encouraging. However, as Downie and Heath (1974) point out that, in using judgemental rating scale criteria relating to personal traits and characteristics, there is a tendency to encounter lower R^2 s. They commented that examination of the research over the years had shown that they generally fall within the band of 0.4 to 0.6 with a median value of 0.5. This value is considerably lower than the value generally sought in psychometric research and related studies. In these fields an R^2 of 0.7 is commonly taken as an acceptable cut-off (Furnham, 1992). However, Money (1997) reinforced the acceptability of R^2 of as low as 0.4 for a study involving variables and assessment methods of the nature employed in the current research. On this basis the regression analysis would enable at least four of the Supra-Competences to be employed in subsequent analysis (having converted the NatWest Life competences using the regression equations from the initial model). In seeking to understand why (given the apparently high content alignment between the NatWest Life and Supra-Competences) a regression analysis did not produce a higher level of commonality it became evident that the two sets of data were arrived at through different assessment methodologies. The JCS requires self plus superior rating whereas the assessment centre scores contained no element of self-rating. Subsequent discussions, with NatWest Life revealed that, as the competences were core to the development of individuals they held a range of assessment data relating to these competences. These included an individual self-assessment made immediately prior to attending an assessment centre and appraisal ratings against each of the competences (the appraisal rating resulting from a combination of self and superior assessment). These data were obtained for the 32 participants in this part of the research programme.

It is generally accepted that multi-rater and multi-method (MRMM) assessment produces a more valid assessment than other methods (Thornton & Byham, 1982; Handyside, 1989; Dulewicz & Fletcher, 1989). Assessment centres are designed on the MRMM principles (Thornton, 1980; Thornton & Byham, 1982). However, it has been relatively uncommon to incorporate self-assessment into the overall ratings of a centre unless they are being employed primarily for developmental purposes (Higgs, 1991). There are, indeed, concerns in an "appraisal" context over the robustness of self-assessment. Thornton (1980) pointed out that self-appraisals tend to be more lenient, have less discriminant validity and less reliability than those conducted by superiors and peers. However, others (Williams, 1989; Mabe & West, 1982; Fletcher, 1985), having conducted wider ranging studies, arrived at more optimistic conclusions. Indeed it is from this work that the use of combined superior and self-assessments are becoming increasingly prevalent (Williams, 1989). Reflecting on the above comments it was decided that in order to compare the NatWest Life and Supra-Competence models it would be appropriate to explore alternative means of identifying the underlying NatWest Life competences.

Table 9.8 Significant Correlations Between NatWest Life Competences and JCS

JCS	NWL Competences																	
	A	B	C	D	E	G	I	J	K	L	M	N	O	P	Q	R	S	T
	Decision Making A	Business Acumen B	Breadth of Thinking C	Analytical Thinking D	Strategic Thinking E	Maintaining Service G	Resourcing & Organising I	Co-ordinating J	Planning & Forecasting K	Directing L	Team Working M	Communication N	Personal Input O	Conflict Management P	Networking & Representation Q	Motivating R	Team Building S	Developing Performance T
1. Information Collection								** .420										
2. Problem Analysis														* .349				
4. Judgement									* .345		** .431	* .350					** .417	
5. Creativity		* .383		** .481	* .360	* .409												
6. Risk Taking															* -.395			
9. Helicopter		* .398			* .340									** .480			* .352	* .341
10. Organisational Awareness & Sensitivity	** .467				* .384		* .344				* .404				** .422			
13. Written Communication			** .427															
21. Development of Subordinates																	** .446	
24. Persuasiveness		* .388											* .348					

Table 9.8 Significant Correlations between NatWest Life Competences and JCS (Continued)

JCS	NWL Competences																	
	A	B	C	D	E	G	I	J	K	L	M	N	O	P	Q	R	S	T
	Decision Making A	Business Acumen B	Breadth of Thinking C	Analytical Thinking D	Strategic Thinking E	Maintaining Service G	Resourcing & Organising I	Co-ordinating J	Planning & Forecasting K	Directing L	Team Working M	Communication N	Personal Input O	Conflict Management P	Networking & Representation Q	Motivating R	Team Building S	Developing Performance T
26. Flexibility				*												*		*
				.388												.408		.354
27. Ascendancy															*			
															.409			
28. Motivating Others		*						*	*			*	**		**			**
		.341						.344	.403			.359	.468		.469			.457
29. Negotiating						*						*						*
						.388						.370						.340
30. Leadership		*			*	**			*						*			*
		.381			.390	.435			.378						.379			.410
32. Achievement Orientation															*			
															.404			
35. Adaptability													*					
													.363					
37. Integrity												*						
												.350						
38. Resilience												**						
												.488						
39. Tenacity																	*	
																	.380	

*: p<0.05 **:p<0.01***:p<0.001

Three options were considered. These were:

- i) Combine the NatWest Life assessment centre rating with the participants' self-assessment. Whilst this approach would be more in line with that employed in arriving at the Supra-Competences from the JCS it would omit the assessment contribution of the participants' immediate line managers.
- ii) Use only the NatWest Life Performance Appraisal Competences ratings. As these are derived from a combination of the managers and self-assessment they would appear to be closer to the methodology employed in the JCS. However, the appraisal process within NatWest Life does include a reward element. Thus there is a danger of this leading to an over-harshness on the part of the superior (Williams, 1989) and leniency on the part of the individual (Thornton, 1980).
- iii) Combine NatWest Life assessment centre ratings with the performance appraisal rating at the time closest to attending an assessment centre. This approach would seem to enhance the MRMM characteristics of the rating and thus enhance the validity of the assessment (Handyside, 1989). At the same time it would incorporate an element of self-assessment which mirrors this component of the JCS.

Overall the third of these options was favoured as being most theoretically justifiable. However, given the importance to the overall research of having a robust basis for converting the NatWest Life competences to Supra-Competences it was decided to test all three models to ensure that the use of the third model would provide an adequate improvement in fit to justify its adoption in subsequent steps in the research process.

Table 9.9 shows the R^2 from all three options alongside those from the initial regression analysis. From this it appears that the use of the appraisal data alone produces the least robust fit providing only two usable Supra-Competences when applying a minimum R^2 in the order of 0.4 (Downie & Heath, 1974). The theoretically preferred option (a combination of development centre ratings and appraisal ratings) produces the best outcome with all twelve of the Supra-Competences having R^2 values in excess of 0.4 and, indeed, ten of them exceeding the median reported by Downie and Heath (1974). The strength of this model compared to the other two options was further examined by conducting a multiple regression analysis of the NatWest Life competences on the forty JCS items. The results of this are shown in Appendix XVIII and reinforce the superiority of the model resulting from combining development centre and appraisal ratings. Based on this analysis it was decided to use this option in the subsequent stages in the research. Appraisal data was collected for all of the NatWest Life participants and combined with the development centre data to produce an average rating score for each converted to Supra-Competences using the regression equations derived from the analysis of the sub-sample of 32 (See Appendix XV for regression equations).

Table 9.9 R² from Regression of NWL Competences on Supra-Competences

Supra-Competency	R ² ①	R ² ②	R ² ③	R ² ④
SC1	.27	.23	.37	.50
SC2	.52	.33	.32	.54
SC3	.38	.46	.53	.69
SC4	.35	.14	.48	.65
SC5	.14	.18	.39	.66
SC6	.23	.48	.24	.50
SC7	.28	*	.30	.59
SC8	.18	.28	.48	.58
SC9	.57	.07	.12	.51
SC10	.47	*	.37	.58
SC11	.68	.10	.15	.41
SC12	.17	.20	.30	.47

Notes:

- ① Analysis based on development centre evaluations only.
- ② Based on NWL appraised competences only.
- ③ Based on development centre ratings and self-assessments combined.
- ④ Based on development centre ratings and appraisal ratings combined.
- * No variables entered.

Overall, whilst the selected model of converting the competences produced an acceptable result it should be borne in mind that the follow-up JCS study was conducted after attendance at the development centre. This could have resulted in ratings (self or manager) which were higher than would have been encountered had the JCS been completed in the absence of knowledge of the centre outcomes. Higgs (1996(c)) reported that post-centre self-assessment and managerial assessments of performance do tend to be influenced by assessment centre ratings. However, it was not possible to further examine this potential contaminator within this study. It is therefore, important to be aware of the possible limitations of this on the overall results and conclusions. Whilst important to flag this concern it is equally important to bear in mind that it is not known whether or not participants from Canada Life and Surrey County Council had attended any form of assessment event near to the time at which they had completed the JCS.

The results of the calculation of the Supra-Competences from the NatWest Life data and the JCS method employed with the samples from Canada Life and Surrey County Council are shown in Table 9.10. The Supra-Competences were scored on a one to five scale with one being low and five being high. Examination of table 9.10 shows that all of the means are above the scale mid point. All except three of the Supra-Competences show a slight negative skew. The three

showing a slight positive skew are: Interpersonal Sensitivity, Adaptability & Resilience and Energy & Initiative. This skew may result from the specific nature of the sample which is somewhat dominated by managers in insurance organisations with financial, actuarial and administrative roles. The sample structure might also explain the slight positive skews, particularly in relation to the cognitive Supra-Competences.

Table 9.10 Distribution of the Supra-Competence Scores (n = 196)

Supra - Competence	Mean	St. Dev.	Skew.	Min.	Max.
1. Strategic Perspective	2.90	.51	-.01	1.57	4.33
2. Analysis & Judgement	3.41	.29	-.62	2.25	4.13
3. Planning & Organising	3.30	.68	-.36	1.19	4.93
4. Managing Staff	3.22	.49	-.55	1.15	4.17
5. Persuasiveness	3.19	.29	-.79	2.17	3.83
6. Assertiveness & Decisiveness	3.01	.40	-.57	1.21	4.06
7. Interpersonal Sensitivity	3.37	.38	.31	2.33	4.67
8. Oral Communication	3.13	.57	-.42	1.25	4.33
9. Adaptability & Resilience	3.33	.48	.30	2.17	5.05
10. Energy & Initiative	3.25	.32	.39	2.50	4.33
11. Achievement Motivation	3.39	.54	-.15	1.28	4.89
12. Business Sense	2.83	.61	-.31	1.00	4.50

Whilst the distribution shows a degree of skewness it is marginal and the application of the Kolmogorov-Smirnov Test (Hair et al, 1995; Norusis, 1994) produced no statistically significant results. Therefore, the data may be treated as being normally distributed in any subsequent analysis.

In order to pursue the examination of the overall process model which is central to this study (see Chapter 8) it is necessary to minimise the number of variables being examined. In 9.10 above the variable relating to Belbin Team Roles was expressed by means of the Team Role Index (Berry, 1995). In this way eight variables were reduced to a single variable whilst retaining the essence of the construct being examined. Belbin's research (Belbin, 1976; 1981) emphasised the importance of mix of Team Roles and "balance" in the team as a determinant of team performance. Therefore, the Team Role Index provided a means of operationalising the construct of "balance".

Whilst there is no directly equivalent study which relates to competences within a team a number of authors have hypothesised that a mix of competences may be important when examining team performance (eg, Hambrick, 1995; Herbert, 1990; Larson & La Fasto, 1989; Finn, 1993; Schroder, 1989). Furthermore, a number of authors have examined the linkage between personality characteristics and traits and competences (eg, Varney, 1985; Pinder & Herriot, 1990; Hutt, 1990; Spencer & Spencer, 1993; Finn, 1993). These two streams of thought indicate the

possibility that a mix of competences, or "balance", within a team might be related to team performance. Dulewicz (1995(a)) conducted a study in which he obtained 16PF, OPQ and JCS data on participants ($n = 100$). In this study he found statistically significant relationships between the Supra-Competences and Belbin Team Roles (derived both from the 16PF and the OPQ). An overall summary of these relationships is provided in table 9.11 and full details are shown in Appendix XVI.

From this table it is evident that there are a number of statistically significant relationships between the Supra-Competences and the Belbin Team Roles. From this it would not seem to be unreasonable to hypothesise that a measure of "balance" in terms of Supra-Competences may be similar to the Team Role Index (Berry, 1995). In this way employing the statistical model used to calculate the Team Role Index may usefully produce a Competency Index. Before finalising the decision to operationalise the construct of a 'Competence Balance' in the same way as the 'Team Balance' it was decided to explore the intercorrelations between the Supra-Competences in this study. The results of this analysis are shown in table 9.12. The purpose of the analysis was to identify any negative correlations which may require an adjustment to any balance index to account for the input of having surpluses of specific Supra-Competences within a team. A review of table 9.12 shows that all of the intercorrelations are positive. This is not a surprising outcome given that the Supra-Competence model is derived from a factor analysis of the JCS.

In the Team Role Index Berry (1995) found that using a "talent" cut off of sten scores of 7.0 or 8.0 ensured avoidance of the substitution effect. The Supra-Competences generated a score in the range of 1.0 to 5.0. Data was not available to convert these to sten scores and thus mirror the Team Role Index precisely. However, by focusing on the higher Supra-Competence scores of 4.0 and 5.0 (as common in research using the JCS - Dulewicz, 1995(a); Sarawano 1995) an equivalent result was achieved.

Employing the Berry (1995) Team Role Index and applying this to the Supra-Competence scores for teams in the current study produced a mean Competence Index score of 0.05 (standard deviation 0.017). The minimum index score was 0.01 and the maximum 0.09. Although the distribution showed a skew of 0.34 the application of the Kolmogorov-Smirnov test produced a score of 1.1882 with a significance of 0.1188. Thus, for the purposes of subsequent analysis the distribution may be treated as being normal.

Productive Thinking Test

The rationale for using the Productive Thinking Test (PTT) in this study was outlined in Chapter 8. The test was administered to all participants in the research programme ($n=196$). The test requires respondents to record as many responses as possible to two situations within a set time period (eight minutes). The responses to each situation are required to relate to the implications or consequences of the situation described. A copy of the PTT is provided in Appendix XVII. This methodology is similar to that employed by Guildford (1959) and requires the responses to be subjectively scored by two trained assessors.

Table 9.11 Summary of Comparison of Significant BTR and Supra-Competence Relationships

BTRs	SUPRA-COMPETENCIES											Business Sense	
	Strategic Perspective	Analysis & Judgement	Planning & Organising	Managing Staff	Persuasive	Assertive & Decisive	Inter-personal Sensitivity	Oral Communication	Resilience and Adaptability	Energy & Initiative	Achievement Motivation		
Plant									-A	+A			
Resource Investigator					+A					+A			
Co-ordinator				+A	+A		-A						+A
Shaper		-A				+B	-B			+A		+A	+A
Monitor Evaluator		+A			-A		-A					+A	
Teamworker	+B	+A		+A	+A	-A	+B		+A				
Implementer	-A	+B					-A					+A	
Completer - Finisher		+A			-A		-A					+B	

Source: Dulewicz (1995(a))

Notes 1 - = negative relationship; + = positive relationship; 2 A = supported in correlation with 16PF or OPQ B = supported in correlation with 16PF and OPQ

Table 9.12 Significant Intercorrelations of Supra-Competences (n=196)

	1. Strategic Perspective	2. Analysis & Judgment	3. Planning & Organisation	4. Managing Staff	5. Persuasiveness	6. Assertiveness & Decisiveness	7. Interpersonal Sensitivity	8. Oral Communication	9. Resilience & Adaptability	10. Energy & Initiative	11. Achievement Motivation	12. Business Sense
1. Strategic Perspective												.433*
2. Analysis & Judgement	.203**											
3. Planning & Organisation												
4. Managing Staff	.483***	.205**										
5. Persuasiveness	.244**	.213**		.477***								
6. Assertiveness & Decisiveness	.421***			.654***	.375***							
7. Interpersonal Sensitivity					.390***							
8. Oral Communication	.254***			.188**	.424***		.455***					
9. Resilience and Adaptability	-.142*						.178*					
10. Energy and Initiative				.264***	.402***	.144*	.210**	.269***				
11. Achievement Motivation			.191**						.157*	.399***		
12. Business Sense	.456***	.188**		.222***	.237**	.334***		.233**	.158*		.152*	

* P<0.05; **P<0.01; ***P<0.001

The assessors identify the number of ideas produced by the respondents (Ideational Flow) ensuring that responses counted are distinct and comprehensible. The second dimension scored is that of Ideational Flexibility (the range of distinctly different ideas or themes employed by the respondents). The assessors rate the Ideational Fluency and Flexibility individually and then discuss differences between their assessments for the whole sample.

This discussion is designed to arrive at a shared and reliable basis of assessment and replicates principles incorporated into assessor reviews (or conclaves) employed in assessment centres (Thornton, 1980; Thornton & Byham, 1982). The methodology is designed to enhance reliability and validity through the principle of multi-rater assessment (Williams, 1989; Handyside, 1989; Thornton & Byham, 1982). From this assessment process scores on two scales, Ideational Fluency (PTT. Volume) and Ideational Range (PTT. Breadth), are calculated. Currently unpublished 'norms' (with percentile distribution) are available (Dulewicz, 1996) and enable the calculation of a five point scale for each of the two dimensions of Productive Thinking. Further use of the PTT data based on percentile distribution is somewhat limited as such data is monotonic and only uses the ordinal positions within the data set (Lehman, 1991). Therefore, it was decided to convert the data to a standardised format to enable its broader application in subsequent analyses (Lehman, 1991). Having transformed data to a standardised format it becomes possible to compute a single overall measure of Productive Thinking by adding the standardised scores for PTT Volume and PTT Breadth.

Given the above standardisation transformation the means and standard deviations will inevitably be 0.00 and 1.00 respectively. However, whilst the combined data (PTT.Score) has a mean of 0.00 it has a standard deviation of 1.68. The distribution of this scale score is very marginally positively skewed (0.05). However, in terms of use of the overall measure in any subsequent multi-variate analysis is not compromised as the Kosmorogov-Smirnov test produces a non-significant result.

Watson-Glaser Critical Thinking Appraisal

All participants in the study completed the Watson-Glaser Critical Thinking Appraisal (CTA) (Watson & Glaser, 1991). Critical thinking is defined by Watson and Glaser (1964) as a composite of attitude, knowledge and skills. The detail of this definition has already been explored (see Chapter 8 above).

In this study Form C of the CTA was employed. This is an Anglicised version of the original CTA (Watson & Glaser, 1991). The conversion of raw scores to percentiles and stens is based on published norm tables. Given the nature of the current study and the level of participants it was decided to use the CTA norms related to UK managerial populations. Norm table 37 from the UK manual (Watson & Glaser, 1991) was used. These norms are based on data from recruitment assessments for executive positions. The sample in the norm study comprised 111 applicants (101 male and 10 female). The mean score for applicants was 62.2 (standard deviation 7.9). The predominance of males in this norm sample was initially a concern given the sex distribution in the current study. However, studies have shown that in CTA scores there are no significant

differences between males and females (eg, Hoogstraten & Christiaans, 1975). The timed version of the CTA was employed in order to achieve a degree of consistency between the populations from the three participating organisations. The mean sten score for the study population was 5.45 (standard deviation 2.10) and the mean raw score was (standard deviation 9.34). The fact that this mean is marginally above the managerial population norms may account for the higher evidence of Monitor Evaluator Team Roles (Belbin, 1976; 1981; Life, 1996). However, it is not at such a level to account for the observed differences in occurrence of this Team Role.

The distribution of CTA scores shows only an extremely marginal positive skewness (-0.01) which is clearly identified as non-significant by the Kolmogorov-Smirnov test (Hair et al, 1995; Norusis, 1994). Within the sample the range of sten scores was extensive (1.0 to 10.0) indicating that range restriction does not need to be taken into account in subsequent analysis.

Combining the CTA and PTT Dimensions of Cognitive Ability

Within the literature Kline (1979) suggests that thinking power may be related to a range of independent measures of creativity. Higgs and Dulewicz (1997(a)) propose that a combination of the CTA and PTT may provide an indication of thinking power which combines divergent and convergent thinking. In order to incorporate such a measure into the current study a means of combining the CTA and PTT scores had to be determined. This was achieved by re-standardising the overall PTT score and adding this to a standardised CTA score thus producing an overall "thinking power" score. This overall "thinking power score" produced a range of scores from a minimum of -4.88 to a maximum of 4.05 with a mean of 0.00 and standard deviation of 1.69. The overall distribution of this score produced a skewness of -0.22. However, the Kolmogorov-Smirnov test produced an insignificant result suggesting that the distribution might be treated as being normal in subsequent multivariate analysis (Hair et al, 1995; Norusis, 1994).

9.5 Team Process Measures (Team Process Questionnaire)

The Team Process Questionnaire was developed from the Dimensions of Board Effectiveness Questionnaire (Dulewicz & Herbert, 1996) which was modified to take account of input from the focus groups and interviews (see 9.2 above). Appendix XI provides details of the Dimensions of Board Effectiveness Questionnaire. The items added to this questionnaire to reflect input from the interviews and focus group discussions were:

- i) The team has measurable goals and objectives;
- ii) Feedback on performance is only provided by the team leaders;
- iii) Team goals are established by the team leader;
- iv) Team performs effectively irrespective of the company's reward and recognition processes;
- v) Team performance depends on the recognition of the success of the team;

- vi) Success of the team depends on the selection of team members;
- vii) All members have clearly understood roles;
- viii) Team members understand the roles and contributions of other team members;
- ix) The mix of skills of team members is important to performance;
- x) It is important to identify the explicit contribution required from each team member;
- xi) Team performance is dependent on differences in the personality/styles of individual team members;
- xii) Team members clarify the expectations of each other;
- xiii) Team members discuss standards of behaviour;
- xiv) Team members have a clear view of each others' contributions;
- xv) Barriers to team performance are considered by the team leader;
- xvi) Team leader discusses and agrees the role and contribution expected by each team member;
- xvii) Behaviour of the team leader provides an example for the team;
- xviii) Team leader acts as a coach to the members of the team.

Of these additional items some 13 were identified by Higgs and Rowland (1992) in their study of effective team processes in an international oil company. In addition, items iv, ix, and xi are in line with the results of the work reported by Belbin (1981). Overall, the "unique" items resulting from the interviews and focus group discussions are iv, v, xiii, and xviii. However, these items were also indicated by the literature (eg, Hackman, 1990; Tjosvold, 1991; Katzenbach & Smith, 1993; Ray & Bronstein, 1995).

An initial piloting of the questionnaire was carried out with a small sample (n=20) of senior consultants in a professional services firm with a heavy involvement in the UK financial sector. This sample included twelve participants with line experience in this sector. The basis of the pilot was to focus on the understandability of the questions, relevance to the issue and potential for use and analysis in the ultimate study (Bell, 1992; Moser & Kalton, 1971). Participants were asked to complete the questionnaire and subsequently interviewed to discuss their responses and reactions. As a result of this study the following items were excluded from the final questionnaire:

- i) **Effective team performance is dependent on the technical excellence of each team member.** In discussions it was clear that participants in the pilot study had widely divergent interpretations of the impact of this factor on teams and that these differences were reflected in apparently widely contradictory ratings on the questionnaire;
- ii) **Decisions are made largely on hard data.** This proved to be a very confusing question with participants in the pilot expressing strong and contradictory views on the significance of this

on ultimate team processes. The real question probably relates to balance of hard and soft data in decision-making. However, even in exploring this the participants expressed divergent and inconsistent views. Therefore, it was decided that this question could be a potential source of error if included in the questionnaire (Moser & Kalton, 1971);

- iii) **Decision-making processes entail judgements of individual contribution.** In the pilot questionnaire scores on this item were inconsistent. Subsequent discussions revealed a wide range of views on the appropriateness and value of this behaviour in a team environment;
- iv) **Team leader's style is unobtrusive.** Again both the pilot questionnaire scores and subsequent discussions revealed a polarisation in terms of style appropriateness to the facilitation of effective team processes;
- v) **Team leader has a fixed role.** The pilot questionnaire results were very varied and subsequent discussion indicated that answers were seen to be situation-specific.

During the pilot a number of the questions specifically included for the purposes of a separate study to examine the dimensions of Board Effectiveness caused a degree of concern. However, these items were retained in the study for the specific purpose of a separate research exercise which is reported by Higgs and Dulewicz (1997(b)).

The Team Process Questionnaire, adapted after the pilot review and excluding items specifically retained for separate analysis for the Board Effectiveness Study, was analysed using a Principal Components factor analysis (a copy of this questionnaire is provided in Appendix XVIII). A varimax rotation was selected (Norusis, 1994; Hair et al, 1995) employing a 1.0 Eigen value cut-off. This analysis produced a fourteen factor model which is shown in table 9.13. The Eigen values and variation accounted for by this model are shown in table 9.14.

The high proportion of variation accounted for by factor 1 is not an uncommon result when employing a Principal Components analysis (Norusis, 1994).

Before beginning the factor analysis intercorrelations between the items were screened to identify any potentially unusual items/relationships which may impair the analysis. None were found. In selecting items for inclusion in the factor description only those with a factor weighting of 0.3 and above were selected, given that the same sample size exceed 100, (Norusis, 1994; Hair et al, 1995). The initial team effectiveness questionnaire (after post-pilot modification) contained 52 items. Factor Analysis led to convergence on 14 factors which represents 27% of the initial questionnaire. This is broadly in line with expectations of the level of reduction likely to be achieved by Factor Analysis (Norusis, 1994; Hair et al, 1995). Ten of the fourteen factors seem to provide logical groupings of items. One exception to this finding related to factor 6 (Learning and Improvement) which included an item "Importance of Social Contact". However, this item had a factor loading of 0.39 and was excluded from subsequent analysis. Factor 5 at first appears to contain an unexpected grouping of items.

Table 9.13 Factor Analysis Results for Team Effectiveness Questionnaire (n=196)

Factor	Item	Factor Loading
1. Team atmosphere	Harmonious relationships	0.76
	Complementary professional relationships	0.68
	High level of trust	0.73
	Genuine listening	0.51
	Candour and openness	0.58
	Co-operative climate	0.57
	Positive atmosphere	0.54
	Shared vision and values	0.53
	Incisive debate	0.41
	Cohesive team	0.70
2. Communication/ Interaction style	Informal atmosphere	0.76
	Humour and enjoyment encouraged	0.66
	Keen and free to ask questions	0.58
	Clear dialogue and communications	0.43
	Flexible style of debate	0.39
3. Performance orientation	Team sets ambitious goals	0.76
	Emphasis on success	0.55
	Team appraises own performance	0.48
	Bad news confronted	0.46
	Team enthusiastic about change	0.36
4. Involvement and participation	Team members involved in goal setting	0.65
	Democratic and participative debate	0.46
	Team Leader invites initiatives	0.60
	Team Leader participates as Team Member	0.41
	Team Leader behaviour provides example	0.55
5. Confidence and comfort	Willing to bring in experts	0.75
	Commitment to decisions	0.51
	Creative ideas encouraged	0.46
6. Learning and improvement	Emphasis on future performance	0.75
	Team learns from mistakes	0.47
	(Social contact important)	0.39
	Thorough preparation	0.55
	Team Leader eliminates performance barriers	0.37
7. Roles	All have clear roles	0.78
	All understand roles of others	0.82
8. Composition and contribution	Skill mix important	0.71
	Explicit identification of required contributions	0.39
	Team Members clarify mutual expectations	
	Team Members have clear view of others contributions	0.50
		0.57

Table 9.13 Factor Analysis Results for Team Effectiveness Questionnaire (n=196) (Continued)

Factor	Item	Factor Loading
9. Process orientation	Discussion of behaviour standards	0.71
	Willing to take risks	0.46
	Feedback from diverse sources	0.49
	Team analyses perceptions and processes	0.59
10. Realistic focus	Realistic time scales	0.71
	Team understands how it adds value	0.65
11. Alignment	Good time management	0.47
	Personal and company values coincide	0.74
12. Enabling leadership	Team has measurable goals and objectives	0.52
	Team Leader discusses role and contributions	0.40
	Team Leader acts as a coach	0.70
13. Interface management	Team Leader manages external relationships	0.78
14. Distribution of contributions	Contributions distributed evenly between members	0.69

Table 9.14 Variances Accounted for by Factor Model (n=196)

Factor	Eigen Value	Percentage of Variation	Cumulative Percentage
1	16.266	31.3	31.3
2	2.356	4.5	35.8
3	2.145	4.1	39.9
4	2.114	4.1	44.0
5	1.790	3.4	47.4
6	1.681	3.2	50.7
7	1.568	3.0	53.7
8	1.414	2.7	56.4
9	1.339	2.6	59.0
10	1.237	2.4	61.4
11	1.143	2.2	63.6
12	1.119	2.2	65.7
13	1.102	2.1	67.8
14	1.029	2.0	69.8

However, on reviewing the detailed wording of the questions comprising these items their grouping could reflect the team's self-confidence and comfort in exposing themselves to challenges (both internal and external). Comments of Factor 10 are similar to those on Factor 5 although with only 2 items the strength of any argument is somewhat reduced. The two items comprising Factor 11 are somewhat difficult to reconcile resulting in a weak logical case for this factor.

The factor analysis excluded five items, viz:

- i) Team performance is dependent on the differences of personality/styles of individual team members;
- ii) The success of the team depends on the selection of team members;
- iii) Team performance depends on recognition of the success of the team;
- iv) Effective team performance is dependent on the company's reward and recognition processes;
- v) Tasks and goals have realistic timescales.

All of these items were originally included following the initial interview and focus group discussions. The first two items would certainly appear to be relevant based on evidence from the literature (Belbin, 1981; Margerison & McCann, 1985, Tjosvold, 1991; Adair, 1986). However, on reflection the conclusion of the above authors relate more to input and outcome rather than process factors. Items (iii) and (iv) above would appear to align with current thinking on team reward (Brown, 1995). However, these may be items more appropriately seen as environmental input factors (Hackman & Morris, 1975).

In order to assess the reliability of the Team Process instrument Cronbach Alphas were calculated for the fourteen factors. In calculating the Cronbach Alphas individual items with a factor weighting of less than 0.40 were excluded (Hair et al, 1995; Norusis, 1994). The results of this analysis are shown in Table 9.15. From this analysis it is evident that some eleven of the fourteen factors have good reliability and two factors each comprise only single items. The single item factors are related to either specific issue research (eg, Item 14 is related to the IOD study, (Dulewicz et al, 1995) or a limited area of the literature (eg, Item 13 relates to the oil company study reported by Higgs & Rowland, 1992). Item 11 (Alignment) has the lowest identified Cronbach Alpha. The apparently illogical nature of this factor, and its composition based on only two items suggest that it would be a relatively weak factor to include in any subsequent analysis. The initial design of the process questionnaire was informed by the team effectiveness factors identified as commonly occurring in the literature on teams and small groups. In addition, given the ultimate aim of the research to examine an interaction process model, the process factors employed in other team modelling research were also examined at the design stage. The core instrument on which the final questionnaire was built was the Dimensions of Board Effectiveness (Dulewicz et al, 1995).

Table 9.15

Alphas using 14 factor model emerging from Varimax Rotation omitting items with a loading of less than 0.40.

Factor	Cronbach Alpha
1. Team Atmosphere	0.95
2. Communication/Interaction Style	0.79
3. Performance Orientation	0.76
4. Involvement and Participation	0.87
5. Confidence and Comfort	0.65
6. Learning and Improvement	0.70
7. Roles	0.76
8. Composition and Contribution	0.69
9. Process Orientation	0.75
10. Realistic Focus	0.60
11. Alignment	0.48
12. Enabling Leadership	0.77
13. Interface Management	-(1)
14. Distribution of Contribution	-(1)

Note ⁽¹⁾ Single item factor, thus Alpha cannot be calculated

The instrument grouped the items under four headings, viz: i) Predispositions; ii) Climate; iii) Relationships; and iv) Decision-Making. These items mapped onto a number of major effectiveness factors identified in the literature on teams and performance. Table 9.16 provides a brief summary of the main team and group effectiveness factors identified from the literature (together with illustrative references) placed alongside these are commonly encountered process factors used in team/group process modelling and the factors emerging from the analysis of the Team Process instrument employed in this research.

The Board Effectiveness Questionnaire groupings can be seen as relating to the team effectiveness factors (in table 9.16) in the following way:

- i) Predisposition: A review of the items under this heading indicates elements of the effectiveness factors of: Goals and Purpose, Team Interaction; and Feedback on Performance;
- ii) Climate: Items covered by the Climate heading relate to: Cohesiveness and Team Interactions;
- iii) Relationships: These items relate to the effectiveness factors of Cohesiveness and Communication;

iv) Decision-Making: Items under this heading relate to Team Interactions, Communication and Leadership.

In the design of the Team Process Instrument additional items were added based on the work of Higgs and Rowland (1992), and the interview and focus group discussions, which ensured that the remaining effectiveness areas were included within the scope of the instrument (ie, Diversity, Role Clarity, Involvement and Team Learning).

Table 9.17 summarises the relationships encountered (based on content analysis; Easterby-Smith et al, 1991) between the Team Process instrument factors and the process factors encountered in the team and process model literature.

It was somewhat surprising that the effectiveness factor of Diversity did not emerge as a clear single factor. This would have been expected from the literature on team effectiveness (eg, Belbin, 1976; 1981; Margerison & McCann, 1985; Dulewicz et al, 1995) and importance of team mix and team roles in this literature. However, it may well be that mix of style and personality is more in the nature of an input factor (Shaw, 1971; Furnham, 1992; Schein, 1988). In the context of team interaction processes Diversity appears to be more oriented towards the valuing of diversity of views, opinions and contributions than the underlying mix of personality characteristics in the team. In this context the Team Process Questionnaire factors of Composition and Contribution and Distribution of Contribution would appear to have encompassed elements of Diversity.

Within the interaction process modelling and research the process factor of Decision- Making is occasionally employed in model construction (Greenbaum et al, 1988; Eisenhardt, 1989; Amason, 1996). This factor did not emerge from the analysis of the Team Process Questionnaire. However, the items in the factor Involvement and Participation do, to an extent, have decision-making implications. Four factors emerged from the analysis of the Team Process Questionnaire which do not, on first inspection, appear to relate to effectiveness groupings in the team literature, nor to commonly encountered factors in process model research. These were: Confidence and Comfort; Realistic Focus; Alignment and Interface Management. However, inspection of the items comprising these factors does indicate linkages to factors encountered in the literature (see table 9.17). Overall it would appear that the Team Process Questionnaire produces a reasonably robust measure of some eleven factors which are in line with the literature used to inform the final development of the questionnaire.

In using the Team Process Questionnaire within the overall study and analysis of the results it is important to emphasise that the unit of analysis is the team rather than individual team members. This raises potential issues in relation to the use and analysis of multiple response data and the aggregation of such responses to form a group response (Seidler, 1974). In practice there are few recognised techniques available for the analysis of multiple responses and aggregate of such responses (Pinto et al, 1993).

Table 9.16 Review of Team Process Questionnaire Against Key Process Factors from Literature

Process Factors from Group and Team Literature	Process Factors from Literature on Team/Group Process Models	Process Factors from Analysis of Team Process Instrument
<p>1. Objectives, Goals and Purpose Likert, 1961; Casey, 1985; Bennis and Nanus, 1985; Blake et al, 1987; Harris and Harris, 1989; Tjosvold, 1991; Guzzo and Shea, 1992; Davis et al, 1992; West, 1994; Pearson, 1994; Dumaine, 1994; Katzenbach and Smith, 1993; Rogers et al, 1994; Ray and Bronstein, 1995; Higgs and Rowland, 1992.</p>	<p>1. Goals, Purpose and Objectives Pinto et al, 1993; Hackman and Walton, 1986; West and Anderson, 1996.</p> <p>2. Co-operation/Cohesiveness Pinto et al, 1993; Hackman and Morris, 1975; McGrath, 1984; Shaw, 1981.</p>	<p>1. Team Atmosphere</p> <p>2. Communication/Interaction Style</p> <p>3. Performance Orientation</p> <p>4. Involvement and Participants</p>
<p>2. Involvement and Participation Dainty and Kakabadse, 1992; Hackman, 1990; 1992; West, 1994; Eichora, 1974; Holt, 1987; Stott and Walker, 1995; Blanchard, 1990; Derring, 1982; Dainty and Kakabadse, 1992; Blake et al, 1987; Stewart, 1990; Hastings et al, 1985; Tjosvold, 1991.</p>	<p>3. Involvement/Participation West and Anderson, 1996; Barrett-Lennard, 1975.</p> <p>4. Impact of Leader Barrett-Lennard, 1975; Cooper, 1975; Thomas, 1988; Korsgaard et al, 1995.</p>	<p>5. Confident and Comfort</p> <p>6. Learning and Improvement</p> <p>7. Roles</p> <p>8. Composition and Contribution</p>
<p>3. Team Interactions Tannenbaum et al, 1992; Mullen and Cooper, 1994; Adair, 1986; Hambrick, 1994; Margerison and McCann, 1985; Tjosvold, 1991; Leavitt et al, 1973.</p>	<p>5. Team Interactions Greenbaum et al, 1988; Hackman and Morris, 1975; McGrath, 1964; Smith et al, 1994; Gladstein, 1984; Amason, 1996.</p>	<p>9. Process Orientation</p> <p>10. Realistic Focus</p>
<p>4. Cohesiveness Tannenbaum et al, 1992; West and Slater, 1994; Seashore, 1954; Woodcock, 1986; Higgs and Rowland, 1992; Mayo, 1933; Leavitt and Bahrami, 1988; Gibb, 1964; Golembiewski and McConkie, 1975.</p>	<p>6. Communication Hackman and Morris, 1975; McGrath, 1964; Smith et al, 1995.</p> <p>7. Task Orientation Hackman and Morris, 1975; West, 1990; West and Anderson, 1996; Gladstein, 1984.</p>	<p>11. Alignment</p> <p>12. Enabling Leadership</p> <p>13. Interface Management</p> <p>14. Distribution of Contribution</p>

Table 9.16 Review of Team Process Questionnaire Against Key Process Factors from Literature (Continued)

Process Factors from Group and Team Literature	Process Factors from Literature on Team/Group Process Models	Process Factors from Analysis of Team Process Instrument
<p>5. Communication Katzenbach and Smith, 1993; Adair, 1986; Higgs and Rowland, 1992; Kutz, 1982; Deutch, 1985; Ray and Bronstein, 1995; Robinson, 1991; Tjosvold, 1991; Guzzo and Shea, 1992.</p>	<p>8. Decision-Making Eisenhardt 1990, Amason 1996, Greenbaum et al 1988</p>	
<p>6. Team Learning Senge, 1990; Tjosvold, 1991; Nixom, 1990; Guzzo and Shea, 1992; Belbin, 1993; Eisenstat and Cohen, 1990.</p>		
<p>7. Diversity Belbin, 1976; 1981; Margerison and McCann, 1985; Parkinson, 1995; Dulewicz et al, 1995; Parker, 1990; Deutch, 1985.</p>		
<p>8. Leadership Woodcock and Francis, 1986; Robinson, 1991; Hackman, 1990; 1992; Adair, 1986; Blake et al, 1987; Kolter, 1988; Hambrick, 1994; Anderson et al, 1990; Schein, 1988; Steckler and Fondus, 1993; Spencer and Pruss, 1992; Tjosvold, 1991.</p>		
<p>9. Role Clarity Whitaber, 1994; Dulewicz et al, 1995; Higgs and Rowland, 1992.</p>		
<p>10. Feedback on Performance West, 1994; Borrelli et al, 1995; Goleman, 1996; Dyer, 1977; Dewar, 1980; Gibson, 1983.</p>		

Table 9.17 Team Process Instrument Factors Compared to Literature Derived Factors from Team/Group Effectiveness Studies and Process Models

Team Process Questionnaire Factor	Apparent Linkages with Group/Team Literature	Apparent Linkages with Group/Team Process Models
1. Team Atmosphere (10 Items: $\alpha=0.95$)	Cohesiveness	Co-operation/Cohesiveness
2. Communication / Linkage Style (5 Items: $\alpha=0.79$)	Team Interaction Communication	Team Interaction Communication
3. Performance Orientation (5 Items: $\alpha=0.76$)	Objectives / Goals / Purpose	Objectives / Goals / Purpose Task Orientation
4. Involvement and Participation (5 Items: $\alpha=0.87$)	Involvement and Participation Objectives / Goals / Purpose	Involvement and Participation Objectives / Goals / Purpose
5. Confidence and Comfort (3 Items: $\alpha=0.65$)	Team Interaction Involvement and Participation	Decision Making Team Interaction
6. Learning and Improvement (5 Items: $\alpha=0.70$)	Team Learning	Team Interaction
7. Roles (2 Items: $\alpha=0.76$)	Role Clarity	Team Interaction
8. Composition and Contribution (4 Items: $\alpha=0.69$)	Diversity	Involvement and Participation
9. Process Orientation (4 Items: $\alpha=0.75$)	Feedback on Performance	Task Orientation
10. Realistic Focus (2 Items: $\alpha=0.60$)	Goals / Purpose / Objectives	Goals / Purpose / Objectives
11. Alignment (2 Items: $\alpha=0.48$)	Cohesiveness	Co-operational Cohesiveness
12. Enabling Leadership (3 Items: $\alpha=0.77$)	Leadership Goals / Purpose / Objectives	Impact of Leader Goals / Purpose / Objectives
13. Interface Management (1 Item: $\alpha=N/A$)	Leadership	Impact of Leader
14. Distribution of Contributions (1 Item: $\alpha=N/A$)	Diversity	Team Interactions

Bourgeois (1980) and Cohen and Cohen (1983) proposed the use of hierarchical regression on high and low convergent groups and to test the differences in under standardised Beta values to determine the confidence with which individual scores might be aggregated to form the group's score. If differences in Beta values are not significant aggregation may take place with a reasonable degree of confidence. In a recent study of senior level teams West and Anderson (1996) addressed the issue of multiple response aggregation through examination of consensus amongst individual respondents in a group. They employed a method of determining interrater reliability proposed by James et al (1984). Within the current study to justify the aggregation of the questionnaire responses to the group level it is necessary to demonstrate agreement amongst team members on their ratings of group processes (George, 1990; James et al, 1984; Kozlowski & Hattrup, 1992). As this requirement was broadly similar to that in the West and Anderson (1996) study, it was decided to follow their approach and employ the James et al (1984) methodology. Using this approach the interrater agreement for each team on each of the team process scales was calculated. Appendix XIX provides more detail on the formulae used for the interrater agreement calculations. Table 9.18 below summarises the data on the Team Process questionnaire, including the interrater agreement values. From this table it can be seen that the interrater agreement values range from 0.82 (Involvement and Participation) to 0.92 (Confidence and Comfort and Composition and Contribution). These results suggest that it is appropriate to aggregate individual responses on all of the Process factors.

It is also important to examine differences between groups to determine the discriminating power of the Team Process measures being used in this study. West and Anderson (1996) highlighted the importance of this and in their study employed a one-way analysis of variance (ANOVA). This approach has been adopted in this study. ANOVAs on the aggregated variables were performed for each of the fourteen Team Process factors and the three Outcome Factors. The results of these analyses are shown in table 9.19. In relation to Team Outcome factor 1 (Team Cohesion) the F ratio was greater than 1.0 (suggested by Hays (1981) as minimum evidence of discrimination) for all Process Factors with the exception of TPF6 (Learning and Improvement). Moreover in the case of three factors the F value was statistically significant. This result is not unexpected given the prevalence in the literature (eg, Tannenbaum et al, 1992; Mullen & Cooper, 1994; Hackman & Morris, 1975; Tjosvold, 1991; Pinto et al, 1993; West & Anderson, 1996) of references to these, and closely related factors, differentiating between team performance.

The absence of evidence of the discrimination ability of Learning and Improvement is somewhat surprising as this factor encompasses items frequently mentioned as differentiators in terms of team effectiveness and performance (eg, Guzzo & Shea, 1992; Belbin, 1993; Eisenstat & Cohen, 1990). The fact that there was no significant difference between the groups in relation to the Enabling Leadership Factor was most surprising. The literature suggests that the items which compose this factor are those likely to contribute to the team climate (eg, Woodcock & Francis, 1981; Hackman, 1990; Spencer & Pruss, 1992; Tjosvold, 1991).

Table 9.18 Means, Standard Deviations, Cronbach Alphas(r) and Interrater Agreement for Team Process Variables (n=196)

Team Process Factor	Mean	SD	Rwg(i) ⁽²⁾	r
1. Team Atmosphere	2.69	0.65	0.86	.95
2. Communication/Interaction Style	2.45	0.54	0.90	.79
3. Performance Orientation	2.87	0.57	0.89	.76
4. Involvement and Participation	2.62	0.72	0.82	.87
5. Confidence and Comfort	2.44	0.49	0.92	.65
6. Learning and Improvement	2.96	0.58	0.89	.70
7. Roles	2.61	0.70	0.83	.76
8. Composition and Contribution	2.80	0.49	0.92	.69
9. Process Orientation	3.65	0.67	0.85	.75
10. Realistic Focus	2.62	0.60	0.88	.60
11. Alignment	2.87	0.57	0.89	.48
12. Enabling Leadership	2.95	0.66	0.85	.77
13. Interface Management	2.94	0.69	0.84	⁽¹⁾
14. Distribution of Contribution	2.72	0.69	0.84	⁽¹⁾

Notes

⁽¹⁾ Single item factor, thus Alpha cannot be calculated

⁽²⁾ Interrater agreement using formula reported by James et al (1984)

The results may be explained by the nature of the participating organisations. In all three cases the organisations had invested significantly in managerial and executive development initiatives and espouse core values including empowerment, coaching others, open communication and decision-making. Indeed the organisations' efforts in these, and related areas, may account for the relatively low proportion of process factors which achieved significant F ratios in both the comparison with the outcome factor of Team Climate and with the other two outcome factors.

In relation to team outcome Factor 2 (Improvement Orientation) the F ratio was greater than 1.0 for all Process Factors with the exception of TPF3 (Performance Orientation). The lack of discrimination encountered with this factor is not in line with expectations for the literature (eg, Katzenbach & Smith, 1993; Guzzo & Shea, 1992; Dumaine, 1994). The F value was statistically significant in the case of two Process Factors (Realistic Focus and Distribution of Contribution). Whilst this was a generally surprising result some evidence for such an outcome may be found in terms of the importance of involvement and participation (eg, West & Anderson, 1996; Dainty & Kakabadse, 1992; Hackman, 1990). The single item comprising the Distribution of Contribution factor can readily be seen as relating to participation in team processes. Indeed when the intercorrelations between the team process factors in this study are examined (see

Appendix XXIII) a positive and statistically significant correlation is found between Distribution of Contribution and Involvement and Participation.

In examining the results of the ANOVA for the third outcome factor (Team Achievements) it is notable that an F ratio exceeding 1.0 is found for only seven of the fourteen process factors. Thus the discriminating ability of the process factors in relation to this outcome is somewhat limited. However, Process Factors which exceed the F ratio value of 1.0 are those which are, in a broad sense, the most expected from the literature on relationships between team processes and results in terms of achievements (eg, Katzenbach & Smith, 1993; West 1994; Tannenbaum et al, 1992; Dainty & Kakabadse, 1992; Hackman, 1990). The two process factors which showed statistically significant F ratios in the analysis against the Achievement outcome factor were Learning and Improvement and Realistic Focus. The absence of discrimination between teams in relation to Learning and Improvement and the Outcome Factor of Improvement Orientation was commented on above. In practice the expression of the expected discriminating relationships has arisen through the Achievements Outcome factor and is, therefore, not unexpected. One item in the Realistic Focus process factor is "the team understands how it adds value". It is possible that this, at least in part, relates to feedback on performance. As such the discriminatory ability of the factor would be relatively unsurprising given the comments on the relationships between feedback and team performance within the literature (eg, West, 1994; Borrelli et al, 1995; Goleman, 1996; Dyer, 1977).

Overall, from the results of the one-way ANOVA, it would appear that the Team Process Factors have some ability to differentiate between teams. However, the level of differentiation is limited. This may provide further support for the view that an interaction between input and process factors is more likely to produce a better explanation of differences between teams in terms of outcomes.

9.6 Team Outcome Measures

In developing a measure of team outcomes, based on his analysis of the available research, Hackman (1990) stated that there is value in exploring both "hard" and "soft" performance data. In general terms, in the context of behavioural research, Furnham (1992) highlights the difficulty in obtaining good criteria. However, the focus on only hard data is not necessarily the way to resolve this difficulty. Furnham (1992) observes that:

"It is frequently and erroneously assumed that hard data is better because it is easier to measure reliably and less prone to human error. It may, indeed, be more reliable, but it is not at all clear that it is more valid. Hard data may be influenced by different sources of noise and on occasions less reliable."

These views have also been expressed by other researchers into team performance (eg, Higgs & Rowland, 1992; Critchley & Casey, 1984). On this basis a mixture of hard and soft outcome measures were incorporated into an instrument developed and used in a study of management teams in an oil company (Higgs & Rowland, 1992).

Table 9.19 One-way ANOVA for Team Process and Team Outcome Factors

Team Process Factors	T OF 1			TOF 2			TOF 3		
	d.f.	F Ratio	Sign F	d.f.	F. Ratio	Sign. F	df	F. Ratio	Sign. F
TPF 1	3,50	4.3414	0.0085 **	3.50	2.2295	0.0962	3.50	1.6617	0.1871
TPF 2	2,51	4.0788	0.0227 *	2.51	2.3555	0.1051	2.51	1.2349	0.2994
TPF 3	3,50	1.8235	0.1549	3.50	0.6017	0.6170	3.50	0.4111	0.7457
TPF 4	3,50	1.9770	0.1294	3.50	1.2960	0.2861	3.50	0.4658	0.7074
TPF 5	2,51	2.7088	0.0762	2.51	1.4510	0.2430	2.51	0.2824	0.7552
TPF 6	3,50	0.6488	0.5874	3.50	1.0935	0.4060	3.50	0.4123	0.7448
TPF 7	3,50	1.5729	1.5729	3.50	1.2082	0.3164	3.50	4.7161	0.0056 **
TPF 8	2,51	3.6675	3.6675	2.51	1.0883	0.4129	2.51	1.5921	0.2134
TPF 9	2,51	1.2674	1.2674	2.51	1.1846	0.3142	2.51	0.2543	0.7764
TPF 10	2,51	2.1315	2.1315	2.51	4.1049	0.0222 *	2.51	4.1381	0.0216 *
TPF 11	3,50	1.9168	1.9168	3.50	1.0050	0.4970	3.50	1.3892	0.2569
TPF 12	3,50	1.0662	1.0662	3.50	1.4256	0.2463	3.50	1.1375	0.3430
TPF 13	3,50	0.1283	0.1283	3.50	1.0831	0.4033	3.50	0.1662	0.9187
TPF 14	4,49	1.0523	1.0523	4,49	2.8515	0.0334 *	4,49	0.7237	0.5800
TPF 2 and 4	2,51	3.1640	3.1640	2.51	1.0798	0.3473	2.51	1.1387	0.3283

*:p<0.05, **:p<0.01

The instrument used by Higgs and Rowland (1992) covered the following items: i) Team members are mutually supportive; ii) Team members interactions are positive; iii) The team operates to a shared agenda; iv) Team members are motivated to perform; v) The team demonstrates learning and developing; vi) Individual team members demonstrate learning and development; vii) The team is proactive in its dealing with problems and tasks; viii) Conflict between team members is handled constructively; ix) The team's customers are satisfied; x) The team consistently achieves its goals; xi) Individual team members achieve their goals and objectives.

In the original study of 16 teams (mean team size 6.4; SD 2.1) the instrument factor analysed into two factors (using a Varimax rotation). These were labelled Team Results and Team Atmosphere. The items within each factor and the Cronbach Alphas are shown in table 9.20.

This instrument was expanded, based on the initial interviews and focus group discussions in this study. The items added to the Higgs and Rowland (1992) questionnaire, based on the initial qualitative research were: i) Team focuses on change and improvement; ii) Teams are able to make change happen; iii) The team generates a high volume of new ideas and innovation; iv) The team is able to cope effectively with crises; v) The team develops a good mix of knowledge and skills. Of these items support was found in the literature for the change focus (eg, Hackman, 1990; Tjosvold, 1991; Ray & Bronstein, 1995) and innovation (eg, Hackman, 1990, Senior, 1996; West & Slater, 1995). The mix of knowledge and skills is more generally seen as an input rather than an outcome factor (eg, Belbin, 1981; Margerison & McCann, 1985).

The revised instrument was piloted with managers of the professional services firm who took part in the Process instrument pilot described in 9.4 above. As a result of this pilot the following items were excluded:

- i) **The team has a good mix of knowledge and skills.** In discussions with pilot managers this was consistently seen as an input to the team rather than an outcome;
- ii) **All team members follow-up decisions with a high level of commitment.** This item was consistently seen as being identical to the item which is stated as: "team decisions result in positive and specific actions".

Appendix XXI shows the final version of the team outcome questionnaire used in this study. Given the importance to the study of the outcome questionnaire as a means of generating a robust dependent variable, it was decided to subject this to a rigorous analysis. Many authors have highlighted the weakness of outcome measures as a general flaw in organisationally-based team research (West & Slater, 1995; Furnham & Stringfield, 1993; Senior, 1996; Tjosvold, 1991) it was decided to ensure that the measure in this study would need to sustain examination as a robust indicator of team outcomes in an organisational setting.

In order to analyse the questionnaire the team scores on each item attributed to the team by the manager/executive to whom the team reported were analysed using a Principal Components analysis.

Table 9.20 Results of Team Performance Questionnaire Factor Analysis, Higgs and Rowland 1992

Factor	Items	Cronbach Alpha
1. Team Atmosphere	<ul style="list-style-type: none"> ■ Positive Interactions ■ Mutually Supportive ■ Shared Agenda ■ Team Members Motivated ■ Constructive Conflict 	0.68
2. Team Results	<ul style="list-style-type: none"> ■ Team Achieves Goals ■ Customers are Satisfied ■ Team Members Achieve Goals ■ Individuals Learn ■ Team is Proactive ■ Team Learns ■ Decisions Result in Positive Action 	0.71

All four variations available in SPSS (ie, Varimax, Oblimin, Equimax and Quartimax) were examined. In general Varimax is expected to produce the largest number of factors and Oblimin will commonly reduce the number of factors (Norusis, 1994; Hair et al, 1995). The significance to the research of a robust measure of outcomes (identified by this questionnaire) warranted examining all four rotations. The results of these analyses are shown in tables 9.21 and 9.22. The variations accounted for by each of the factors in each rotation are shown in Table 9.23.

Again, given the importance to the research of the outcome measure it was felt to be important to examine the reliability of the items in the factors generated by the factor analysis. For each of the four factor analyses Cronbach Alphas were calculated for the items in the factor scales indicated. Alphas in excess of 0.70 are considered to be acceptable in terms of scale reliability. The results of these calculations are shown in table 9.24.

All four analyses produced a three factor model. Reviewing the factor weightings and Cronbach Alphas for each model shows no significant improvement resulting from the use of other than a Varimax rotation. Given this, it seems appropriate that the Varimax rotation should be used in subsequent analyses (Norusis, 1994; Hair et al, 1995). The Varimax rotation excluded two items which were:

- i) Team's ability to respond to crises;
- ii) Team's decisions result in positive and specific actions.

The first of these items was one of those added following from the initial interviews and focus group discussions.

Table 9.21 Factor Analysis of Team Outcome Questionnaire Using Varimax, Oblimin and Equimax Rotation (n= 196)

Factor	Item	Factor Loading 1*	Factor Loading 2*	Factor Loading 3*
1. Team Cohesion	■ Shared Agenda	0.87	0.97	0.86
	■ Positive Interaction	0.73	0.76	0.71
	■ Mutually Supportive	0.66	0.65	0.64
	■ Team Members Motivated to Perform	0.60	0.56	0.58
	■ Team Demonstrates Learning	0.57	0.56	0.55
	■ Constructive Conflict Management	0.57	0.56	0.55
	■ Individuals Demonstrate Learning and Growth	0.49	0.49	0.47
2. Improvement Orientation	■ Focus on Change and Improvement	0.80	0.80	0.81
	■ Make Change Happen	0.74	0.76	0.73
	■ Proactivity	0.66	0.63	0.66
	■ Generate Ideas and Innovation	0.53	0.47	0.54
3. Achievements	■ Team Members Achieve Goals	0.78	0.81	0.79
	■ Team Achieves Goals	0.73	0.72	0.75
	■ Customers are Satisfied	0.73	0.70	0.74

* Models: Factor 1 = Varimax rotation; Factor 2 = Oblimin rotation; Factor 3 = Equamax rotation

Table 9.22 Factor Analysis of Team Outcome Questionnaire Using Quartimax Rotation (n=196)

Factor	Item	Factor Loading
1. Team Climate	Shared Agenda	0.81
	Positive Interaction	0.79
	Mutually Supportive	0.76
	Team Members Motivated to Perform	0.75
	Team Demonstrates Learning	0.68
	Constructive Conflict Management	0.66
	Individuals Demonstrate Learning and Growth	0.59
	Generate Ideas and Innovation	0.56
2. Achievements	Team Members Achieve Goals	0.72
	Customers Are Satisfied	0.64
	Team Achieves Goals	0.62
3. Improvement Orientation	Make Change Happen	0.65
	Focus on Change and Improvement	0.64
	Proactivity	0.52

Table 9.23 Variations Accounted for by Rotations of Team Outcome Questionnaires

Rotation	Factor	Eigen Value	Percentage of Variation	Cumulative Percentage
Varimax	1	5.9	42.1	42.1
	2	1.25	8.9	51.1
	3	1.05	7.5	58.5
Oblimin	1	5.9	42.1	42.1
	2	1.25	8.9	51.1
	3	1.05	7.5	58.5
Equamax	1	5.9	42.1	42.1
	2	1.25	8.9	51.1
	3	1.05	7.5	58.5
Quartimax	1	5.9	42.1	42.1
	2	1.25	8.9	51.1
	3	1.05	7.5	58.5

Table 9.24 Reliability of Scales Generated by Factor Analyses (n= 196)

Factor	No. of Items	Rotation	Cronbach Alpha
1	7	Varimax	0.85
	7	Oblimin	0.87
	7	Equamax	0.86
	8	Quartimax	0.78
2	4	Varimax	0.74
	4	Oblimin	0.76
	4	Equamax	0.75
	3	Quartimax	0.75
3	3	Varimax	0.75
	3	Oblimin	0.74
	3	Equamax	0.74
	3	Quartimax	0.73

In reviewing the literature on team performance there appears to be a heavy emphasis on actual performance achievements. However, a significant number of authors point to the need for a balanced approach to outcome measurement (eg, Hackman & Morris, 1975; Berry, 1995; Senior, 1997). Table 9.25 provides a summary of the outcome measures reported in a range of studies compared (on a content analysis basis) with the results of the factor analysis of the current team outcome instrument. The factor analysis of the team outcome questionnaire produces two

factors (Cohesion and Achievement) which are in line with the measures of performance of teams which are, by and large, expected from a review of the literature on teams and the previous research. The Improvement Orientation factor is somewhat unexpected from the literature. However, a number of authors (eg, Hackman, 1990; 1992; Dyer, 1977; Leavitt & Bahrami, 1988) indicate the possibility of such a factor. Hackman (1990), in his outline of the components of group effectiveness highlights the following elements:

- i) The degree to which the group's outputs meet requirements in terms of quantity, quality and timeliness;
- ii) The extent to which the group experience improves its members' ability to work as a group in the future; and
- iii) The degree to which the group experience contributes to individual satisfaction.

Table 9.25 Review of Team Outcome Instrument Against Example Key Outcome Measures from Literature

Outcome Measures from Group/Team Research Literature	Research Outcome Factors
<p>1. Achievement Katzenbach and Smith, 1993; Chance, 1989; Johnson and Johnson, 1991; Cook and Campbell, 1979; Dyer, 1977; Ray and Bronstein, 1995; Tjosvold, 1991; West and Slater, 1995; Hill, 1982; Margerison and McCann, 1985; Blake et al, 1989; Lawson, 1995; Zigon, 1994; Banke et al, 1996; Belbin, 1976; 1981; Senior, 1996; MacDuffie, 1995; Kutz, 1982; Hackman, Brouseau and Weiss, 1975; Dainty and Kakabadse, 1992.</p> <p>2. Cohesiveness/Atmosphere/Climate Bradford and Cohen, 1984; Senior, 1996; Lawson, 1995; Cook, 1993; Hardingham and Royal, 1994; McGrath, 1984; Hackman and Morris, 1975; Cook and Campbell, 1974; Adair, 1986; Arkin, 1995; Margerison and McCann, 1985; Leigh and Maynard, 1994.</p> <p>3. Decisions Hill, 1982; Orpen, 1995; Streufert and Swazey, 1986; Spencer and Pruss, 1992; Isabella and Waddock, 1994.</p> <p>4. Improvement Focus Dyer, 1977; Leavitt and Bahrami, 1988; Hackman, 1990; 1992.</p> <p>5. Mixed/Balanced Measures Ray and Bronstein, 1995; Hackman and Morris, 1975; Higgs and Rowland, 1992; Zigon, 1994; Kaplyn and Norton, 1992; Eccles, 1991; Senior, 1996; Berry, 1995; Borrelli et al, 1995; Katzenbach and Smith, 1993; Weisbord, 1985.</p>	<p>1. Team Cohesion</p> <p>2. Improvement Orientation</p> <p>3. Achievements</p>

The emergence of the Improvement Orientation factor is, however, very much in line with the descriptions provided, of how executives (in the initial interviews) assess the performance of the

teams reporting to them. During these discussions this was identified as an important requirement both in terms of senior teams' commitment to continuous improvement and contribution to strategy formulation. The general lack of reference to this type of outcome/performance measure in the somewhat vast literature on teams and teamworking may well be due to the significant under-representation of senior management and executive teams within this literature.

In reviewing the overall results of the analysis in comparison to the literature there is a clear alignment with the apparently major factors of Achievements and Cohesiveness/ Atmosphere/ Climate. Using the three factors together, from the Varimax rotation, accounts for some 58.5% of the variations in outcomes. This compares to the Cohesion factor alone which accounts for 42.1% of the variation. This increase in variation accounted for by the additional two factors could be interpreted as providing a degree of support for the arguments for a balanced mix of outcome measures (eg, Hackman & Morris, 1975; Borrelli et al, 1995; Berry, 1995). However, further work would be needed to substantiate the assertion with a higher degree of confidence. It is interesting to note that there is no emerging factor relating to Decisions (Quality/Type). However, there was only a single item in the questionnaire relating directly to decisions (Team's decisions result in positive and specific actions). Whilst this was included in the Higgs and Rowland (1992) analysis as a Team Result item, it was excluded in the Varimax rotation of the team outcome instrument. It may be speculated that the nature of the Achievement factor items covering both goals and customer satisfaction imply a level of decision quality within the outcome. However, further research would be required to substantiate such a speculation.

It is interesting to compare the items within the Cohesion and Achievement factors emerging from the analysis of the team outcomes questionnaire with those identified by Higgs and Rowland (1992) under the factor labels of Team Atmosphere and Team Results. The most notable differences are that the two "learning" items (Individuals Learn and Team Learns) moves from the Results to the Cohesion factor. In part this may be due to the slightly different nature of the total questionnaire. However, it may also be due to the inherent sensitivity of factor analysis to sample size (Hair et al, 1995; Hays, 1981). However, the inclusion of the "Learning" items in a climate factor is not totally absent from the literature (eg, Senge, 1990; Berry, 1995).

Overall it would appear that the team outcome instrument provides a relatively robust measure of team outcomes which contains reliable factors and accounts for a significant amount of the overall variation in outcomes within the current sample.

9.7 Summary

This chapter has examined the structure of the actual sample employed in the research together with the results relating to the key study variables. The development of the team outcome and team process measures has been discussed, including the way in which the qualitative data informed the final instruments. The next chapter examines the interrelationships between the variables used in this research project.

Chapter 10. Results and Discussion 2: Relationships Between Variables

"We have first raised a dust and then complain we cannot see."

Bishop George Berkely; A Treatise Concerning The Principles of Human Knowledge, 1710

10.1 Introduction

This chapter presents the results from the correlational analyses of the relationships between the variables employed in this study. In chapter 8 the limitations of correlational analysis were discussed. In order to further explore the data and address (at least in part) these limitations the variables were examined in terms of the differences between high and low performing teams (measured in relation to outcome factors). The results of this analysis are also reported and discussed in this chapter.

The results are organised and presented as follows:

- 10.2 Input:Process Factors: A review and discussion of the relationships found between the input factors and the team process factors.
- 10.3 Input:Outcome Factors: Analysis and discussion of the relationships between the independent input variables and the dependent outcome variables.
- 10.4 Process:Outcome Factors: A discussion of the results in terms of the encountered relationships between the independent process variables and the dependent outcome variables.
- 10.5 Overview of Interrelationships: An overall review of the interrelationships encountered between the variables and formulation of a tentative model of these.
- 10.6 Differences Between Teams and Relationships with Alternative Input Variables: This section examines differences between teams. The extent to which the input and process variables differentiate between "high" and "low" performing teams is examined, based on the results obtained. Throughout the literature there are references to input variables such as team size (eg, Anderson et al, 1990; Johnson & Johnson, 1987; Hambrick & Mason, 1984), tenure of team members (eg, Katz, 1982; Smith et al, 1994; Hambrick & Mason, 1984) and corporate culture - implying company differences (eg, Nutt, 1986; Spencer & Pruss, 1992). Whilst these items were specifically excluded from the selected variables for this study (see Chapter 8) data was available and the impact of this data, in terms of differentiating between high and low performing teams is examined.

10.2 Input:Process Factors

This section examines the results found in terms of the relationship between the input factors and the process factors which have been identified from the factor analysis of the team process questionnaire. The results are examined both in terms of the overall input factors used in the

ultimate model testing (eg, Belbin Team Role Index, Supra-Competence Index etc) and the more detailed breakdown of the separate items within the indices.

Belbin Team Roles

Table 10.1 shows the significant correlations between the Belbin Team Role Index (Berry, 1995) and the team process factors (full correlational data is provided in Appendix XXIII).

From table 10.1 there is a significant relationship between the team process factor of Process Orientation and the BTR Index. Examination of the items which comprise the Process Orientation factor (Discussion of behaviour standards, willing to take risks, feedback from diverse sources, and team analyses of perceptions and processes) indicate that a "balanced" team in Belbin terms (Belbin, 1976; 1981) is able to surface and address these issues and thus operate more effectively. The process orientation relationship is clearly aligned with the views put forward by a number of researchers (Schneider, 1994; Beer, 1994; Pearson, 1987; Spencer & Pruss, 1992; West, 1994; Borrelli et al, 1995). The positive relationship with the team process factor of Alignment is somewhat unexpected. However, it should be borne in mind that this factor comprises only two items and has a coefficient alpha of only 0.48. Equally the indicated relationship between the factor Interface Management (correlation of 0.28: $p < 0.05$) has to be considered in the context that this is a single item factor and consequently has no alpha value.

From the literature it is somewhat surprising that there is no relationship with the process factor of Team Atmosphere (Belbin, 1976; 1981; Tjosvold, 1991; Senior, 1997; Hambrick, 1995). It is also surprising that there is no relationship with Communication and Interaction, and Involvement and Participation (Belbin, 1976; 1981; Tjosvold, 1984; Michaels, 1977; Deutch, 1985; Blake et al, 1987). In broad terms there would have been an expectation that the nature of the measures would have shown relationships between the process factor of Composition and Contribution and the BTR Index (Margerison & McCann, 1985; Belbin, 1976; 1981; Davis et al, 1992; Mumma, 1992). However, the result does indicate that the dynamics of teams are somewhat complex and team roles are only one of a wide range of factors (West, 1994).

Table 10.1 Significant BTR Index Correlations with Team Process Factors (n = 54)

Team Process Factor	BTR Index
9. Process Orientation	0.37**
11. Alignment	0.232*
13. Interface Management	0.28*

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Table 10.2 examines a more detailed breakdown of the relationship between specific Team Roles and team process factors.

Table 10.2 Average "Talent" Belbin Team Role Scores Correlated with Team Process Factors (n =54)

Team Process Factors	Belbin Team Roles		
	Resource Investigator	Completer Finisher	Monitor Evaluator
1. Team Atmosphere		-.304*	-.292*
2. Communication & Interaction Style		.280*	
6. Learning and Improvement	.304*		-.284*
8. Composition and Contribution		-.288*	
12. Enabling and Leadership		-.391**	

*:p<0.05; **p<0.01; ***:p<0.001

From this analysis the negative relationships between the Completer Finisher and Monitor Evaluator roles are expected (Belbin, 1976; 1981; Dulewicz, 1995(a)) as is the negative relationship between Monitor Evaluator and the team process factor of Learning and Improvement. Equally the positive relationship between the BTR of Resource Investigator and the team process factor of Learning and Improvement is in line with the literature (eg, Belbin, 1976; 1981; Senior, 1996). The negative relationships between the Completer Finisher BTR and the process factors of Composition and Contribution and Enabling Leadership are broadly in line with Belbin's original propositions (Belbin, 1976; 1981) and subsequent studies exploring his model (Senior, 1996; Berry, 1995). Some of the expected relationships which did not emerge related to Performance Orientation (Katzenbach & Smith, 1993; Tjosvold, 1991; Higgs & Rowland, 1992); Process Orientation (Hunter et al, 1992; Gersick & Davis-Sacks, 1990; Stott & Walker, 1995; Beer, 1994); Enabling Leadership, as a positive relationship (Woodcock, 1989; Spencer & Pruss, 1992; Fiedler, 1978; Bradford & Cohen, 1984); Confidence to Act (Bourgeois & Eisenhardt, 1988); and Roles (Higgs & Rowland, 1992; Larson & La Fasto, 1989). However, in part at least, these unexpected relationships may relate more to the conceptual modelling framework than specific item interrelationships (Hackman & Morris, 1975; McGrath, 1984; Pinto et al, 1993).

Supra-Competences

Table 10.3 summarises the significant relationships found between the Supra-Competence Index and the Team Process Factors.

Dulewicz (1995(a)) demonstrated a number of significant relationships between the Belbin Team Roles and the Supra-Competences (calculated by means of factor analysis of the Job Competences Survey). Therefore, there would be an expectation of similar relationship patterns between the Supra-Competences and the team process factors to those encountered in a comparison with the Belbin Team Roles. However, examination of tables 10.1 and 10.3 indicate that these expected similarities were not encountered in the current study.

10.3 Supra-Competence Index Correlations with Team Process Factors (n = 54)

Team Process Factor	Supra-Competence Index
7. Roles	.22*
8. Composition and Contribution	.23*
10. Realistic Focus	.223*

*:p<0.05; **:p<0.01; ***:p<0.001

Finn (1993) proposed that the team competence mix may be related to team performance. This concept of mix is also highlighted by Higgs and Rowland (1992). The encountered relationships (from table 10.3) are largely in line with these hypotheses. The relationship between the team process factor of Realistic Focus and the Supra-Competence Index is somewhat unexpected. However, this factor comprises only two items (Good Time Management and Team understands how it adds value) and an alpha at the lower end of those found with the process instrument (alpha of 0.60). Examination of the items within this factor does, however, identify potential explanation of the encountered relationships. Higgs and Rowland (1992) identified the significance of a team understanding how it adds value as an important element related to the competences of a team. This view is reinforced in the competency literature when team competence mix is considered (Finn, 1993; Bradford & Cohen, 1984; Cook, 1993; Higgs, 1991; Hambrick, 1995).

Table 10.4 examines the more detailed relationships between the specific Supra-Competences and the team process factors. The relationship between the Supra-Competence of Achievement Motivation and the team performance factor of Learning and Improvement is in line with McClelland's findings on achievement motivation (McClelland, 1971).

Furthermore it is in line with some of the views on effective team performance configurations (Katzenbach & Smith, 1993; Tjosvold, 1991; Higgs & Rowland, 1992; Herbert, 1990). The relationships between Persuasiveness and Assertiveness and Decisiveness and the team process factors support the findings of Dulewicz (1995(a)) and the broader literature in relation to leadership and teamworking (eg, Belbin, 1981; 1976; Margerison & McCann, 1985; Woodcock & Francis, 1981; Spencer & Pruss, 1992). Interface Management as a team process factor is highlighted relatively rarely (Higgs & Rowland, 1992). However, based on their description of the results of a study within an international oil company the linkage between this factor and the Supra-Competence of Assertiveness and Decisiveness is understandable. In exploring this relationship it is important to bear in mind that this particular process factor comprises a single item (Team Leader manages external relationships) which may logically be seen as an element of Team Leadership (Blake et al, 1987; Spencer & Pruss, 1992; Leigh & Maynard, 1994; Fielder, 1978; Bradford & Cohen, 1984).

Table 10.4 Significant Correlations Between Supra-Competences and Team Performance Factors (n = 54)

Team Process Factor	Supra-Competence		
	5. Persuasive- ness	6. Assertiveness & Decisiveness	11. Achievement Motivation
6. Learning and Improvement			-.40*
12. Enabling Leadership	.43*	.486**	
13. Interface Management		.408*	

It is somewhat surprising that no relationship was found between Interpersonal Sensitivity and the team process factors of Team Atmosphere and Communication and Interaction. Such a relationship may be inferred from a number of the research studies into team processes (eg, Argrell & Gustafson, 1996; Blanchard, 1988; Senior, 1996; Litwin & Stringer, 1968; Borrelli et al, 1995; Tjosvold, 1984; Deutch, 1985). Dulewicz (1995(a)) found a wide range of relationships between Belbin Team Roles and Supra-Competences which could be seen as indicating a wider range of relationships between Supra-Competences and team processes than have been identified in this study. However, the unit of analysis in Dulewicz's study was the individual whereas the unit of analysis in the current study is the team. Therefore, the encountered relationships relate to a, previously unexplored, measure of team competence mix which was theoretically indicated by Finn (1993).

Critical Thinking Appraisal and Productive Thinking Test

In the study no significant relationships were found between the thinking style input measures (CTA, PTT and combined CTA:PTT) and the team process measures. This finding was encountered at both the team and individual participant level of analysis. Clearly, whilst the literature is not specific on these potential relationships, these results are somewhat unexpected (eg, Myers & McCaulley, 1989; Higgs & Dulewicz, 1997(a); West & Anderson, 1996). The relationships between cognitive elements and outcome factors would be expected to be more evident than the process relationships (eg, Belbin, 1976; 1981; Furnham, 1992; West & Anderson, 1996; Higgs & Dulewicz, 1997(a)).

10.3 Input:Outcome Factors

The relationships between the input and outcome measures (as measured through the team outcome questionnaire) are examined in this section using both the overall team measures (eg, BTR Index, Supra-Competence Index) and the average team scores in terms of the range of Belbin Team Roles and Supra-Competences in each team. The interrelationships of the measures at the overall team level of analysis are summarised in table 10.5.

Table 10.5 Overall Team Level Relationships Between Input and Outcome Factors (n=54)

Input Factors	Outcome Factors		
	TPM1 Team Cohesion	TPM2 Improvement Orientation	TPM3 Team Achievements
BTR Index	.30*	.34**	.197
Supra-Competence Index	.032	.33**	-.029
CTA	.122	.009	.018
PTT	-.083	-.011	.041
CTA.PTT	.096	.132	.106

*:p<.05; **:p<0.01; ***:p<.001

Belbin Team Roles

The positive and significant correlation between the Belbin Team Role Index (Berry, 1995) and the outcome factor of cohesion is implied in Belbin's original work (Belbin, 1976; 1981). Belbin pointed out that duplication of certain roles (eg, Shaper) caused conflict within the team (Belbin, 1976; 1981) and that a "balanced" team would be one in which the 'abrasiveness' of certain roles would be offset by the interpersonal skills associated with complementary roles (eg, Co-ordinator, Team Worker). The positive correlation with the outcome factor of cohesion would tend to be supportive of this view of the mix hypothesis. The significant positive correlations between the BTR Index and the outcome factor of Improvement Orientation is, initially, unexpected. However, the items within this factor (focus on change and improvement; making change happen proactively; and generating ideas and innovation) would tend to be associated with the Belbin Team Roles of Plant and Resource Investigator. Higher values of the BTR Index imply a greater degree of facility with which these Team Roles are accommodated within the team (Belbin, 1976; 1981; Berry, 1995; Senior, 1996). The nature of the Belbin Team Role Index is such that it may be considered to be an indication of heterogeneity within a team. Thus higher index scores may be viewed as measures of increasing heterogeneity and, as such, indicative of greater innovation, which may be considered as an important element of Improvement Orientation (Anderson et al, 1990). Tjosvold (1984) points to the need for a team to be able to manage diverse and independent behaviours in order to achieve superior performance. Within this framework he identifies an "improvement mentality" as being important to the performance outcome.

In moving from the overall index level to examining the relationship between individual Team Roles and outcomes (using an average team "talent" score) shows a limited degree of relationship. The current study data provides a single significant relationship between the average "talent" score for the BTR of Resource Investigator and the outcome measure of

Cohesion (correlation of 0.352 with a significance level of $p < 0.01$). Given the nature of the Cohesion outcome factor in this study and the nature of the Resource Investigator role this relationship is expected (Belbin, 1976; 1981).

The lack of a significant correlation between the BTR Index and Team Achievements is somewhat surprising in the light of Belbin's original hypotheses (Belbin, 1976; 1981) and the views of other authors and researchers emphasizing the value of "mix" in a team (eg, Margerison & McCann, 1985; Mumma, 1992). In relation to Belbin, in particular, the current study provides no evidence of the contribution of team mix to the realisation of performance. However, this lack of outcome does lend a degree of support to the inadequacies of Belbin's model in an organisational (as opposed to experimental) setting (Furnham et al, 1993, West & Slater, 1995).

Supra-Competence Index

The findings of Dulewicz (1995(a)) would suggest strong parallels between the BTR Index and Supra-Competence Index findings from the current study. However, it is somewhat surprising that the mix of Supra-Competences does not relate to the outcome measure of "Cohesion". It is at this level that the greatest level of convergence with the Team Role Index might be expected (Finn, 1993; Belbin, 1976; 1981). The lack of a significant correlation between the Supra-Competence Index and Cohesion is additionally surprising given the findings, at an individual level, of Dulewicz (1995(a)). Furthermore, other authors examining competences in a team setting indicate potential climate relationships which are not encountered in this study (Cook, 1993; Higgs, 1996(b); Goleman, 1981; Dulewicz et al, 1997; Larson & La Fasto, 1989). At a more detailed level the significant relationships between the average team scores on the Supra-Competences and the Outcome factors are shown in table 10.6 (more detailed correlation data is shown in Appendix XXIII). The relationship between Persuasiveness and Cohesion is initially somewhat surprising. However, there is some evidence that individuals who score highly on Persuasiveness as a Supra-Competence are more generally socially skilled (Dulewicz & Herbert, 1997). In addition this finding may well be related to the leadership of the team (eg, Higgs & Rowland, 1992; Hatch, 1990; Davis et al, 1992; Adair, 1986; Ray & Bronstein, 1995).

Furthermore, this finding may support the findings of Belbin (1976; 1981) in terms of the "social leadership" role performed by the team Co-ordinator role. The relationship between the Supra-Competence of Business Sense and the Outcome factor of Improvement Orientation is somewhat surprising. However, the Supra-Competence of Business Sense is often something of a "rogue factor" and comprises a single item factor from the analysis of the JCS (Dulewicz et al, 1997). Therefore, it is difficult to draw any substantial conclusions from the encountered relationship in this study (although the study results may provide some support for the need for further research to explore the real nature of the Business Sense Supra-Competence).

At an individual Supra-Competence level there are a number of significant relationships with the Achievements outcome factor.

Table 10.6 Average Team Supra-Competence Scores Correlated with Team Outcome Factors (n = 54)

Supra-Competences	Team Outcome Factors		
	1. Team Cohesion	2. Improvement Orientation	3. Achievements
5. Persuasiveness	.29*		.27*
7. Interpersonal Sensitivity			.37**
8. Oral Communication			.28*
12. Business Sense		.28*	

The relationship between Persuasiveness and Achievement may in reality be more closely related to team leadership and the role of the leader in relation to managing team interfaces with the organisation and their internal and external customers (Higgs & Rowland, 1992). The positive relationship between Interpersonal Sensitivity and Achievements is particularly interesting in the light of the current hypotheses being proposed in the context of Emotional Intelligence (eg, Goleman, 1996). Furthermore, the finding is supportive of a range of existing research results and theoretical hypotheses (eg, Lawson, 1995; Kaplan & Norton, 1992; Fiedler, 1978; Bradford & Cohen, 1984; Hackman, 1990; Tyson & Jackson, 1992).

The positive relationship between Oral Communication and the Achievements outcome is superficially somewhat surprising. However, as Dulewicz et al (1997) have identified this is a Supra-Competence (at an individual level) which is related to managerial progression and thus may be more understandable in a team achievement context. Furthermore it may be related to the team's ability to manage internal interfaces and support the provision of customer service (Higgs & Rowland, 1992; Borrelli et al, 1995).

The analysis of the data from this study provides some results which are surprising in terms of the absence of expected relationships. The absence of a relationship between outcome measures and the Supra-Competence of Managing Staff tends to contradict a significant emphasis in the literature which positions team working as an effective paradigm for management in a volatile business environment (eg, Tjosvold, 1991; Ray & Bronstein, 1995; Woodcock & Francis, 1981; Parker, 1990; Leigh & Maynard, 1994; Hardingham & Royal, 1994). However, it is important to bear in mind that the Supra-Competence model has an individual focus (Dulewicz, 1995(a)) and that the concept of team competence mix remains relatively unexplored within the literature (Finn, 1993). In addition the Index is unweighted and therefore takes no account of potential dysfunctionalities resulting from surpluses of certain Supra-Competences within the team (eg, the impact of more than one member with high Assertiveness and Decisiveness scores).

Critical Thinking Appraisal (CTA)

No significant relationships were encountered between the Watson-Glaser Critical Thinking Appraisal and the team outcome factors. Whilst the literature indicates linkages between the mix of skills in a team (eg, Margerison & McCann, 1985; Senior, 1996), there is little which examines the specific relationships between cognitive ability, at the team level, and team performance. Williams and Sternberg (1988), in an experimental study of teams, proposed the construct of 'group intelligence'. However, they highlighted that whilst groups are no smarter than the sum of their talents they can sub-optimize their potential if the processes employed do not enable members to share their talents. Equally they identified that the performance of 'harmonious' groups are enhanced by the presence of particularly talented members. The little that has been written, at the team level, in relation to cognitive abilities indicates that group processes can have a negative impact on the mental efficiency of the group (eg, Janis, 1972). In Belbin's original work he deliberately examined "high intelligence teams" (which he labelled Appollo Teams) and found that they did not out perform other mixed teams (Belbin, 1976; 1981). As Belbin employed the CTA as an element in the assessment of mental capability (Belbin, 1976; 1981; Life, 1996) the results encountered in this study could be considered to be in line with this finding.

Productive Thinking Test (PTT)

The results, in table 10.5, show that no significant relationships were found between the PTT and any of the outcome factors. As with the CTA there has been relatively little work which has been carried out, at the group or team level, which explores the relationship between measures of divergent thinking and team performance or outcomes (West & Anderson, 1996). In a review of existing research into innovation and teams Agrell and Gustafson (1996) concluded that team innovation is influenced by the contextual determinant of group climate. However, this views innovation (a potential consequence of divergent thinking) as an outcome rather than input factor. In exploring innovation in top management teams West and Anderson (1996) considered the proportion of innovators in a team as an input factor. This was based on earlier work (Burningham & West, 1995) which led to the formulation of a proposition that the extent and quality of team innovation will be determined by the proportion of innovative individuals who constitute the team. In their study, West and Anderson (1996) employed the five-item scale developed by Burningham and West (1995) to measure individual propensity to innovate. They found that their results supported one of their hypotheses which was that the proportion of innovators in a team would influence team innovation. In particular they found a significant relationship between the proportion of innovators and the innovation radicalness, which was one of their outcome factors.

Whilst the current study does not explore innovation as a specific outcome factor the Improvement Orientation factor might, in the light of the above, have been expected to have a degree of relationship to the input factor of divergent thinking as measured by the PTT. However, this expected relationship pre-supposes that the PTT is an indicator of creativity or

innovative propensity. As has been shown above the PTT does not appear to be related to other measures of creativity and thus the lack of relationship may be considered as unsurprising. This is not to say that a relationship between innovative propensity in a team and the outcome factor of Improvement Orientation should not be expected. The exploration of this could prove to be fertile ground for future research.

Combined CTA and PTT

The fact that the study showed no relationship between the composite CTA:PTT score and the outcome factors is unsurprising given the discussion above.

10.4 Process:Outcome Factors

This section of the chapter examines the results encountered which illuminate the relationships between the team process factors, as measured by the team process questionnaire, and the three outcome factors (ie, Team Cohesion, Improvement Orientation and Achievements). Table 10.7 shows the correlations found between the team process factors and the outcome factors.

Table 10.7 Significant Correlations Between Team Process and Outcome Factors (n = 54)

Team Process Factor	Team Outcome Factor		
	Team Cohesion	Improvement Orientation	Achievements
1. Team Atmosphere	0.28**	0.23*	0.03
2. Communication and Interaction	0.31**	0.27**	0.10
3. Performance Orientation	0.27**	0.02	0.02
4. Involvement and Participation	0.28**	0.17	-0.03
5. Confidence and Comfort	0.37**	0.22*	0.14
6. Learning and Improvement	0.08	0.15	0.05
7. Roles	0.30**	0.24*	0.23*
8. Composition and Contribution	0.50***	0.34**	0.28**
9. Process Orientation	0.25*	0.09	0.15
10. Realistic Focus	0.29**	0.30**	0.34**
11. Alignment	0.12	0.25*	0.10
12. Enabling Leadership	0.24*	0.07	0.02
13. Interface Management	0.04	-0.12	-0.02
14. Distribution of Contribution	0.24*	0.07	-0.03

***:p<0.001; **:p<0.01; *p<0.05

The range of significant correlations between the team process factors and the outcome factor of cohesion is to be expected from the extensive literature examining elements of these

relationships (eg, Tjosvold, 1991; Katzenbach & Smith, 1993; Casey, 1985; Beer, 1994; Blanchard, 1988; Hambrick, 1995). The particularly high and very significant relationship between the process factor of Composition and Contribution is unsurprising given the previous research evidence relating to the impact mix of skills and personalities of team members on the functioning of the team in terms of its cohesiveness (eg, Woodcock, 1989; Spencer & Pruss, 1992; McClure & Werther, 1993; Larson & La Fasto, 1989; Pavett & Lau, 1983). Indeed much of the Team Role literature focuses on the relationship between the team composition and balance and team outcomes (eg, Belbin, 1976; 1981; Margerison & McCann, 1989; Woodcock, 1989; Stewart, 1989; Spencer & Pruss, 1992). In general terms the literature tends to be more focused on performance outcomes rather than cohesion. However, in chapter 8 above the debate concerning the nature of team performance has been examined and the arguments for the inclusion of climate elements (eg, cohesiveness) reviewed. Within their group interaction process model Hackman and Morris (1975) specifically include cohesiveness as an outcome factor. These results tend to lend support to such an inclusion.

The lack of a significant relationship between the process factor of Learning and Improvement and Cohesion is somewhat unexpected. The individual items within this factor are indicated within the literature as being related to elements of team climate and cohesiveness (eg, Higgs & Rowland, 1992; Deutch, 1985; Hackman, 1990; Dulewicz et al, 1997). These results, however, do not support such a relationship when the items are combined into a single factor. This finding may, in part, be due to the nature of the sample and in part to the exigencies of the process of factor analysis. The lack of a significant relationship between the process factors of Alignment and Interface Management and the Cohesion outcome factor is not particularly surprising. The Cronbach Alpha of the Alignment factor is relatively low and Interface Management comprises a single item only which may more appropriately be considered as an element of leadership.

Fewer significant relationships are encountered between the process factors and the outcome factor of Improvement Orientation. This outcome factor is not widely examined in the literature (see chapter 9) and thus it is difficult to comment, on an overall basis, as to whether or not the results are different from hypothesised or research expectations found in the literature. In examining the significant relationships encountered in this study they are generally understandable in the light of previous research. Both Team Atmosphere and Communication and Interaction are widely found to be related positively to team climate measures (eg, Senior, 1996; Davis et al, 1992; Pearson, 1987; Tjosvold, 1991; Ray & Bronstein, 1995; Anderson et al, 1990). Team Composition is widely identified as being related to cohesion and has been discussed above.

The team process factor of Confidence and Comfort is not widely encountered in the literature. However, the relationship encountered in this study does provide support for the findings of Bourgeois and Eisenhardt (1988). In their study of management teams in a 'high velocity' environment (they used the micro computer industry as an illustration of such an environment)

they found that 'confidence to act' was a factor which consistently accounted for differences between high and low performing teams. It is important, however, to bear in mind that the management teams in this study could not be considered to be operating in a 'high velocity' environment. This finding could indicate that Bourgeois and Eisenhardt's factor of 'confidence to act' is not specific to managerial teams in 'high velocity' environments. Inspection of the items comprising the Confidence and Comfort factor shows that one is related to the encouragement of creative ideas. West and Anderson (1996) provided evidence to show a relationship between innovative propensity amongst team members and the innovative output of the team. It may be that the Improvement Orientation factor in this study could be linked to innovation in the team. If this were so then the relationship between the Confidence and Comfort process factor and the Improvement Orientation outcome factor could be seen as less surprising given the findings of West and Anderson (1996). However, further research would be necessary before making this assertion with complete confidence.

Within the literature the importance of clarity and understanding of roles in a team has been emphasised in theory and in research studies (Higgs & Rowland, 1992; Katzenbach & Smith, 1993; Tjosvold, 1984; 1991; Spencer & Pruss, 1992; Hackman, 1990; Eisenstat & Cohen, 1990). The results from this study tend to reinforce this finding with the Roles process factor being one of only three where significant relationships are found with all of the outcome factors. The apparent strength of the process factor of Realistic Focus, in that significant relationships between this and all of the outcome factors are encountered, is not strongly indicated within the literature. Higgs and Rowland (1992) identified a relationship between a team's clarity of understanding of how it contributes and adds value and the performance of the team. Throughout the literature considerable emphasis is placed on the importance of the clarity of a team's mission and goals in securing effective performance (eg, Katzenbach & Smith, 1993; Tjosvold, 1991; Orpen, 1995; Larson & La Fasto, 1989; Zigon, 1994; Woodcock, 1989; West, 1994). The Realistic Focus factor may, in practice be an element of this broader understanding of mission and objectives. Indeed there are significant positive correlations, in this study, between the process factors of Realistic Focus and the other factors which include items relating to goals and objectives (Performance Orientation and Involvement and Participation). Overall, in considering the Realistic Focus factor it is important to bear in mind that it comprises only two items and has a relatively low alpha (0.60).

The relationship between the Alignment process factor and Improvement Orientation outcome factor is somewhat surprising and does not appear to be indicated by the literature. This process factor comprises only two items and has the lowest alpha of all of the multi-item factors in this study (alpha = 0.48). Thus it may be inappropriate to place too much emphasis on the relationship encountered.

The lack of many significant relationships between the process factors and the outcome factor of Achievements is somewhat surprising and unexpected. The only significant relationships which are encountered with this outcome factor are those with the process factors: Roles, Composition

and Contribution and Realistic Focus. Each of these have been discussed briefly above. The Composition and Contribution factor relationship with Achievements would appear to lend weight to much of the previous research on Team Roles (eg, Belbin, 1976; 1981; Margerison & McCann, 1989; Mumma, 1992; Berry, 1995). The current study does provide information relating specifically to management teams and the data have been gathered in an organisational setting. To an extent, therefore, the study addresses some of the limitations in team research identified by West and Slater (1995).

From the data available it is not possible to determine whether the limited relationships between the process factors and the Achievement factor are indicative of a general absence of linkage between process and performance factors or whether the results have been influenced by the absence of a "hard" and objective measure of team performance. The absence of such a measure may have led to an over-subjective assessment of team achievements by the individual executives making such assessments. Furthermore, there may have been variation in interpreting the factor items and scales by the executives in their assessment of this factor. It would certainly be valuable, in future research, to examine process to outcome relationships in which a "hard" and objective measure of team performance is incorporated into the range of Outcome measures.

From a review of table 10.7 it is interesting, and initially surprising, to note that Enabling Leadership is only significantly related to the outcome factor of Cohesion. Many other studies have indicated the significance of leadership in relation to a range of team performance factors (eg, Higgs & Rowland, 1992; Katzenbach & Smith, 1993; Maxon, 1986; Woodcock, 1989; Woodcock & Francis, 1981; Leigh & Maynard, 1994; Hambrick, 1995; Senior, 1996). However, in many of the published studies, in a team context, leadership behaviour has been examined as a single variable item (indeed in a number of the studies the operationalisation of leadership has not been made explicit). Within this study the factor of Enabling Leadership encompasses three leader specific items. However, a number of the other factors also include leadership-related items. Factor 13 (Interface Management) is a single item factor which relates directly to one element of leader behaviour. In addition Factor 4 (Involvement and Participation) includes three items specifically relating to leadership behaviour, and Factor 6 (Learning and Improvement) includes one item. From this content analysis of the factors it is possible to hypothesise that leadership is an element in explaining a number of the encountered relationships between team process and performance within this study. However, due to the outcomes of the factor analysis all leadership designated items did not come together in a single factor. The results show only that the items comprising the factor Enabling Leadership have an outcome relationship limited to Cohesion. On reflection, therefore it would be incorrect to generalise from this and suggest a broader lack of relationships between team leadership and the team outcome factors.

Care needs to be taken in reviewing these results in terms of expected and unexpected relationships. It should be borne in mind that much of the team research has been based on non-managerial teams and often entailed experimental rather than organisational settings for the

research (West & Slater, 1995). Furthermore, the sample involved in the current study is a highly specific one in terms of dominant industry setting and team member organisational roles. The extent to which the findings are sample specific should be explored in future research.

10.5 Overview of Inter-relationships Between Variables

Interrelationships Between Input Variables

In examining the interrelationships between the input variables there are two distinct purposes which are i) to establish the degree of intercorrelation which may have an impact on the ultimate model examination; and ii) to explore the inter-relationships in the light of the literature on input factors related to teamworking. In order to explore the basic inter-relationships the following measures were employed: i) Belbin Team Role Index; ii) Supra-Competence Team Index (see above); iii) average team score on the CTA; iv) average team score on the PTT; and v) average team score on the combination of the CTA and PTT.

To examine further the interrelationships between the input factors, in the light of the literature, the following measures were employed: i) average team 'talents' using the BTR model; this was calculated by means of the average biserial score per 'talent' per team member using an 8 sten cut-off (ie, a sten score of 8 on a talent scored 1 and the average team 'talent' score is calculated as the sum of 'talents' per role divided by the number of team members for each role); ii) average team score per Supra-Competence using the same approach as in i), but using a score of 4 or 5 on each Supra-Competence as an alternative to the 8 sten cut-off in i) above (Dulewicz, 1995(a); Saraweno, 1995); and iii) average CTA and PTT scores (including the individual PTT volume and breadth scale scores) as in the initial analysis.

A summary of the input measures which are to be used in the overall model analysis are shown in table 10.8. Examination of this table shows that the only significant intercorrelation is that between the BTR Index and the Supra-Competence Index. This result is not surprising in the light of the results published by Dulewicz (1995(a)) and indeed lends general support to the conclusion from his research that there is a relationship between the Supra-Competences and Belbin Team Roles. However, the scale of the significant correlation (0.39) is at a level which suggests that the factors may both be used in subsequent model testing as the relationship is less than the 0.5 level identified as a cut-off for unique factors in model examination (Hair et al, 1995; Lehman, 1991). Furthermore, the relationship between the two indices could be viewed as lending support to the assertion that team competence mix is important to team performance (Finn, 1993; Smith, 1995; Cook, 1993; Herbert, 1990). The lack of correlations between the CTA and PTT and both the BTR Index and Supra-Competence Index could well indicate that, for this sample at least, these are measuring distinctly different constructs. Equally the absence of correlational relationships between the CTA and PTT suggests that they are measuring different constructs in terms of 'thinking style'. The CTA is a measure of analytic thinking (Watson & Glaser, 1991) whilst the PTT is a measure of divergent thinking (Higgs & Dulewicz, 1997(a)). The lack of intercorrelation lends support to the differentiation between these two elements of thinking style.

Table 10.8 Intercorrelations Between Principal Input Measures (n = 196)

	BTR Index	SC Index	CTA	PTT
BTR Index	1.00			
SC Index	0.39**	1.00		
CTA	-0.17	-0.163	1.00	
PTT	0.041	-0.135	0.146	1.00

*=P<0.05; **=P<0.01; ***=P<0.001

A more detailed examination, within the current study, of the relationship between the BTRs and the Supra-Competences within a team is summarised in table 10.9 (a full correlational summary is provided in Appendix XXIII). A number of the encountered relationships are somewhat expected. The Plant relationship with Strategic Perspective is indicated by Belbin (1976; 1981) and Dulewicz (1995(a)). Equally the Completer Finisher relationship is in line with Belbin's assertions (1976, 1981). The negative relationship between Managing Staff and the Team Worker role is somewhat surprising. However, the tenacity and assertiveness associated with managing others (Dulewicz, 1995(a)) would be at odds with the lower levels of tenacity and higher levels of sensitivity associated with the Team Worker role (Cattell, 1989; Belbin, 1976; 1981). The negative relationship between the Monitor Evaluator role and persuasiveness is somewhat predicted by Belbin (1976; 1981) and highlights the need to develop a greater understanding of this role indicated by Dulewicz (1995(a)). The negative relationship between the Co-ordinator role and the Supra-Competence of Adaptability and Resilience appears somewhat surprising. However, whilst adaptability may be associated with this role the 16PF equations underpinning the role do not highlight resilience as a feature. Furthermore, Dulewicz's study (1995(a)) shows no clear relationship between resilience and the Co-ordinator's role. Overall, the relationships between the BTRs and Supra-Competences in this study are broadly in-line with the expected relationships (Belbin, 1976; 1981; Dulewicz, 1995(a)). The relatively minor variations from these expectations may be due to the somewhat specific structure of this sample (see chapter 9 above).

The PTT provides an examination of divergent thinking whilst the CTA provides a measure of analytical or convergent thinking (Higgs & Dulewicz, 1997(a)). A lot of effort has gone into developing constructs to illuminate the competences associated with different aspects of creativity (Wallach, 1988). However, these constructs have often been abstract and failed to deliver much information about real life competences which are of interest. A large proportion of this research has been conducted in educational settings with a focus on traditionally perceived creative capabilities (eg, painting, music, etc).

In the business world there is a lot of interest in innovation and creativity as an aspect of competitive performance (Gronhaugh & Kaufmann, 1988).

Table 10.9 Statistically Significant Relationships Between BTR's and Supra-Competences
(n = 196)

Supra-Competences	BTR's				
	Co-ordinator	Monitor Evaluator	Team- Worker	Completer Finisher	Plant
S.C.1: Strategic Perspective					.317*
S.C.3: Planning and Organising				.280*	
S.C.4: Managing Staff			-.267*		
S.C.5: Persuasiveness		-.357**			
S.C.6: Assertiveness and Decisiveness				-.296*	
S.C.8: Oral Communication			.458***		
S.C.9: Adaptability & Resilience	-.328*				

*=P<0.05; **=P<0.01; ***=P<0.001

Within studies of managerial performance it is not uncommon to encounter creativity or innovation as competences in managerial competency frameworks (eg, Dulewicz, 1995(a), Spencer & Spencer, 1993). Sometimes these constructs are seen as two distinct competences (eg, Spencer & Spencer, 1993). However, they are often in reality related. Gronhaugh and Kaufmann (Ibid) provide a useful commentary on their conceptual interrelatedness:

"In writings on innovation it is necessary to examine the construct's definition in terms of the creation of something new, and its adoption (ie, it has to have perceived utility) innovations presuppose creativity; creativity implies the ability to see or imagine new perspectives. Creativity involves both problem finding and problem definition" (Wallach, 1988).

In attempting to examine the construct of creativity a considerable amount of work has been done to flesh out its psychological meaning. Within this research one major direction emerged; that of **flow of ideas** (Wallach, 1988). However, Ghiselin (1955) pointed out earlier that flow (ideational fluency) is not a sufficient measure of creativity. Indeed Guilford (1959) began to examine a range of tests which fell into a category in which items had no one correct answer but required a range of responses in order to assess divergent thinking. Examination of those tests led to three derived scores, viz: i) fluency (number of responses), ii) flexibility (range of categories within responses), and iii) originality of responses.

Other studies have attempted to examine the relationship between creative thinking and mental abilities. Again studies have frequently been conducted within an educational setting and produced mixed results. Bennet (1972) in a study of 1000 school children found that scores on

divergent thinking tests and conventional mental ability tests (sometimes referred to as convergent thinking tests) were not independent. However, other studies examining the relationship between mental ability tests and creative talent accomplishments found no relationship (Wallach, 1988; Milgram & Milgram, 1976; Singer & Whiton, 1971). These studies also found, however, a positive relationship between ideational flow and talented accomplishments. However, there does appear to be a paucity of research into these relationships in an organisational context.

The conflicting evidence on links between creativity and intelligence may, in part be due to the controversies surrounding the nature of mental ability tests and the operationalisation of its measurement. As Furnham (1992) points out mental ability:

“... refers to an individual’s capacity for abstract and critical thinking. A large number of controversies surround this concept - for instance, whether it is uni-or multi-dimensional, to what extent it is inherited or learnt, and how it should be measured.”

Thus, from the research to date (albeit a limited amount in an organisational context) there seem to be a number of questions or issues which warrant further research. These are:

- i) Are divergent thinking tests a measure of creativity? (Kline, 1979);
- ii) Is there a relationship between creativity (as measured by tests of divergent thinking) and mental ability tests? (Grønhaugh & Kaufmann, 1988);
- iii) Is there evidence of relationships between apparent measures of creativity and creative performance in an organisational setting?

In relation to this third question there is far less research evidence to examine. In the Belbin studies on team roles (Belbin, 1981) evidence is proposed that the inclusion of a creative role in a team (ie, the Plant role) is associated with effective team performance. However, the identification of this role is strongly linked to the Cattell 16PF Factor B (a stated indicator of mental ability) and the derived second order factor of creativity (Cattell & Butcher, 1970). There have been a limited number of further organisationally related studies. Dulewicz (1995(a)) in looking at validating the Belbin Team Role model did find significant relationships between the Plant Team Role as identified by the 16PF and OPQ and the Supra-Competences (Dulewicz & Herbert, 1992) which were negative in relation to Resilience and Adaptability and positive in relation to Energy and Initiative.

In order to explore relationships between the data obtained in the current study a number of data analyses were conducted. To produce statistically usable data the Productive Thinking Test scores on each of the two scales were converted to standard scores. The addition of those standard scores was used to produce a combined divergent thinking score (PTT overall). In line with the literature which suggests that thinking power (Kline, 1979) may be related to independent measures of creativity, a combination of the Critical Thinking Appraisal score and PTT score was calculated. This entailed standardising the additive PTT overall score and adding this to a standardised score from the Critical Thinking Appraisal raw scores (CTA.PTT). As this

element of the current study was essentially exploratory in nature the relationships between the thinking scales and other measures were examined by means of correlational analysis.

Table 10.10 shows the intercorrelations between the Critical Thinking Appraisal, Productive Thinking Test and combined Thinking Power scores (CTA.PTT). There are no significant correlations between the Watson-Glaser Critical Thinking scores (CTA) and the individual or combined scale scores of the Productive Thinking Test. This would indicate that the two measures are independent and, therefore, potentially measuring distinct and independent constructs. The significant relationships between the Watson-Glaser (CTA) and CTA.PTT scores are explicable in terms of the nature of the construction of the CTA.PTT score and do not contradict the previous observation. Table 10.11 shows a summary of the significant correlations between the "Thinking Test" scores and the 16PF primary factors together with the related second order factors (fuller details are provided in Appendix XXIII). The absence of relationship between factor B and Volume, PTT, Breadth Standard, and PTT overall could reinforce the independence of the Productive Thinking Test constructs from other measures of mental ability. The positive correlations between Breadth. PTT. (range of ideas) of the Productive Thinking test and 16PF factors E (Assertive) and H (Bold) are initially somewhat surprising. However, it may be hypothesised that identifying a range of different implications of a situation may provide underpinning for related traits or alternatively (and possibly more correctly) the underlying traits may lead to more diverse thinking around implications and opportunities. The negative correlation between 16PF factor Q1 (Experimenting) and the PTT Volume (volume of ideas) is surprising and does not suggest any obvious interpretation. Given the construction of the CTA.PTT score the significant correlations are clearly understandably influenced by component item correlations.

The only significant correlations between the "Thinking Power" measures and the 16PF second order (and derived second order) factors was that with Tough Poise (see table 10.11). This is a somewhat surprising result, although it may be explicable in terms of the trait underpinning the exhibition of divergent thinking behaviours. Perhaps more surprising is that none of the thinking measures are significantly related to the derived 16PF second order factor of Creativity. This factor in itself is not related to a direct measure of creative ability, but is a composite which was found from analysis of the profiles of individuals in creative occupations (eg, artists, writers, research scientists etc. - Cattell & Butcher, 1970). As such, it is a factor used in the examination of creativity which Helson (1988) would have classified as being a combination of the application of personality psychology with some elements of "eminent people" studies. There are some dangers in inclusion of such "eminent" components and overall studies of personality characteristics across fields (Eiduson & Beckman, 1973).

Table 10.10 Intercorrelations of Measures Used in Examining the Productive Thinking Test (n = 196)

	PTT Volume	PTT Breadth	PTT Overall	CTA. PTT	CTA
PTT Volume	1.00***				
PTT Breadth	0.405***	1.00***			
PTT Overall	0.849***	0.838***	1.00***		
CTA.PTT	0.648***	0.605***	0.784***	1.00***	
CTA	0.103	0.006	0.064	0.723***	1.00***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Volume PTT = Standardised score for the volume of ideas scale on the Productive Thinking Test

Breadth PTT = Standardised score for the range for ideas on the Productive Thinking Test

PTT. overall = Volume Standard + Breadth Standard

CTA.PTT = Addition of standardised PTT Score and standardised CTA raw score

CTA = Standardised raw scores on the Critical Thinking Appraisal

Table 10.11 Significant Correlations of Productive Thinking Test Measures with the 16PF (n = 196)

16PF Factor	Volume PTT	Breadth PTT	PTT Overall	CTA. PTT	CTA
16PFB (Abstract Thinking)				0.178*	
16PFE (Assertive)		0.275**	0.180*		
16PFH (Bold)		0.190*			
16PFFQ1 (Experimenting)	-0.170*			-0.219**	-0.185*
Tough Poise 16PF Second Order	0.184*	0.164*			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10.12 summarises the significant correlations between the Productive Thinking and Critical Thinking measures and the Belbin Team Roles derived from the 16PF (a full correlation matrix is shown in Appendix XXIII). A relationship with the Plant role was expected. What is surprising is that this is only found in relation to Volume PTT (number of ideas). It would have been expected that a relationship would also have been found with the range of ideas (Breadth PTT) and hence with the PTT overall. One possible explanation of the limited (in comparison to theoretically expected) Plant relationships is the absence of a measure of the originality or uniqueness of ideas in the Productive Thinking test. Furthermore, given the dominant impact of 16PF Factor B on the calculation of the Plant role and the lack of association of the Productive Thinking test with this factor, the subsequent lack of strength of relationship with the Plant role is more readily

understandable. This could be an issue to explore in terms of the overall validity of the structure and composition of this team role. Perhaps even more surprising is the absence of a correlation between the CTA score and the Plant Role, given that in Belbin's original work the CTA was a factor in team role composition (Belbin, 1981). However, Watson and Glaser (1991) comment that, whilst the CTA shows strong relationships with the evaluative components of thinking style, no studies have examined directly the relationship to creative thinking. The other "ideas" role in Belbin's model is that of Resource Investigator (Belbin, 1981) and the absence of significant relationship with this role is again somewhat surprising. Equally surprising are the unexpected positive relationships between Breadth PTT and the Belbin Team Roles of Shaper, Co-ordinator and Implementer, none of which would be viewed as creative roles.

Table 10.12 Significant Correlations of Productive Thinking Test Measures with Belbin Team Roles (n = 196)

Belbin Team Role	Volume PTT	Breadth PTT
Co-ordinator		0.267**
Shaper		0.192*
Implementer		0.240**
Plant	0.168*	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As mentioned above, a factor analysis of 40 'primary' competences from the JCS has produced 12 independent factors, referred to as Supra-Competences (Dulewicz, 1994). Table 10.13 summarises the significant correlations between the thinking measures and the Supra-Competences derived from factor analysis of the Job Competences Survey. The correlations between Analysis and Judgement and CTA, and the CTA.PTT, were positive and to be expected, since the CTA is designed to measure these competences and CTA appears to have had a greater influence on the composite measure than did PTT. Similar results were found with Planning and Organising. In addition, the relation between Oral Communication and PTT volume was anticipated. Negative correlations were found between CTA and Managing Staff and Business Sense. On reflection, the latter was not totally unexpected. A previous study of the JCS produced similar results concerning Business Sense and its relationship with managers' advancement (Dulewicz & Herbert, 1997). It is, however, far more surprising that there is no relationship between any of the PTT measures and Strategic Perspective, given the general description of this Supra-Competence; it covers the ability to see the broader issues and take account of wide-ranging issues both internally and externally.

Assertiveness and Decisiveness, of which Risk-taking is a component, was negatively correlated with PTT. The negative correlation may initially appear surprising but it is consistent across all measures.

Table 10.13 Significant Correlations of Productive Thinking Measures and Supra-Competences (n = 196)

Supra-Competences	Volume PTT	Breadth PTT	PTT overall	CTA.PTT	CTA
2. Analysis & Judgement				0.234**	0.242**
3. Planning & Organisation				0.197*	0.18*
4. Managing Staff					-0.235**
6. Assertiveness & Decisiveness	-0.221**	-0.307***	-0.321***	-0.275**	
8. Oral Communications	0.170*				
9. Adaptability & Resilience	-0.194*	-0.240**	-0.260**	-0.260**	
11. Achievement Motivation	-0.239**		-0.214*		
12. Business Sense				-0.201*	-0.260**

* p < 0.05, ** p < 0.01, ***p < 0.001

The ability to envisage a large number and diverse range of implications of a problem or situation would appear, from these results, to be associated with submissiveness, indecision and risk aversion. More cautious individuals would appear, from these results, to do better on divergent tasks. Furthermore, when combined with high Analysis and Judgement, this finding could account for the "paralysis by analysis" phenomenon.

The negative correlations between PTT and Resilience and Adaptability, and Achievement Motivation suggest that high performance on PTT is perhaps more a function of stress induced motivation than of a more positive need to achieve. Furthermore, the findings on Resilience and Adaptability are supported by the results of a study which showed a significant negative correlation between the Plant Team Role derived from the 16PF and that Supra-Competence (Dulewicz, 1995(a)).

Overall Relationships

The preceding section has reviewed and discussed the results of the current study in terms of the correlational analysis between independent variables and between these and the dependent variables. Table 10.14 summarises the statistically significant relationships encountered. In any correlational research it is important to bear in mind that a correlation cannot imply causality (Graziano & Raulin, 1989) and that caution has to be exercised in interpreting the results (Hair et al, 1995; Lehman, 1991). However, correlational data may be helpful in shedding light on theoretical or hypothesised relationships between variables (Graziano & Raulin, 1989; Moser &

Kalton, 1971). Correlational research data provides evidence concerning the strength and nature (ie, positive or negative) of relationships between variables. It is not generally possible to prove an existing theory through correlational research alone given the possible impact of variables not being examined or interrelationships between the variables being considered in a multi-correlational study (Graziano & Raulin, 1989). However, the absence of an hypothesised relationship can, to an extent, negate a proposed theory.

The results presented in table 10.14 need to be considered in the light of the evidence of the intercorrelations between the independent variables which are shown in Appendix XXIII. From examination of this table it is evident that the only significant interrelationship between the input variables is that encountered between the Belbin Team Role Index and the Supra-Competence Index (0.39; $p < 0.01$). Therefore, in respect of the overall correlational analysis there may be a limitation on the interpretation of the encountered relationships between these two variables and the team outcome factors. Similarly the significant intercorrelations between many of the team process factors may limit the confidence with which conclusions can be drawn concerning their relationships with the team outcome factors.

Having highlighted the limitations of correlational research in arriving at causal inferences it is worth considering the requirements for determining causality. Lehman (1991) points out that there is significant debate around arriving at meaningful statistical evidence of causality. Kenny (1979) identified three requirements which should be met before a causal connection between two events may be inferred. These are i) covariation; ii) temporal ordering (ie, the cause must precede the effect); and iii) absence of confounding. In many aspects this last requirement is at the root of much experimental design with an aim of excluding effectively all extraneous variables. However, as Lehman (1991) points out:

“The very act of controlling the situation carefully enough to eliminate confounding may also make the situation so far removed from the real world that the results have no meaning.”

Lehman (1991) also points out that in practice inferences about cause and effect are made in order to progress the development of theory and understanding in spite of the strict limitations on causal inference. Acknowledging these limitations is important. However, it is generally accepted that causal relationships may be proposed in conjunction with correlational data on the basis of previous theory and research evidence (Wright & Fowler, 1986).

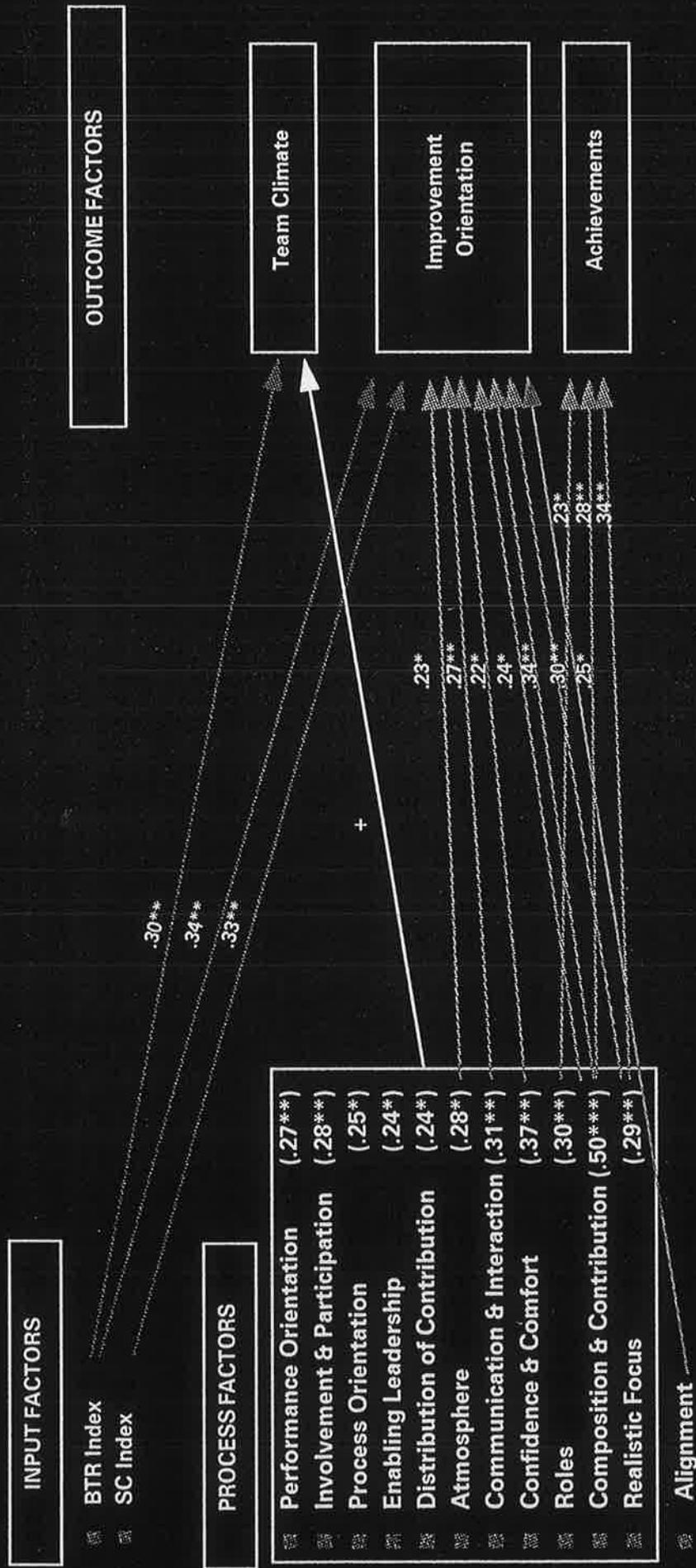
On this basis the results from the correlational analyses in the current study have been examined in the light of the relevant literature (see chapter two to six above). The overview of the significant relationships encountered and the likely direction of these relationships are summarised in figure 10.1.

Table 10.14 Summary of Significant Correlations Between Input and Process Variables and Outcome Factors (n = 54)

Team Outcome Factors	Input Factors		Process Factors											
	BT Index	SC Index	Atmosphere	Communication and Interaction	Performance Orientation	Involve-ment and Particip-ation	Confid-ence and Comfort	Roles	Compo-sition and Contri-bution	Process Ori-entation	Realistic Focus	Align-ment	Enabling Leadership	Distribution of Contribution
Team Cohesion	.30**		.28**	.31**	.27**	.28**	.37**	.30**	.50***	.25*	.299**		.24*	.24*
Improvement Orientation	.34**	.33**	.23*	.27**			.22*	.24*	.34**		.30**	.25*		
Achievements								.23*	.28**		.34**			

*.P<0.05; **.P<0.01; ***:P<0.001

Figure 10.1 Initial Model Emerging from Correlational Analysis



*: p<0.05; **: p<0.01; ***: p<0.001

10.6 Differences Between Teams

The exploration of the data by means of an examination of the differences between high and low performing teams represents an approach which is distinctly separate from the correlational and multivariate analyses (Hays, 1981; Downie & Heath, 1974; Lehman, 1991). The purposes of this step in the analyses of the results were:

- i) to provide a means of exploring the potential impact of confounding variables not included in the previous analyses;
- ii) to ascertain alternative support for causal inferences drawn from a theoretical perspective in the correlational analyses (Wright & Fowler, 1986; Downie & Heath, 1974); and
- iii) to provide evidence, through the use of a compound outcome measure, to offset the potential risks of overlap between outcome and process measures (eg, Hackman & Morris, 1975).

In order to explore the differences between teams in the study t-tests for independent samples were employed (Norusis, 1994). The process employed for identification of groupings for analysis entailed dividing the sample into high and low performing teams. For the purposes of analysis a high performing team was defined as one for which **all three** outcome factors were rated as being above the scale mid-point. Similarly a low performing team was one in which **all three** outcome factors were rated below the scale mid-point. The resulting distribution of the sample is summarised in table 10.15. This section examines the differences between high and low performing teams across the range of input and process variables. This was carried out both at the team and individual level (for BTRs and Supra-Competences in order to explore item differences) and at team level for other variables. In addition the significance of the differences based on a number of other variables, not included in the main study, are examined in order to check for their possible impact on variations amongst the study variables (Hair et al, 1995; Lehman, 1991; Norusis, 1994).

Table 10.15 Distribution of "High" and "Low" Performing Teams (n = 54)

	N	%
"High" Performing Teams	19	35.19
"Low" Performing Teams	17	31.48
Other Teams	18	33.33

Input Variables

The results of the t-test analyses for the input variables are summarised in table 10.16.

Table 10.16 t-tests for Independent Samples for Input Variables (n = 54)

Variable	t-value	df	2-tail significance	95% CI for difference
Team Role Index	2.03	34	0.049*	(.000, .027)
Competency Index	1.03	34	0.312	(-.005, .015)
CTA	.29	34	0.770	(-.606, .811)
PTT	-.19	34	0.847	(-.804, .664)
CTA.PTT	-.19	34	0.852	(-.824, .685)
BELBIN TEAM ROLES (1)				
Co-ordinator	-.54	34	0.590	(-.286, .165)
Shaper	.30	34	0.768	(-.83, .111)
Implementer	-.48	34	0.637	(-.162, .101)
Monitor Evaluator	-2.03	34	0.049*	(-.368, .001)
Team Worker	-.37	34	0.717	(-.268, .186)
Resource Investigator	.64	34	0.528	(-.140, .268)
Completer Finisher	-.86	34	0.398	(-.216, .088)
Plant	.94	34	0.352	(-.012, .033)
SUPRA-COMPETENCES (2)				
Strategic Perspective	.30	34	0.767	(-.175, .235)
Analysis and Judgement	-2.19	34	0.036*	(-.181, -.007)
Planning and Organising	.32	34	0.748	(-.200, .276)
Managing Staff	.20	34	0.846	(-.160, .194)
Persuasiveness	1.60	34	0.120	(-.022, .182)
Assertiveness & Decisiveness	-.36	34	0.723	(-.191, .134)
Interpersonal Sensitivity	1.63	34	0.112	(-.034, .313)
Oral Communication	.99	34	0.330	(-.132, .383)
Adaptability and Resilience	-.29	34	0.771	(-.221, .165)
Energy and Initiative	-.08	34	0.939	(-.125, .116)
Achievement Motivation	.04	34	0.969	(-.250, .259)
Business Sense	1.15	34	0.258	(-.099, .357)

*:P<0.05; **:P<0.01; ***:P<0.001

Notes (1) BTR's calculated by averaging 'talent' (using an 8 step cut-off) for each role for all team members
 (2) Supra-Competences calculated by averaging competency score for each competency for all team members.

Reviewing the input variable data shows that only three of the variables demonstrate significant differences between high and low performing teams. The differentiation associated with the Team Role Index provides a degree of support for Belbin's original findings (Belbin, 1976; 1981). Belbin found that the mix of Team Roles within a team was a vital factor in explaining the differences between high performing and other teams. Berry (1995) developed the Team Role Index as a means of more effectively operationalising Belbin's "mix" construct (see chapter 8 above). The results from this study are somewhat different from those encountered by Berry (1995). He found that whilst the Team Role Index did not predict high performance it could identify low performing teams. Overall the whole area of studies associated with the Belbin Team Role Model is somewhat confused with contradictory information, methodologies and instruments for operationalising Team Roles (Furnham & Stringfield, 1993). The current study uses managerial teams in an organisational context and thus addresses a number of problems and limitations identified in team studies (West & Slater, 1995). Furthermore it uses the formula reported by Dulewicz (1995(a)) for deriving the Team Roles from the 16PF.

This should overcome a number of the limitations in Team Role studies identified by Furnham and Stringfield (1993). However, in so doing it can produce different findings to those in studies using different instrumentation (Berry, 1995).

The only individual Team Role which differentiates between high and low performing teams is that of Monitor Evaluator. However, the methodology for averaging 'talents' across team members is not itself widely accepted (Senior, 1997; Berry, 1995) and the Monitor Evaluator role is widely seen as being problematic and in need of further research (Furnham & Stringfield, 1993; Dulewicz, 1995(a)). Therefore, the Team Role Index may be the more reliable indicator of differentiation between high and low performing teams than the individual averaged Team Role scores.

Dulewicz (1995(a)) demonstrated relationships between the Supra-Competences and a number of the Belbin Team Roles. His findings provide a basis for the hypothesis that there may well be a relationship between the Team Role Index and a Supra-Competence Index calculated on similar principles. Indeed within this study such a relationship was encountered. Given that result it was somewhat surprising that the Supra-Competence Index was not found, in this study, to differentiate between high and low performing teams. It is evident from table 10.16 that the only individual Supra-Competence which differs between high and low performing teams is Analysis and Judgement. This is somewhat surprising as this is a Cognitive Supra-Competence and the other cognitive measures (CTA and PTT) show no differentiating abilities (from the results available). However, care should be taken in interpreting the Analysis and Judgement finding given the methodological limitations outlined above.

Process Variables

The results of the t-test analyses for the process variables are summarised in table 10.17. A review of the results of the t-test analysis for process factors shows a very much higher incidence of significant results than was encountered when reviewing the input variables. This

may well be seen as lending support to the arguments of those authors who contend that, in a team context, process is the most important factor in differentiating between high and low performing teams (eg, Beer, 1987; Pearson, 1994; Blanchard, 1988). However, care should be taken in drawing such a conclusion from the results of this study. In the first place the nature of the sample may have given rise to a degree of homogeneity in input variable profiles. This would, in the view of some researchers, in itself be a factor accounting for team performance results. For example authors such as Smith (1995) and Hambrick and Mason (1984) have found relationships between senior level team homogeneity and performance outcomes. Secondly, it is important to be aware that process factors may act as moderator variables and thus it is important to explore the interrelationships between all variables in more detail (Hackman & Morris, 1975; Pinto et al, 1993).

Table 10.17 t-tests for Independent Samples for Process Variables (n = 54)

Variable	t-value	df	2-tail significance	95% CI for difference
Team Atmosphere	-2.29	34	0.028*	(-.889, -.053)
Communication/Interaction	-2.61	34	0.013*	(-.779, -.097)
Performance Orientation	-1.80	34	0.081	(-.737, .045)
Involvement and Participation	-2.68	34	0.011*	(-1.010, -.138)
Confidence and Comfort	-2.96	34	0.006**	(-.751, -.140)
Learning and Improvement	-1.31	34	0.198	(-.670, .144)
Roles	-2.45	34	0.020*	(-.976, -.090)
Composition and Contribution	-4.51	34	0.000***	(-.833, -.315)
Process Orientation	-2.28	34	0.029*	(-.927, -.054)
Realistic Focus	-3.72	34	0.001***	(-.989, -.290)
Alignment	-2.36	34	0.024*	(-.814, -.061)
Enabling Leadership	-2.78	34	0.009**	(-.942, -.147)
Interface Management	-.12	34	0.909	(-.526, .470)
Distribution of Contribution	-1.59	34	0.122	(-.851, .105)

*:P<0.05; **:P<0.01; ***:P<0.001

Other Variables

Given the structure of the current sample, in terms of company representation, it is important to test for differences based on company alone (Lehman, 1991). Within the literature there is evidence that team size is a significant factor in differentiating team performance (eg, West & Anderson, 1996). In addition there is some evidence that the length of time a team has been together (team tenure) is related to the performance of the team (eg, Larson & La Fasto, 1989;

Barrett-Lennard, 1975; Hackman, 1990; Hambrick & Mason, 1984; Michel & Hambrick, 1992; Keck, 1991; Smith et al, 1994). It was decided to test the data available to establish whether or not either of these variables differentiated between high and low performing teams within the current study. The results of these analyses are shown in table 10.18. Reviewing the results in this table indicates no significant differences based on these three variables. The lack of significant differences between high and low performing teams based on the Company variable indicates that it may be safe to examine the overall results without further exploration of company differences (Lehman, 1991). The lack of differentiation between high and low performing teams based on team size is somewhat surprising given the findings from previous team research (and indeed from earlier small group research: Shaw (1971)). However, the current sample is dominated by relatively small (three to five person) teams and thus the results may be influenced by range restriction (Lehman, 1991). A similar comment may be made in terms of team tenure, given that the majority of teams in the current study have been together for less than two years.

Table 10.18 t-tests for Independent Samples for Other Variables (n = 54)

Variable	t-value	df	2-tail significance	95% CI for difference
Company	-1.08	34	0.286	(-.632, .192)
Team Size	.44	34	0.659	(-.785, 1.224)
Team Tenure	.32	34	0.753	(-.564, .772)

*:P<0.05; **:P<0.01; ***:P<0.001

Table 10.19 shows an overall summary of the results from this differential analysis and the correlational analyses. Inspection of this tables does indicate a degree of similarity in the findings which can be used to support the theoretically based causal inferences implied in the discussion of the results of the correlational study. Furthermore the similarities found using the compound outcome measure do tend to provide a degree of comfort that the potential overlap between the outcome cohesion factor and process items may not be unduly influencing the findings from the correlational examination of the data.

10.7 Summary

The results presented in this chapter have shown a range of both expected and unexpected relationships between the input, process and outcome variables. The limitations of correlational analysis in terms of causal inference (Wright & Fowler, 1986; Graziano & Raulin, 1989) are partially ameliorated through exploration of the data in terms of differences between the teams. This alternative analysis of the data demonstrated some support for the results in terms of the correlational analysis.

Table 10.19: Comparison of Results from Correlational Analyses and Differences Between Teams

Variables	Differentiate Between High & Low Performing Teams	Correlate with Outcome Factors		
		Cohesion	Improvement Orientation	Achievements
INPUT				
BTR Index	✓	✓	✓	-
SC Index	-	✓	-	-
PROCESS				
1. Team Atmosphere	✓	✓	✓	-
2. Communication and Interaction	✓	✓	✓	-
3. Performance Orientation	-	✓	-	-
4. Involvement and Participation	✓	✓	-	-
5. Confidence and Comfort	✓	✓	✓	-
6. Learning and Improvement	-	-	-	-
7. Roles	✓	✓	✓	✓
8. Composition and Contribution	✓	✓	✓	✓
9. Process Orientation	✓	✓	-	-
10. Realistic Focus	✓	✓	✓	✓
11. Alignment	✓	-	✓	-
12. Enabling Leadership	✓	✓	-	-
13. Interface Management	-	-	-	-
14. Distribution of Contribution	-	✓	-	-

An issue in the study of teams (highlighted in chapter 8) is that associated with the apparent overlap between some process and outcome measures. For example, cohesion is seen by some as both a process and outcome measure (eg, Hackman & Morris, 1975). The use of all three outcome factors in establishing the criterion for high and low performing team distinctions ameliorates, to an extent, the overlap issue through establishing a compound criterion. The analysis of differences between teams presented in this chapter tends to lend support to the conclusions drawn from the discussion of the correlational results in terms of the differentiating input and process variables.

The next chapter examines the research data using multiple regression analysis to model the relationships between key variables. The overall results are then reviewed and examined against the research hypotheses.

Chapter 11. Results and Discussion 3: Examination of Models and Research Hypotheses

"Without Contraries is no progression. Attraction and Repulsion, Reason and Energy, Love and Hate, are necessary to Human existence."

William Blake: *The Marriage of Heaven and Hell* (1793)

11.1 Introduction

This research has been designed to examine the extent to which the team interaction processes act as a moderating variable in explaining variations in team performance. Hackman and Morris (1975) attempted to explore the group interaction process effect through both reviews of previous research and their own experimental study. They concluded that evidence exists for a range of input:process relationships (eg, Sample & Wilson, 1965; Conway, 1967; O'Dell, 1968; Hall & Williams, 1966). They also found evidence for process:performance relationships (eg, Kelley & Thibault, 1954; Steiner, 1972; Lanzetta & Roby, 1960).

In their specific study, Hackman and Morris (1975) found further evidence to support input:process; input:outcome and process:outcome relationships. However, they were unable to shed any substantive light on the overall input:process:performance relationship. To this extent their lack of success mirrored the earlier attempts to develop a quantitative model of the full process interaction conducted by Sorenson (1971) and Katzell et al (1970). In part the early lack of success in finding evidence to support group or team process as a moderating variable in the input: performance relationship may well be due to the complexity entailed in studying such relationships. As Abel (1976) pointed out:

"There has been a lot of research into decision-making in relation to groups, but the models produced do not work in the face of reality. The major problem is that of research complexity."

Since the work of Hackman and Morris (1975) there has been a growth in the use of modelling to attempt to shed light on the input:process:outcome relationships within teams (see chapter 6). In general terms these have been unsuccessful in the absence of parsimony in the selection of variables to include in the study (Smith et al, 1994). However, some evidence has emerged in more recent studies which, at least partially, demonstrates the mediation impact of process factors (eg, Prussia & Kinicki, 1996). Within this section the results of modeling the data, both as a main effects and full interaction process model, are presented and discussed. In addition the overall research findings are examined and their relationship to the research hypotheses is discussed.

11.2 Model Examination

Selection of Variables

In developing the modelling it has been necessary to work to a basis of a minimum of 3 observations per item in the regression equations (Money, 1997). Hair et al (1995) point out that at a level of 5 observations per item in a multiple regression analysis it can be considered difficult to generalise the findings beyond the immediate study sample and thus the use of 3 observations per item will certainly limit the generalisability of the findings. Given the constraints of the actual sample size conducting a regression-based model analysis leads to a need for selection of components for the study. Thus the research aim of examining an interaction model (Hackman & Morris, 1975) gives rise to a number of important selection decisions. The available data comprises some four **input** items (viz, Belbin Team Role Index, Supra-Competence Index, Average Critical Thinking Score and Average Productive Thinking Score) and fourteen **process** factors (from the Team Process Questionnaire). To examine a full interaction model using all of the available data would require a sample of some 180 teams (on the basis of a minimum of a 3:1 ratio for all items in the regression analysis which would include all interactions between input and process). As there are only 54 teams available in the sample the full potential model, implied from the factor analysis of the team process questionnaire, cannot be examined. In looking for a more parsimonious model which can be tested with the available data there are two strategies which might be employed. These are:

- i) reduce the input factors. This may be most effectively achieved by combining the cognitive factors and using the composite Critical Thinking Appraisal and Productive Thinking Test Score.
- ii) reduce the number of process variables.

The first of these options whilst initially attractive would not seem to be an advisable decision given the findings from the analysis of input factors (see chapter 9). The findings suggest that the PTT is measuring a different construct from the CTA. Furthermore the CTA has not been designed as a measure of divergent thinking (Watson & Glaser, 1991). No additional enlightenment in terms of input:input and input:process relationships are encountered when employing the combined CTA measure (Higgs & Dulewicz, 1997(a)). Thus there is no overall theoretical or empirical justification for employing the combined CTA.PTT input measure as an alternative to the CTA and PTT as separate variables.

In exploring the second option it is useful to begin from a theoretical perspective. Of the fourteen process factors the literature appears to provide the most significant support for four of them in terms of their impact on team outcomes and performance. These, and example references in support of them are summarised in table 11.1 below. A further reduction of these process factors is theoretically possible. The literature indicates a significant degree of overlap and interchangeability between Communication and Interaction and Involvement and Participation (eg, Hackman & Morris, 1975; Hall, 1971; Spencer & Pruss, 1992; Higgs & Rowland,

1992). Examination of the items comprising these factors in the factor analysis reinforces this conceptual overlapping. If the items comprising these two factors in the current study are combined into one nine item scale the resulting Cronbach Alpha is 0.87. This alpha is equivalent to that found for the Involvement and Participation factor and exceeds that found for Communication and Interaction (0.79). Furthermore an examination of the study intercorrelations (see Appendix XXIII) shows a statistically significant intercorrelation between the two factors (0.823; $P < 0.001$) where as the intercorrelations with the other potential model variables are all at less than 0.5, suggesting their suitability for inclusion in the regression model (Hair et al, 1995, Lehman, 1991). The above suggests that the combined "Communication and Involvement" variable may be reliably included in the model testing.

Table 11.1 Support for Process Factor Selection

Team Process Factor	Evidence from Literature
2. Communication and Interaction Style	McGreggor, 1960; Pavett and Lau, 1983; Hackman and Morris, 1975; Likert, 1961; Blanchard, 1990; Hambrick, 1994; Dulewicz et al, 1995; Larson and La Fasto, 1989; Amason, 1996; Maier, 1967; Child, 1972; Thibault and Kelley, 1959; Stogdill, 1959; Shaw, 1971
3. Performance Orientation	Pearson, 1994; Davis et al, 1992; Chlewinski, 1981; Larson and La Fasto, 1989; Likert, 1961; O'Leary et al, 1994; Locke and Latham, 1990; Guzzo and Shea, 1992; Isabella and Waddock, 1994; Humber et al, 1992; Deutch, 1980; Harris and Harris, 1989; Hardingham and Royal, 1994; Fiedler, 1978; Anderson et al, 1990; Tjosvold, 1984; Borrelli et al, 1995; Rogers et al, 1995; Dumaine, 1984
4. Involvement and Participant	O'Leary et al, 1994; Meyer, 1994; Anderson et al, 1990; Borrelli et al, 1995; Tjosvold, 1984; 1991; McGregor, 1960; Likert, 1961; Hackman, 1990; Davis, 1992; Bourgeois and Eisenhardt, 1988
12. Enabling Leadership	Spencer and Pruss, 1992; Leigh and Maynard, 1994; Bradford and Cohen, 1984; Senior, 1996; Wilks, 1995; Woodcock, 1989; Woodcock and Francis, 1981; Maxon, 1986; Hunter et al, 1992; Eisenhardt and Cohen, 1990; Hackman, 1990; Saavandra et al, 1990; Larson and La Fasto, 1989; Hackman and Walton, 1986; Thomas, 1988, Jorsgaard et al, 1995; Guth and Macmillan, 1986

In examining the scope for interactions to be examined within the model the 3:1 ratio, given a sample of 54 management teams, provides for the inclusion of no more than eleven interactions. Within the literature there is support for the examination of Input: Leadership interactions (Tjosvold, 1991; Barrett-Lennard, 1975). Support for an Input:Communication and Involvement interaction is found within other model-based studies (eg, Hackman & Morris, 1975; Smith et al, 1994; Greenbaum et al, 1988; Tannenbaum et al, 1992; Amason, 1996). The support for the Input:Performance Orientation is largely derived from the goal-related content of this factor (eg, Katzenbach & Smith, 1993; Pinto et al, 1993; West & Anderson, 1996). The number of available interactions to include in the study means that one input:process interaction cannot be included. Overall it would appear from both the literature and the input:input results from this study that the PTT is potentially the least supported variable. At the same time the research

support for Input:Performance Orientation is the lightest, given that the support is predominantly linked to the goal-related items in this factor.

Based on the above points it was decided that the variables to be included in the model examination would be:

- i) Input Variables: Belbin Team Role Index; Supra-Competence Index; CTA; PTT
- ii) Process Variables: Communication and Involvement (composite factor); Performance Orientation; Enabling Leadership
- iii) Interaction Variables: Belbin Team Role Index with all Process Variables; Supra-Competence Index with all Process Variables; CTA with all Process Variables; PTT with Communication and Involvement and Enabling Leadership.

Reviewing the Data

The proposed models were examined using multiple regression analysis with the outcome factors as the dependent variable. Hair et al (1995) identify three key assumptions for the use of multivariate analysis which are: i) normality; ii) homoscedasticity; and iii) absence of correlated errors. It is important to examine the independent variables for univariate normality at an initial stage of the analysis in order to determine whether or not any transformation of the variables will be required for multivariate analyses (Hair et al, 1995; Lehman, 1991; Norusis, 1994).

The distributions of the independent variables (including the composite from combining factors 2 and 4) were examined to identify the extent of skewness and kurtosis (details of variable distributions are shown in Appendix XXIV). In order to test for the significance of any deviation from a normal distribution the Kolmogorov - Smirnov test (available within SPSS) was applied. Hair et al (1995) caution against the use of this test for small samples (fewer than 30) and highlight its sensitivity when used with very large samples (exceeding 1000 observations). The current sample size is 54 and it was, therefore, decided that the Kolmogorov - Smirnov test could be employed. Table 11.2 summarises the results of this analysis. From this table it can be observed that, whilst the univariate distributions exhibit degrees of skewness and kurtosis none are significant when the Kolmogorov - Smirnov test is applied. As a result the univariate distributions may be treated as being normal for the purposes of subsequent multivariate analysis.

Homoscedasticity is an assumption which is related primarily to dependence relationships between variables. It refers to the assumption that dependent variables exhibit equal levels of variance across the range of predictor variables. It is desirable because the variance of the dependent variable being explained in the dependence relationships should not be concentrated only in a limited range of the independent values. The sample was studied using the Levene test statistic (Hair et al, 1995; Norusis, 1994). In applying the Levene test the null hypothesis of equal variances is being examined.

A statistically significant test result requires transformation of the data to deal with a violation of the homoscedasticity assumption in further multivariate analysis. The Levene test results for the study sample are shown in Appendix XXV. Examination of these data shows no statistically significant results, therefore there are no variables exhibiting heteroscedasticity and thus the underlying assumption of homoscedasticity has not apparently been violated.

A key issue in interpreting the regression variate is that of correlation among the predictor variables (Hair et al, 1995). Collinearity is often a data problem rather than a model specification problem. In essence the existence of multicollinearity makes it difficult to determine the contribution of each independent variable because the effects of the independent variables are confounded due to collinearity. The most common measures for assessing both pairwise and multiple variable collinearity are the tolerance value and the variance inflation factor (VIF) (Norusis, 1994; Hair et al, 1995). If the tolerance variable is small, it is almost a linear combination of the other independent variables. The VIF is closely related to the tolerance; as the VIF increases so does the variance of the regression coefficient.

In examining the regression analyses for the current study it was found that the full hypothesised model, using the Enter regression option (Norusis, 1994), produced a number of variables with low tolerances and high VIFs (see Appendix XXVI). However, producing a more parsimonious model resulting from a Stepwise regression analysis produced variables with high tolerances and low VIFs. Thus the model resulting from the Stepwise analysis is one in which multicollinearity is minimised. From table 11.4 it can be seen that the tolerances and VIF's for the two models being examined are all within the range which suggests that the analysis is relatively free from collinearity (Hair et al, 1995; Norusis, 1994).

Table 11.2 Distributions of Independent Variables (n = 54)

Variable	Mean	SD	Skew	Kurtosis	K-S "statistic	2-tail significance
CTA	5.24	1.18	-0.01	-0.01	0.6315	0.8201
PTT	0.059	1.083	-0.272	-0.272	0.4400	0.9903
CTA.PTT	0.065	1.095	0.207	0.876	0.7163	0.6839
Belbin Team Role Index	0.06	0.02	-0.11	-0.55	0.8113	0.5258
Supra-Competence Index	0.5	0.017	0.34	-0.198	1.1882	0.1188
Team Process Factor 1	2.69	0.065	0.17	-0.52	0.5440	0.9287
Team Process Factor 2	2.44	0.54	0.81	0.07	1.0514	0.2189
Team Process Factor 3	2.87	0.57	0.18	-0.58	0.4903	0.9698
Team Process Factor 4	2.62	0.72	0.83	0.15	0.9873	0.2839
Team Process Factor 5	2.44	0.49	0.28	0.27	0.5463	0.9265
Team Process Factor 6	2.96	0.58	0.22	0.27	0.7437	0.6378
Team Process Factor 7	2.61	0.70	0.41	-0.51	0.9485	0.3293
Team Process Factor 8	2.80	0.49	0.11	-0.65	0.5393	0.9332

Table 11.2 Distributions of Independent Variables (n = 54) (Continued)

Variable	Mean	SD	Skew	Kurtosis	K-S "statistic	2-tail significance
Team Process Factor 9	3.65	0.67	-0.39	-0.47	0.7307	0.6597
Team Process Factor 10	2.62	0.60	-0.35	-0.46	0.7162	0.6842
Team Process Factor 11	2.86	0.57	0.05	-0.27	0.5222	0.9480
Team Process Factor 12	2.95	0.66	0.37	-0.60	0.5907	0.8763
Team Process Factor 13	2.94	0.69	0.03	0.54	0.5758	0.8946
Team Process Factor 14	2.72	0.69	0.70	1.41	0.6314	0.8202
Combined Factor 2 & 4	2.53	0.63	0.82	0.08	1.0194	0.2514

Notes © Kolmogorov-Smirnov Test

Analysis of Models

The initial model examined was a main effects model in which all selected input and process factors were entered into a regression on each of the outcome factors. This is represented by the equation:

$$Y_o = B_o + B_1 \text{Input}_1 + B_1 \text{Input}_2 + \dots B_2 \text{Process}_1 + B_2 \text{Process}_2 + \dots E$$

The second model being reviewed is a full process interaction model in which all selected input and process factors, together with the selected interaction variables, were entered into a regression on each of the outcome factors. This is represented by the equation:

$$Y_o = B_o + B_1 \text{Input}_1 + B_1 \text{Input}_2 + \dots B_2 \text{Process}_1 + B_2 \text{Process}_2 + \dots B_3 \text{Input}_1 \times \text{Process}_1 + B_3 \text{Input}_2 \times \text{Process}_2 + \dots + E$$

The results of the examination of these models are summarised in table 11.3.

In reviewing the results from the main effects model (model 1) there is unsurprising support for the relationships between the BTR Index and the items comprising Communication, Interaction and Involvement and the outcome factor of Cohesion. The Leadership factor (Enabling Leadership) is again surprisingly found to be unrelated to the outcome factor of Cohesion.

In relation to the Improvement Orientation outcome factor the regression model supports the relationships with the BTR Index and the Communication and Involvement variables found in the earlier correlational analyses (see chapter 10). However, somewhat surprisingly the relationship with the Supra-Competences Index is not encountered in this model. This may well be due to the nature of the Stepwise regression analysis and the impact on the parsimony of relationships due to the elimination of collinearity (Hair et al, 1995). Given the previous correlational analysis the only surprising result from this model is the relationship between Enabling Leadership and Achievements.

Table 11.3 Stepwise Regressions of Alternative Models (n = 54)

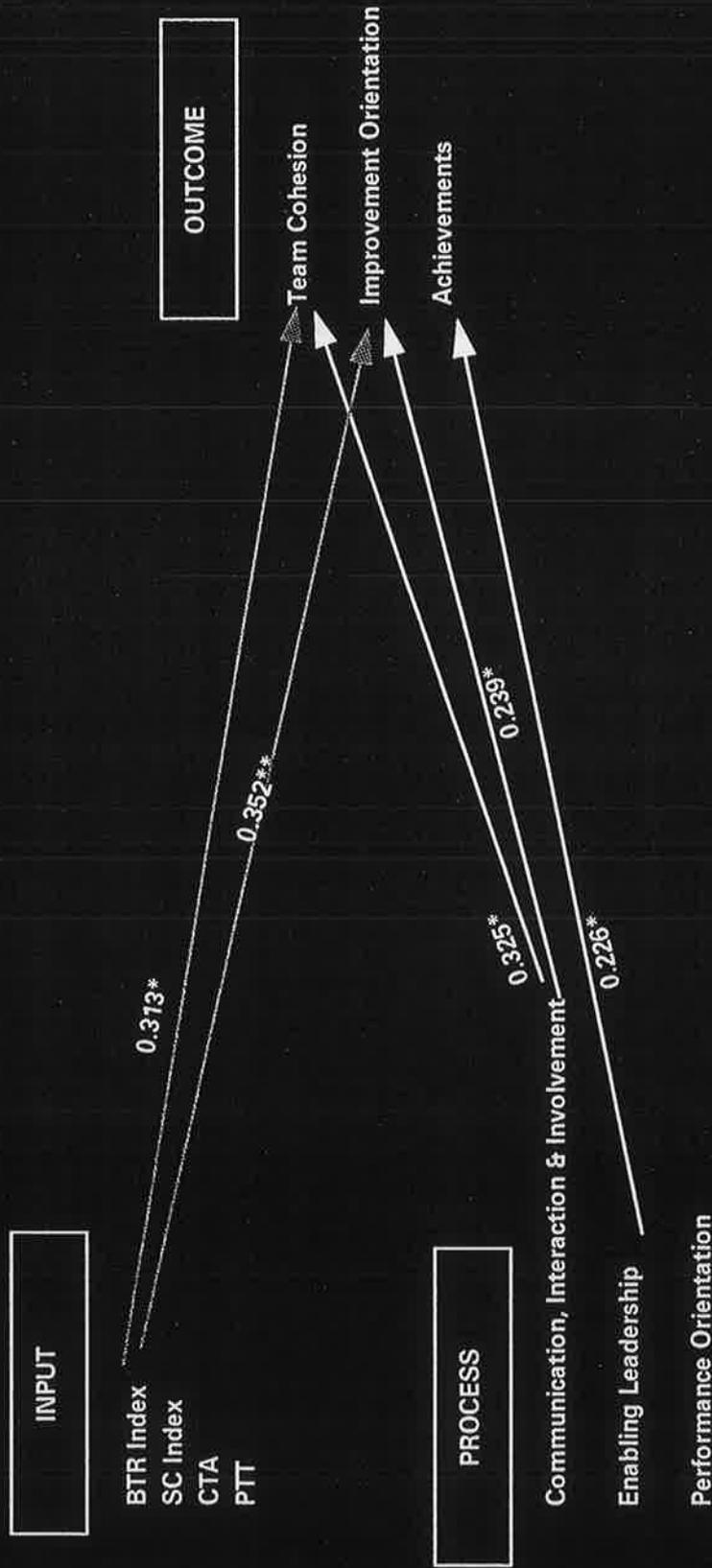
	Outcome Factors	Input, Process and Interaction Factors	Standardised Betas	Significance of T
Model 1	Cohesion	■ BTR Index	0.313	0.016*
		■ Communication, Interaction and Involvement	0.325	0.013*
	Improvement Orientation	■ BTR Index ■ Communication, Interaction and Involvement	0.352 0.239	0.008** 0.037*
	Achievements	■ Enabling Leadership	0.226	0.04*
Model 2	Cohesion	■ Communication, Interaction and Involvement	0.573	0.0002***
		■ BTR Index x Communication, Interaction and Involvement	0.546	0.0009***
		■ Supra-Competency Index x Performance Orientation	0.231	0.042*
		■ CTA	0.182	0.142
	Improvement Orientation	■ Communication, Interaction and Involvement	0.297	0.036*
		■ BTR Index	0.310	0.028*
		■ Supra-Competency Index	0.215	0.038*
		■ CTA x Leadership	0.240	0.042*
	Achievements	■ Enabling Leadership	0.273	0.05*
		■ BTR Index x Communication, Interaction and Involvement	0.282	0.044*
■ CTA		0.203	0.062	

*** : $p < 0.001$, ** : $p < 0.01$, * : $p < 0.05$

This is more closely in line with the literature than the results encountered in the correlational study (eg, Spencer & Pruss, 1992; Larson & La Fasto, 1989; Woodcock, 1989; Woodcock & Francis, 1981; Senior, 1996). The model emerging from this one-stage process analysis is summarised in figure 11.1.

The results of the full interaction process analysis (model 2) show a larger number of significant relationships than found in the main effects model (model 1). In relation to the Cohesion outcome it is interesting to note that the interaction of the BTR Index and Communication and Involvement Process factor produces a higher level of explanation of variance than the BTR Index alone (either in the correlational analysis or in model 1). This may be viewed as evidence of the process factor of Communication, Interaction and Involvement acting as a moderator variable. This was hypothesised by Hackman and Morris (1975), but not demonstrated in their subsequent research.

Figure 11.1 One-stage Regression Model of Team Outcomes



*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Furthermore, the finding does provide a degree of support for the view, frequently encountered in the literature on teams and small groups, that process in a team is an important factor in releasing the potential of the combination of talents and skills within the team (eg, Beer, 1994; Pearson, 1994; Anderson et al, 1990; Beeby & Simpson, 1995; Bartlett & Ghoshal, 1995; Higgs, 1991). The emergence, in this model, of the Supra-Competence Index as a variable related to Cohesion in combination with the Process factor of Performance Orientation, provides further evidence of process as a mediator variable.

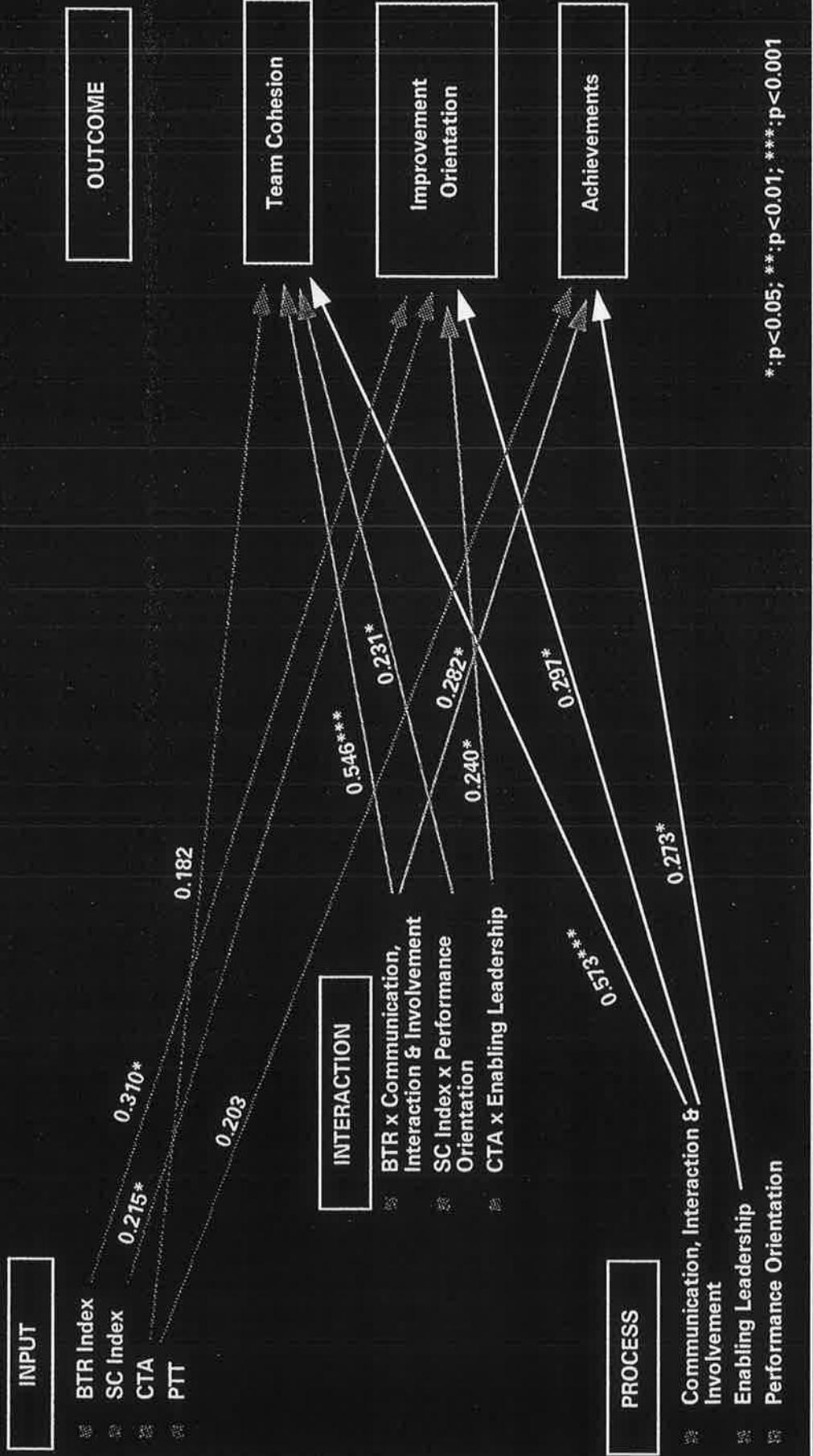
In relation to the outcome factor of Improvement Orientation it is extremely interesting to note the significant relationship which is found with the interaction of the CTA and process factor of Enabling Leadership. This, together with the relationship of Enabling Leadership to Achievements, tends to provide supporting evidence for a significant role of leadership in terms of team performance (Woodcock, 1989; Woodcock & Francis, 1981; Spencer & Pruss, 1992; Leigh & Maynard, 1994; Isabella & Waddock, 1994; Hardingham & Royal, 1994; Bradford & Cohen, 1984; Maxon, 1986; Senior, 1997). Furthermore, the analysis brings the CTA into the team effectiveness arena for the first time. The absence of relationships between CTA constructs and team performance (or even apparently negative relationships - Belbin, 1976; 1981) have contradicted practitioner experience. Belbin's Apollo Team findings (Belbin, 1976; 1981) have caused a degree of dissonance with practitioners in this area (Borrelli et al, 1995) for some while. However, a set of leadership behaviours able to release the critical reasoning abilities of a team combined with the CTA scores of the team members leads to a higher degree of understandability of previous research findings.

The relationship, with model 2, between the Achievements outcome factor and the combination of the BTR Index and Communication and Involvement could indicate that the process interaction explains the result of outcome findings originally reported by Belbin (Belbin, 1976; 1981), but subsequently the subject of significant debate (eg, Senior, 1996; Furnham et al, 1993). The model emerging from the interaction analysis is summarised in figure 11.2.

In reviewing these results it is important to exercise caution. In multiple regression analysis an important final stage is the validation of the model with a different sample. Practical and logistical barriers prevented this being done in the current study. Therefore, validation and confirmation of the encountered models with different samples should be considered as an area for further research.

In comparing the two models it is important to examine the R^2 values for each of the outcome factors (Hair et al, 1995; Norusis, 1994). Table 11.4 provides a comparison of models one and two. From examination of this table it is evident that the full interaction process model provides more explanation of the variance in team outcomes than the main effects model. This enhancement in accounting for variations in outcome is consistent across all three outcome variables. Not only do the R^2 values increase with a shift to the full interaction model, but the number of variables included in the regression also increases.

Figure 11.2 Interaction Process Model of Team Outcomes



Therefore, the interaction model appears to describe more completely the relationships between the variables which account for differences in team outcomes than a main effects model. For this sample, at least, the explanatory power of the interaction process model is stronger than for the alternative model.

11.3 Overall Findings and Examination of Hypotheses

The results examined in the preceding sections have produced a mixture of expected and surprising findings. In part this may be due to the limitations of the sample and a number of the methodologies employed. These limitations are discussed further in the following chapter. The somewhat mixed findings may also be a reflection of the complexity of researching into teams which have been highlighted by many authors (eg, Furnham, 1992; Hackman, 1990; Schein, 1988; Hambrick, 1995).

This section provides a summary of the main conclusions which may be drawn from the research results and analyses. In particular, it examines the extent to which the research hypotheses are supported by the results of this study.

Qualitative Results

The qualitative section of the overall research design was established primarily as a vehicle for contributing to the development of instruments for measuring both team processes and outcomes. However, reviewing the overall findings from this aspect of the research does provide some useful insights into managerial team working.

Table 11.4 Comparison of Stepwise Models (n = 54)

		Model 1	Model 2
R ²	TPM 1	0.19	0.30
	TPM 2	0.17	0.25
	TPM 3	0.05	0.15
No. variables in equation	TPM 1	2	4
	TPM 2	2	4
	TPM 3	1	3
Tolerances of variables	TPM 1	0.99; 0.99	0.96; 0.70; 0.61; 0.86
	TPM 2	0.99; 0.99	0.82; 0.80; 0.80; 0.79
	TPM 3	1.0	0.92; 0.96; 0.91
VIF of variables	TPM 1	1.03; 1.03	1.05; 1.43; 1.65; 1.17
	TPM 2	1.03; 1.03	1.22; 1.24; 1.24; 1.26
	TPM 3	1.0	1.09; 1.04; 1.10

It does, however, have to be borne in mind that the interviews and focus groups were conducted within a single organisation and therefore the generalisability of the conclusions has to be limited (Easterby-Smith et al, 1991; Yin, 1989). Subject to this caveat some of the main conclusions which may be drawn from the qualitative results are:

- i) There does appear to be support for the use of "mixed" measures in assessing team performance. The interview and focus group participants consistently highlighted the dangers of reliance on "hard" outcome measures and the need to incorporate psychosocial indicators as a means of measuring the effectiveness of a team. These observations provide a degree of support for the overall interaction process model in terms of the two types of outcome (Hackman & Morris, 1975). In addition they provide qualitative support for the proposition that performance measures in team studies should incorporate both "hard" and "soft" measures (Furnham, 1992; Hackman, 1990). In examining, in discussion, the psychosocial outcomes the research participants placed considerable emphasis on cohesion of the team as an indicator of effectiveness. This provides support for the views expressed by many within the literature (eg, Katzenbach & Smith, 1993; Hastings et al, 1986; Tjosvold, 1984; 1991) and the associated view that cohesion is not an input or process factor (as is proposed in the Hackman and Morris (1975) model).
- ii) The findings provide clear support for the importance of diversity within a team in terms of leading to better quality decisions (Laughlin, 1988; Maier, 1970). Within this area of discussion there was strong support for the importance of an appropriate mix of skills in a team (Tjosvold, 1991; Higgs & Rowland, 1992; Hackman & Morris, 1975; Hackman, 1990) and for a blend of styles amongst the team members. This latter point provides evidence to support the Team Role concept frequently highlighted in the literature (eg, Benne & Sheats, 1948; Belbin et al, 1976; Belbin, 1981; Margerison & McCann, 1985; Berry, 1995; Mumma, 1992).
- iii) In terms of the Hackman and Morris (1975) model the interview and focus group data provided support for a number of environmental level input factors. The importance of reward in a broad and relevant context was reinforced (Brown, 1995; Borrelli et al, 1995). In addition, the importance of a supportive culture was highlighted. However, the findings do provide a relatively new insight into this factor in as much as the participants highlighted the importance of a clear and positive example from the CEO as a defining component of a supportive culture.
- iv) A range of process factors appear to be supported by the data emerging from the qualitative component of this study. The importance of clarity of purpose and relevant goals and objectives was highlighted. In discussing this factor the need for goals to be stretching, but realistic, was emphasised. This is supportive of observations on purpose and goals found within the literature (eg, Katzenbach & Smith, 1993; Hastings et al, 1986).

The importance of a clear and participative decision-making process was highlighted by participants. This is in line with the majority of the literature on teams and a high proportion

of the group literature (eg, McGrath & Altman, 1966; Shaw, 1971; Greenbaum et al, 1988; Tjosvold, 1984; 1991; Dainty & Kakabadse, 1992; Higgs & Rowland, 1992). A relatively new insight into this element of team processes did, however, emerge. The research participants emphasised the need for clear behavioural ground rules in relation to the decision-making process and highlighted the need to make these explicit and monitor adherence to them on a regular basis.

- v) One specific aspect of team processes which has received considerable attention within the literature is that of leadership (eg, Adair, 1986; Tjosvold, 1984; 1991; Woodcock & Francis, 1981; Hackman, 1990; Eisenhardt, 1989; Hunter et al, 1992; Rogers et al, 1995). The results from the qualitative research lend considerable support to the importance of the leader's role and behaviours. However, participants emphasised that the positive role contribution was realised through an enabling and facilitating style and the creation of a supportive environment for the team. The importance of support (in the context of team innovation) was demonstrated in a recent study by West and Anderson (1996). The findings from the current study suggests that the leader can play a significant part in providing support, and that supportive and facilitating behaviours may be more generally linked to team outcomes.

In summary, it appears that the qualitative element of this research project has provided a degree of support for a number of the factors associated with effective managerial team working. In addition, it has raised the possibility of a number of additional factors (or modifications to perceptions of factors) which would appear to warrant further study.

Relationships Amongst Input Variables

In the examination of the interrelationships between the input variables employed in the study (ie, Team Role Index, Supra-Competence Index, CTA and PTT) the following key points have emerged:

- i) The significant correlations between the Belbin Team Role Index and the Supra-Competence Index provide evidence to support the relationships between the Belbin Team Roles and the Supra-Competences reported by Dulewicz (1995(a)). The analysis at the Team Role and Supra-Competence level in examining the differences between high and low performing teams provides further supporting evidence for the relationship between these constructs. However, in this latter case the conclusion has to be tempered by the limitation that the data is at a team level rather than an individual level and employs the use of an average "talent" computation (the limitations of which were discussed in chapter 8). The encountered relationship at the Index level provides a degree of support for the concept of a team competence mix proposed in the literature (eg, Finn, 1993; Smith, 1995; Cook, 1993; Herbert, 1990). The evidence is, however, by no means definitive; although it does indicate that this may be a fruitful area for further research.
- ii) The absence of significant relationships between the CTA and PTT suggests that the PTT is measuring a different construct to the convergent thinking ability of critical reasoning

measured by the CTA. However, the lack of relationships (in the analysis of differences between high and low performing teams) provides no evidence of the associations which might be expected with a measure of divergent thinking (eg, Plant, Strategic Orientation). This is in line with the findings reported by Higgs and Dulewicz (1997(b)). In view of the assertions and findings on innovation in teams reported within the literature (eg, West & Anderson, 1996; Belbin et al, 1976; Belbin, 1981) it would seem that further research into the impact of divergent thinking as an input factor would be fruitful.

- iii) The lack of any significant relationships between the CTA and either the Team Role Index or Supra-Competence Index was somewhat surprising. However, previous relationships with the BTRs had been encountered at an individual level (Higgs, 1996(a)) and primarily with the Monitor Evaluator role. The process of formulating a Team Role Index reduces the likelihood (in the light of these previous findings) of encountering a relationship with the CTA at the team level.

Overall, the main contribution of the findings from analyses of the interrelationships between the input variables has been to identify evidence which supports the linkages between the BTRs and Supra-Competences and indicates the possibility of a measure of team competence mix being relevant to the future study of teamworking.

Other Variables

In order to meet the requirements of multivariate analysis the number of variables in the study needed to be limited (Hair et al, 1995; Lehman, 1991). As a result a number of input variables were omitted which are indicated in the literature as impacting on team performance (notably team size and tenure). Data on three of these "other" input variables (ie, team size, team tenure and company) had been collected. The results of the analyses of these variables in examinations of the differences between high and low performance teams, which were discussed in 10.6 above, showed that none of them had any significant relationship as a differentiator. Whilst this, in relation to size and tenure, is counter to findings in other studies (eg, Shaw, 1971; Greenbaum et al, 1988; Eisenhardt, 1989; Smith et al, 1994) the relative range restrictions on these variables in this study may have accounted for this surprising outcome. It would certainly be fruitful in further research, using this study's process and outcome measures, to incorporate team size and tenure as input variables. The fact that no differences were encountered between high and low performing teams based on the basis of company was a somewhat comforting finding as, within this sample, this indicates the potential absence of company differences as a confounding factor.

Examination of Research Hypotheses

The extent to which the research findings, reported above, support the research hypotheses is discussed below:

- H.1.1. **Management teams with an "optimum" balance of Belbin Team Roles will be rated as higher performing teams in terms of both "hard" and "soft" outcomes**

The initial correlational analysis provides partial support for this hypothesis with significant correlations between the Team Role Index (used to operationalise "optimum" balance) and the Team Cohesion and Improvement Orientation outcome factors. This clearly provides evidence to support the relationship to "soft" or psychosocial outcomes. The extent to which Improvement Orientation may be considered a partially "hard" outcome is questionable. Further support for both Team Cohesion and Improvement Orientation outcome factors is provided from the analysis of differences between high and low performing teams. Once again, the regression analysis provides support for the hypothesis in relation to "soft" outcomes. However, when the BTR Index is combined with the Communication, Interaction and Involvement process factor a significant relationship with the Team Achievements outcome factor (a "hard" outcome) is evidenced.

Overall, the results may be seen as providing partial support for this hypothesis. However, the operationalisation of the outcome factors does not include an objective criterion for the measurement of "hard" outcomes. Thus, further research with such a measure may well reveal a clearer and complete support for the hypothesis.

H.1.2. Management teams with a "balanced" mix of competences will be rated as higher performing teams in terms of both "hard" and "soft" outcomes

As with the Team Index results the correlational analysis of competence mix (operationalised as the Supra-Competence Index) indicates partial support for this hypothesis. The encountered relationship from this analysis is with the outcome factor of Improvement Orientation. As discussed above it is by no means clear whether or not this factor can be seen as purely "hard" or "soft". However, when analysing the differences between high and low performing teams, evidence of relationships between the Supra-Competences and all three outcome factors emerges. The regression analysis supports the relationship between the Supra-Competence Index and the outcome factor of Improvement Orientation. When this index is combined with the process factor Performance Orientation, a relationship with the outcome factor of Team Cohesion emerges. Thus, from an overall analysis it would appear that the results do offer partial support for this hypothesis. As with the previous hypothesis the need for further research using a more objective measure of "hard" outcomes may prove fruitful.

H.1.3. Management teams with higher average levels of critical reasoning ability (using the CTA as a measure) will be rated as higher performing teams in terms of "hard" outcomes

The correlational analysis produced no evidence of relationships between the CTA and any of the outcome factors. Similarly, the analysis of differences between high and low performing teams produced no evidence to support this hypothesis. The absence of evidence may be impacted by the lack of an objective measure of "hard" outcomes.

Furthermore, the impact of intervening processes may suppress the input:outcome relationship for this input factor (Williams & Steinberg, 1988; Janis, 1972). The regression analysis indicated relationships (albeit non-significant) between the CTA and both Team Cohesion and Team Achievements. In addition, the combination of the CTA and the process factor of Enabling Leadership showed a significant relationship with the outcome factor of Improvement Orientation. It is clear that, from an overall perspective, the evidence from the current study does not support this hypothesis. There is a degree of evidence of relationship between the CTA and the outcome factors. However, the evidence is somewhat weak and unclear. Thus the relationships should be examined further in future research.

H.1.4. Management teams with higher average levels of divergent thinking will be rated as higher performing teams in terms of both "hard" and "soft" outcomes

Operationalisation of divergent thinking was by the use of the PTT. The results from the study at all levels of analysis fail to demonstrate any relationships between the PTT and outcome factors. Whilst this could be taken as a prima face case for refuting this hypothesis, it is important to consider the possibility that the PTT may not be the most appropriate means of operationalising divergent thinking in a team context. Further research on the measurement of divergent thinking may be useful, given the support for this hypothesis within the literature.

H.2.1. Management teams with an "optimum" balance of Belbin Team Roles will have higher ratings on team process factors than other teams

The correlational analysis demonstrated significant positive relationships between the BTR Index (used to operationalise the "balance" concept) and the process factors. Some three of the fourteen factors were clearly related to the degree of BTR balance in the teams (Process Orientation, Alignment and Interface Management). Whilst this cannot be taken as fully supporting the hypothesis, it does provide partial support and indicates that the relationships are worth exploring further through additional research.

H.2.2. Management teams with an "optimum" balance of competences will have higher ratings on team process factors than other teams

The correlational analysis demonstrated significant positive relationships between the Supra-Competence Index and three of the process variables (Roles, Composition and Contribution, and Realistic Focus). This offers partial support for the hypothesis. The operationalisation of the concept of "optimum balance of competences" by means of the Supra-Competence Index has implications for the findings both in terms of definition of competences (using one of a range of models) and the computation of balance. Further research, perhaps using alternative competences or balance measures, would be needed to fully explore this hypothesis.

- H.2.3. Management teams with higher average levels of Critical Reasoning Ability (measured using the CTA) will have lower ratings on team process factors than other teams**

No significant relationships were encountered between the CTA and the team process factors. Therefore, the results provide no evidence to support this hypothesis.

- H.2.4. Management teams with higher average levels of divergent thinking ability will have higher ratings than other teams on team process factors**

The concept of divergent thinking ability was operationalised by means of the PTT. No significant relationships were encountered between PTT scores and the team process factors. However, further research using alternative measures of divergent thinking or a modification of the PTT (as proposed by Higgs & Dulewicz, 1997(b)) may provide a different picture. At this point it is clear that the current research results do not support this hypothesis.

- H.3.1. Management teams with higher ratings on team process factors will be rated as higher performing teams in terms of both "hard" and "soft" outcomes**

Correlational analysis of relationships between the team process and outcome factors showed significant positive relationships with all three of the outcome factors, thus providing fairly strong support for this hypothesis. The relationships were most numerous with the Team Cohesion factor (eleven of the fourteen process factors) with seven process factors being related to Improvement Orientation and three with Team Achievements. Further support for the relationships across all three outcome factors is provided by both the analysis of differences between teams and the regression analyses. Overall, the research findings do tend to provide support for this hypothesis.

- H.4.1. A team interaction model which accounts for interactions between Input and Process factors will account for more variance in Team Outcomes than a main effects model**

Comparison of the regression results of a main effects and interaction modelling of the data from this study shows that in respect of all three outcome variables the R^2 values in the interaction model are higher. This provides evidence to support the above hypothesis.

- H.4.2. A team model which accounts for interactions between Input and Process factors will provide evidence to show that Team Processes act as mediator variables between Input and Outcome variables**

Due to sample size and the requirements for the number of observations per variable in a multiple regression analysis (Hair et al, 1995; Money, 1997) the study was only able to examine a limited number of Input:Process interactions (eleven in total). The multiple regression analysis demonstrated that three of these produced significant

standardised Betas in relation to the outcome variables. In each case, the interaction either enhanced the value of the Beta for the input variable alone or introduced a new input:outcome relationship. From an inspection of figure 11.2 it is evident that the current study provides a degree of support for the above hypothesis. However, it does have to be borne in mind that the sample size and scope of the current research did not permit validation of the multiple regression models. This should be examined in a future research study.

11.4 Summary

An overall examination of the research findings and comparison with the research hypotheses has shown a good deal of support for team variable interrelationships encountered within the literature. In addition empirical support has been indicated for a number of previously hypothesised relationships.

Support is found for seven of the eleven research hypotheses. Those unsupported relate to the hypotheses associated with Critical Reasoning and Divergent Thinking. In the latter case the lack of evidence may result from the operationalisation of the Divergent Thinking construct rather than the rationale behind the hypothesis. This provides one of a number of potential areas for further research which have been identified in this section and which will be explored in further detail alongside a discussion of the strengths and limitations of this research project in the final chapter.

Chapter 12. Conclusions and Implications

"Our knowledge can only be finite while our ignorance must necessarily be infinite."

Sir Karl Popper: *Conjectures and Refutations*, 1963

12.1 Introduction

The growing importance to organisations of teams and effective teamworking has been discussed in this thesis and is highlighted extensively in the literature (eg, Larson & La Fasto, 1989; Leigh & Maynard, 1994; Spencer & Pruss, 1992; Beeby & Simpson, 1995). The core belief in the critical role of teamworking is summarised by Cook (1993) in the comment:

"Teamworking is no longer an option for many organisations, but a necessary part of corporate effectiveness."

In the introduction to the thesis the underlying belief that the case for teamworking had been substantially proven was summarised in two comments made by Katzenbach and Smith (1993):

"It is obvious that teams outperform individuals." and

"Team is a word and concept well known to everyone."

However, the review of the literature in Chapters two to six has shown that both of these assertions do not bear examination in the light of the available evidence. In broad terms, many researchers and authors question the robustness of the evidence presented to support the assertion of the performance benefits of team working (eg, West, 1994; West & Slater, 1995; Hackman, 1990; Furnham, 1992; Stott & Walker, 1995). The general views of many of these critics are aptly summarised by Stott and Walker (1995) who stated that:

"In the absence of rigorous research it has been necessary to accept many items of common wisdom and expedient to draw on the writings and experiences of respected and scholarly colleagues."

Whilst the need for theoretically and methodologically sound research with teams is undeniable (West & Slater, 1995; Furnham, 1992; Hackman, 1990) it is important to recognise the complexity of the phenomena (and their interrelationships) being studied when embarking on research into teams and teamworking (Abell, 1976; Schein, 1965; Hackman, 1990). In attempting to manage the complexity within a research setting Larson and La Fasto (1989) highlighted the need for a clear framework within which to think about and study teams. One such framework (proposed in a group study context) was developed by Hackman and Morris (1975) who modified an earlier group interaction model presented by McGrath (1964). This framework has been used to provide the organising architecture for this research study. The interaction process framework provides a basis for exploring relationships between: i) Input and outcome factors; ii) Input and process factors; iii) Process and outcome factors; and iv) Input, process and outcome factors in combination.

In recent years a range of studies have been conducted within such a framework (eg, West & Anderson, 1996; Pinto et al, 1993; Greenbaum et al, 1988; Smith et al, 1994). In broad terms, whilst these studies have produced evidence to support input : outcome; input : process and process : outcome relationships it has been difficult to find evidence which demonstrates the mediating impact of process in explaining input : outcome variations.

In the vast literature on teams the focus on management teams, in particular, has been relatively scarce (Critchley & Casey, 1984; Higgs & Rowland, 1992; Senior, 1997; Hackman, 1990). In 1984 Hambrick and Mason produced a paper outlining the significance of top teams in a theoretical framework which they referred to as Upper Echelon theory. This stimulated a stream of demography-based research which often produced contradictory results (Pettigrew, 1992). Furthermore, the difficulty in such studies of gaining access to senior level teams was highlighted (Eisenhardt, 1989) and the limitations of failing to really explore processes in such teams were identified as a future priority in team research (Pettigrew, 1992; Lawrence, 1991).

Against this background the results of a survey of 100 UK companies were unsurprising. In broad terms the survey found that, whilst companies believed in the potential benefits of teamworking, participants found significant problems in realising benefits and developing effective teamworking (Employment and Development Bulletin, 1995). This survey tends to reinforce the overall management problem and research questions which stimulated this research study and which are:

i) Management Problem:

What factors should be focused on to enhance the performance of management teams?

ii) Research Questions:

- a) Is there a relationship between input factors, processes and performance which can contribute to an understanding of the effectiveness of management teams?
- b) How may this relationship be modelled? and
- c) Which factors in the overall process have the greatest impact on the performance of management teams?

The following sections of this chapter explore the extent to which these questions have been answered, the strengths and limitations of the study, the overall contribution which this study has made to the understanding of teams, practical implications of the findings, ideas for further research and what has been learned at a personal level.

12.2 The Management Problem and Research Questions

From both the review of the literature and the findings from the current study some light has been shed on the overall managerial problem. It is clearly important to concentrate on both input and process factors in order to build and enhance the performance of management teams. The literature identifies three key groups of input factors (individual level, group level and environmental level). The current study has explored the individual level and reinforced the

importance of considering the mix of personal styles, related to individual characteristics, within the team. In addition it has highlighted that considering the mix of competences within a team is also an important input factor. Whilst process has previously been a somewhat amorphous term, or one which exclusively focuses on elements of communication (Hackman & Morris, 1975), this study, both in reviewing the literature and through research findings, has given a degree of shape to process and identified a number of specific areas which should be examined in a team in order to enhance its overall effectiveness.

In terms of the research questions both the review of the literature and research findings shed a degree of light on them. There clearly is a relationship between input, process and outcome factors. In broad terms it is clear that processes within a team have a mediating effect on the inputs to the team. This relationship can be modelled, but with difficulty (given the range and complexity of variables and potential interrelationships). In relation to the third research question there is no clear evidence emerging as to which specific factors should be focused on in order to have the greatest impact on team performance. However, it is clear from the current study that by focusing on the combination of input and process factors there is an enhanced pay-off in terms of team outcomes.

12.3 Reflections on the Research Study

The thesis, up to this point, has presented a comprehensive review of the somewhat vast literature relating to teams and teamworking. It has also presented the findings from a very large scale study of senior management teams in an organisational context. From the previous chapter and the comments in 12.2 above it is evident that the research has contributed to an understanding of the complex phenomena which impact on managerial team performance. However, in reflecting on the research there remain issues which need to be examined further in order to build a clear and practical understanding of what it takes to build and sustain an effective managerial team.

One particular issue which remains troublesome is that of the concept of a Team Role. Within this research the Belbin model was used and the contradictory findings and views in relation to the construct validity of Belbin's model have been discussed. If the view is taken that Team Roles reflect behaviours of individual team members in a team setting then questions must be raised as to the stability of Role preferences in differing settings. Indeed in a recent study (Shi & Tang, 1997) evidence was presented to demonstrate that individuals displayed different Team Role preferences (measured using the BTRSPI) in differing task environments. This increases my level of discomfort with viewing Team Roles as set preferences which drive individual behaviour in a team.

An alternative view of the nature of a Team Role (and one to which I subscribe) is that it presents a generally accessible and acceptable means of communicating about individual personalities in a team context. For example it is easier, in a practical team development intervention, to discuss a team member as a Shaper than as a dominant, anxious extrovert. Indeed in reviewing Belbin's original work (Belbin, 1981) it is clear that he was working on examining the impact in a

team of differing combinations of individual personality characteristics. In the early studies Belbin used the 16PF second order factors of Introversion: Extroversion and Stability: Anxiety to examine combinations of differing personalities. The Team Role model which he subsequently developed clearly has value in providing a practical language for describing aspects of differing personality types within a team. However, it appears that in much of the subsequent work which examines Team Roles the personality basis of their construction has been lost (a notable exception to this being the work of Dulewicz (1995(a))). Perhaps it is time to shift the research agenda in relation to Team Roles from further examination of Belbin's model and its operationalisation to a more fundamental re-examination of the core elements of individual personality which provide enduring predictors of behaviours in a range of task and team contexts. In making such a shift it could be profitable to begin future team research using the "Big Five" personality factors (Digman, 1990; Barrick & Mount, 1991) as there is growing evidence of their validity and robustness in relation to predicting individual behaviour and, to an extent, occupational performance. In working from such a personality-based approach it might also be helpful to move away from the term Team Role and begin to talk about an individual's Team Style.

A second troublesome, and related, issue is the concept of a 'Balanced Team'. The difficulties in operationalising Team Balance or Mix have been discussed in this thesis. A fundamental concern arises in addressing BTR balance in teams of less than eight. The view (supported by Belbin, 1981) that one individual possessing two Role Talents has equal value in assessing balance to two individuals each possessing one Talent (eg, Member A having sten 8 plus on both Plant and Co-ordinator equates in balance terms to Member B being a Plant and Member C being a Co-ordinator) is difficult to accept. Furthermore it does appear that, in practice, the Balance or Mix construct is primarily providing evidence of the degree of diversity in the personalities of the members of a team rather than a measure with more significant meaning. As such the measure of balance would be expected to relate to outcomes given the group research evidence relating to the value of such diversity (eg, Shaw, 1971). A limitation of this interpretation of Balance is that it does not take adequate account of surpluses of dysfunctional personality elements in the team mix. Perhaps this issue is again best explored further in the future by breaking free from the Belbin model and examining diversity of personality type combinations using the "Big Five" model.

12.4 Strengths and Limitations of the Study

Many authors have pointed out the need for organisationally based studies of teams (eg, Furnham, 1992; West & Slater, 1995). Furthermore, the need for studies which focus exclusively on senior management teams has been highlighted (eg, Hackman, 1990; Pettigrew, 1992). An overall strength of the current study is that it meets both of these requirements and provides a wide range of quantitative data which is supported by qualitative insights.

Furnham (1992) emphasised the importance to research in this field of well structured studies based on clear theoretical underpinnings. A second major strength of the current study is that the research design flows directly from an extensive analysis of literature (drawn from diverse sources) which relates to team and teamworking.

Further strengths of the study may be summarised as being:

- i) **Sample Size.** The study examines some 54 managerial teams (most of which are at the senior managerial level). This represents one of the largest samples of management teams which has been studied. Furthermore many of the more recent management team studies have relied exclusively on demographic data (Pettigrew, 1992) whereas this study is based on data obtained directly from team members and the executives to whom they report;
- ii) **Intact Managerial Teams.** In broad terms the limitations of a number of studies which set out to examine managerial teams has been that direct access to team members has been limited or non-existent (Eisenhardt, 1989; Pettigrew, 1992) which has been a particular problem with senior level teams. The current study, both in its qualitative and quantitative components, has obtained data directly from current practising managerial teams and the executives to whom they report;
- iii) **Exclusively Management Teams.** In a large number of studies of teamwork (outside of the demographically-based research) there have been issues relating to either the mixture of managerial and non-managerial teams or to the testing of managerial team models with non-managerial populations. This latter point has been particularly notable in research into the Belbin Team Role Model (eg, Furnham et al, 1993; Fisher et al, 1994; Senior, 1996; Berry, 1995). Within the current study only managerial teams operating in a managerial context were included;
- iv) **Range of Data Available.** Due to current and past consulting relationships the author was able to obtain detailed psychometric and related data on all participating managerial team members. This overcame a number of the limitations reported in previous managerial team research (eg, Pettigrew, 1992; Hambrick & Mason, 1984; Eisenhardt, 1989);
- v) **Set in an Organisational Context.** Within the literature the need for organisationally-based (as opposed to laboratory/experimental research) has been highlighted (West & Slater, 1995; Hambrick, 1990; Dulewicz, 1995(a)). The current study is exclusively organisationally-based;
- vi) **Measure of Team Process.** Hackman and Morris (1975) highlighted the limitations of measuring process through focus on communication-based interventions. Nutt (1990) reinforced this limitation through his observation that process is broader than behavioural interactions. In the current study an instrument to assess process is employed which is broader in scope than communication and behaviour interaction.

In various sections of this thesis the limitations of sample size, instrumentation and methodology have been highlighted. These may be summarised as follows:

- i) **Sample.** In order to obtain access to a sample of sufficient size for meaningful analysis it has been necessary to exploit contacts and relationships with current clients willing to provide access to intact management teams in an organisational setting. As a result the sample comprises only three organisations with a dominant representation from the UK life assurance sector. This limits the generalisability of the findings (Yin, 1989; Easterby-Smith et al, 1991). This point is reinforced by a number of the results, most notably the distribution of BTRs (see 9.1 above) which appears somewhat idiosyncratic. Whilst the decision on obtaining access to intact managerial teams has produced a substantial sample (54 teams) it has proved to be below the minimum level for full scale Structural Equation Modelling (LISREL) which needs a minimum of 100 to operate effectively (Hair et al, 1995);
- ii) **Variables.** In order to examine relationships between variables using multiple regression analysis it has been necessary to select a smaller number of variables than are indicated by the research and available within the data set (Hair et al, 1995; Lehman, 1991). Thus some of the potential interrelationships remain unexamined;
- iii) **Absence of Objective Outcome Measure.** Whilst there is much debate around the validity of employing "soft" outcome measures (eg, Hackman, 1990; Furnham, 1992) there is no doubt that the absence of a clear and objective outcome measure has had an impact on the results and their interpretation;
- iv) **Lack of Examination of Multiple Dependant Variables.** The sample size precludes the use of analytical methodologies which employ the facility to examine the simultaneous impact and relationships between the independent variables and multiple dependant variables. In consequence relationships to dependant variables have been examined in series and thus the explanatory power of more sophisticated multivariate techniques have been missed;
- v) **Absence of Consistent Competence Measure.** The use of two distinct competence frameworks within the study resulted in the employment of a statistical devise to unify the data. The use of multiple regression to align the NatWest Life Competences with the Supra-Competences resulted in a statistically acceptable decision which failed to account for all of the variance between the two competence models;
- vi) **Operationalising Competence Mix.** There exists no means of describing and defining competence mix within a team. In order to explore this phenomenon it was necessary to "borrow" a model employed for use in determining a mix of Belbin Team Roles. The applications of this model to competences had not been previously tested and thus the results may be questionable;
- vii) **A Selection of Variables for Regression Analysis.** Whilst the sample size limitations have already been discussed, in practice it was necessary to reduce the number of variables which would be considered in this study. In part this led to a selection of individual input and process factors. However, the selection of interaction factors, in spite of theoretical underpinning, may have impacted on the final findings.

12.5 Contribution of the Research

This research study makes a significant contribution to the understanding of teams and teamworking. It represents one of the largest studies of managerial teams to have been reported. In addition to the scale of the study it takes on the research agendas identified in a range of studies examining teamworking from differing perspectives.

In terms of the Belbin Team Role debate the study provides evidence which relates to the more robust means of measuring BTRs from the 16PF (Mottram, 1988) and is one of the relatively few to have been based on exclusively management teams. In addition the study extends further the work carried out by Berry (1995) on operationalising the BTR mix construct. The discussion in 12.3 above contributes to an agenda for future research which will, hopefully, lead to fresh insights into the nature of Team Roles. In addition to the specific contribution to the Team Role debate (and perhaps more importantly) the study contributes to understanding of the complexity of the phenomena associated with developing effective managerial team performance. The process model research agenda has been progressed by this study which not only provides further evidence of the mediating impact of team processes, but also provides a new robust and reliable instrument for measuring such processes. Some of the specific contributions of this research project to the understanding of teams and teamworking are:

- i) Providing insights from reviewing existing research. The literature review examined a diverse and extensive range of theory and research pertaining to teams and performance and placed this within an overall framework which provides illumination of the significant relationships between the variables that impact on the performance of managerial teams. Several of the analyses of differing streams of the literature have brought together material from diverse sources and compared them directly for the first time;
- ii) The development of a reliable and robust instrument to measure team outcomes which can be used in subsequent research;
- iii) The development of a reliable and robust instrument for the measurement of team processes which can be used in subsequent research;
- iv) Provision of evidence to support the construct of Team Role mix using the Belbin Team Role model. The findings, using this measure, of Berry (1995) showed that an absence of "mix" is associated with ineffective team performance, but found no evidence to associate superior performance with an "ideal" mix employing this Index measure. The current study shows that the Team Role Index is also associated with effective team performance (as measured by the outcome instrument employed). The debate in 12.3 above provides some further thoughts on the future direction of research to explore the whole construct of Team Mix.
- v) The provision of evidence to support the concept of team competence mix being associated with effective team performance. Whilst such a concept is theoretically proposed (eg, Schroeder, 1989; Finn, 1993) prior to this study research evidence to support this proposition had not been presented;

- vi) Evidence that process factors act as mediators in team input:outcome relationships. The current study provides further support for previously identified input:outcome, input:process and process:outcome relationships. However, it additionally provides significant evidence that processes act as a mediator variable in the input:outcome relationship.

This study provides practical as well as theoretical contributions to the understanding and development of teams. The model and framework summarised in 12.6 below provides a new way of diagnosing and responding to team development needs which flows directly from this research project.

12.6 Practical implications

In the introductory chapter to this thesis the "real world" problems facing organisations in building and developing effective managerial teams were outlined. The core issue facing those involved with team development relates to the choice of focus. The question posed by many is "Is the key to success people or processes?".

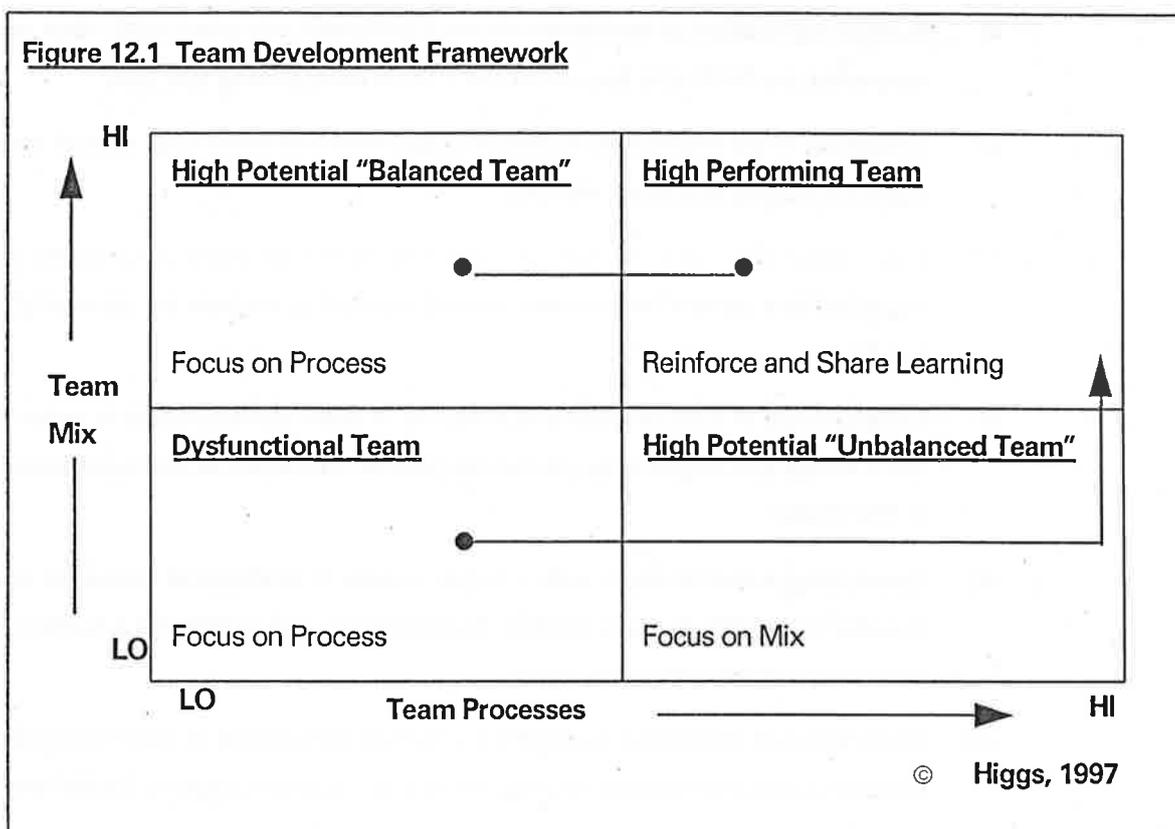
This research provides guidelines on the nature and assessment of Team Mix. Whilst questioning a number of existing Team Role models and associated "mix" issues it should be possible to identify potential "mix" elements from a review of the literature section of the thesis. In doing this myself (in my consulting role) and combining the research data with more than ten years experience as a team developer I have identified the following requirements for personality components in a team. These are:

- i) A mixture of convergent and divergent thinkers. This mixture enables the team to generate innovative solutions to problems and ensure that such solutions are capable of execution;
- ii) A number of members who are achievement oriented. These members ensure that the team is focused on closure, results and delivery;
- iii) At least one member who is both group oriented and tough-minded (an unusual combination) who can ensure conflict is constructively surfaced and that attention is paid to collaboration and the effective maintenance of the group interaction processes;
- iv) A number of members who are outward looking (Extroverts most likely) and can ensure that the team do not become too introspective.

In reflecting on this "practitioner-led" mix specification it appears that these requirements map on to four of the "Big Five" personality factors (Barrick & Mount, 1991). The four in question are: Extraversion, Openness, Agreeableness and Conscientiousness.

The Team Process and Team Outcome instruments developed and presented in the research study have direct practical application in the identification of team development needs.

The overall "modelling" presented and the results which were encountered suggest a framework for team diagnosis and development planning. This framework is presented in figure 12.1 below.



Using this framework will enable the appropriate intervention to be made in order to build team performance. For example if the team is diagnosed as being “Dysfunctional” the initial intervention should focus on developing the team’s processes. Once this has been completed the team should feel more able to address the more difficult mix issues. The process questionnaire presented in this research may be used initially to position the team on the “Process” axis. Following this process actions may be identified by analysis of the process questionnaire factors and identification of the low scoring factors as priorities for action.

12.7 Potential Future Research

When considering the research agenda which potentially emerges from this study there are two distinct components. These are:

- i) potential areas relating directly to the methodology and structure of the research study; and
- ii) potential directions relating to the broader issues raised in the course of the study.

These research themes are examined briefly below.

Summary of future research from findings

In reviewing the current research study and findings a number of potential areas for future research have been identified. These would appear to be:

- i) The exploration of Belbin Team Roles using a managerial norm basis for the 16PF;

- ii) Further exploration of the Belbin Monitor Evaluator role using both 16PF managerial norms for the 16PF and the use of the CTA in determining this role;
- iii) Validation of the regression model findings from this study with a more heterogeneous separate managerial team sample;
- iv) Exploration of the overall findings from this study with managerial teams from within other organisations (drawn from other sectors) in order to explore the generalisability of the results;
- v) Development of a more objective measure of team achievements in order to further test the findings and explore the partial support for a number of the hypotheses encountered in this study;
- vi) Conducting a similar study with a larger sample of managerial teams (ie, in excess of 100) in order to be able to apply LISREL methodology, and overcome a number of the limitations applicable to this study;
- vii) Exploration of alternative competence models and means of identifying competence balance in order to test the findings from this study and explore further the construct of team competence balance;
- viii) Further exploration of a means of operationalising the construct of divergent thinking and its impact on team performance;
- ix) Examination of the input:process:outcome model using different variables in order to test a different part of the overall framework and contribute further insights into the overall modelling of team behaviour and performance.

Potential future research relating to identified issues

To a large extent this stream of potential research relates to the Team Role and Team Mix issues identified in 12.3 above. It would be most valuable to explore the Team Role (or Team Style) construct from the start point of the "Big Five" personality factors. Such research could address the issues associated with the relationship between these factors and behaviours in a team which are consistent across a variety of task and environmental settings. Whilst early research of this type may have to be of an experimental design, it would be important to develop subsequent research quickly in an organisational setting (given the already existing dearth of organisationally-based team research studies).

In 12.3 above the concerns and issues relating to Team Mix were highlighted. Further research designed to test the extent to which "mix" is a measure of diversity of personalities in a team or is, indeed, more akin to the concept proposed by Belbin, would be most valuable. Whilst it would be feasible to begin exploring this area using established models (eg, Belbin) it would be extremely useful to see studies which explore the issue using models emerging from the "Big Five" related research described above.

Throughout this thesis the issues over gaining access to senior level and top teams have been highlighted. The current study has been possible because such difficulties were overcome. However, it would be valuable to continue the effort to gain access to top teams for research purposes. In particular it would be useful to conduct qualitative research at this level in order to develop a clearer understanding of the differences between top teams and other managerial teams.

12.8 Learning from the Research Process

The process of doctoral research has been described as both an apprenticeship (Easterby-Smith et al, 1991; Bell, 1992) and a learning journey (Joynt, 1995). In reflecting on the experience of conducting the current research a number of key learning points are evident. These may be summarised as:

- i) The need for focus. The current project has, as is evidenced from the reduction of the initial research model, required considerable effort to move from an intellectually attractive to a researchably feasible framework for a study. Even so it is arguable that the final research framework and associated data was too broad to enable clear and focused hypotheses to be rigorously explored. (At the end of the project a large number of areas for further research may have resulted from insufficient focus in the current study and research design);
- ii) The value of qualitative data. Within the research design for this project the qualitative component played an apparently minor part. However, the insights from this element of the research were significant and potentially under-exploited within the overall project;
- iii) The importance of rigour in operationalising constructs. The attempt to operationalise the construct of divergent thinking through the use of the PTT has demonstrated that taking a potentially broad construct and operationalising it through an instrument which is examining only one element of the construct can lead to an absence of expected relationships;
- iv) The importance of a strategic view of research. The establishment of a broad strategic research agenda by Hambrick and Mason (1984) in relation to Upper Echelon Theory and the prompting of a stream of tactical research to explore this agenda provides a good example of the way in which research in relation to large and complex agendas may be managed. The lesson from this is, in part, to do with understanding the differences between creating a theoretical framework and conducting sound and rigorous empirical research.

12.9 Concluding Comments

Having set out on a research journey and an apprenticeship I have found that I have encountered elements which relate to both metaphors. In apprenticeship terms I have learned much and coped with the research equivalent of "asking for a left-handed screwdriver". In terms of a journey I can only describe the experience through a continuation of the metaphor. Having thought of the journey as being the equivalent of travelling from the suburbs of London to the centre, on arriving at the centre I realise that the journey has only just begun. I now have to deal with the problems of navigating the complexities of routes to different parts of the centre.

Beyond that, I have to consider where these routes may lead in terms of access to other parts of the country. However, having negotiated the apparently insurmountable obstacles of the route into the "centre" and coped with the disappointments and frustrations of the journey, I now feel excited at the prospect of continuing the journey.

The areas for further research outlined above represent destinations on future journeys which I hope, having served my apprenticeship, to be able to undertake as a journeyman.

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Appendices

Appendix I

**Team Effectiveness Factors
From Literature Review**

Summary of Team Effectiveness Factors

- Impact of power structures
- Mutual accountability
- Performance culture
- Positive feedback, recognition and new and clear rules
- Change of mind sets
- Clear and specific performance goals
- Culture
- Envision common direction
- United in goals
- Feel empowered and skilful
- Explore alternatives before decision
- Reflect on process
- Walk talk from top (environment)
- Belief in interdependence
- Goal alignment
- Share information
- See each others' perspective
- Mutual support
- Good communication
- Open discussion of differences
- Exchange of information
- Constructive conflict management
- Impact of task (fear of failure)
- Expect success
- Recognition & reward
- Legitimise activities
- Identify issues
- Influence each other
- Combine ideas
- Sensitivity of leaders
- Role structure
- Interconnectedness of roles
- Belief in skills and resources
- All-round skills
- Complementary skills
- Effective and appropriate leadership
- Balanced roles
- Self-insight and understanding
- Effective process
- Achieve results
- Challenging targets
- Relationship management
- Information management
- Effective organisation
- Encourage challenge of status quo
- Decision-making process
- High standards and procedures
- Maintenance of purpose
- Clear roles and contribution
- Balance functional and team roles
- Appropriate skill mix
- Review learning
- Understand team's character
- No status barrier
- Mutual respect
- Shared aims and objectives
- Co-operation
- Trust
- Openness
- Confront issues
- Inter-group relations
- Good/appropriate selection
- Sound procedures
- Scope for individual development
- Recognise and adapt to strengths and weaknesses
- Check assumptions
- Sense of curiosity
- Respect and value differences
- Example from top
- Subsume function to team goal
- Understand diversity
- Clear contribution
- Learn from mistakes and errors
- Previous experience
- Organisation culture
- Expectations
- TU attitudes
- Review process and content
- Involvement in mission
- Concern for team result
- How authority exercised
- Nature of objectives
- Mix of personalities
- Dynamics
- Allocation of roles and responsibilities
- Existence of challenge processes
- Clear time frames
- Honest and open feedback
- Lack of turf issues
- Proactive
- Credit and recognition
- Individuals feel important and valued
- Identifiable contribution
- Performance feedback
- Authority to act
- Access to resources
- Capture and use learning
- Value systems
- Clarify interdependence
- Collaborative culture
- Size
- Multi-source feedback
- Breadth of thinking
- Encourage new thinking
- Challenge assumptions
- Self-knowledge
- HR infrastructure
- Set own goals
- Measurable goals
- Helicopter view
- Effective X-training
- Shared process and rules
- Sense of identity
- Senior management support
- Cohesiveness
- Flexibility of members
- Remove/challenge barriers and constraints
- Need for differential skills
- Competence of members
- Balanced participation
- Recognise individual
- Ownership of goals and process
- Involvement
- Inspiring vision
- Celebrate success
- Value opinions
- Clear roles

Team Effectiveness Factors - Illustrative Mentions in Literature

Factors	Tjosvold 1991	Tannebaum et al	Laughlin	Katzenbach & Smith 1993	Robinson 1991	Maton & Deutch	Guzzo & Shea 1992	Argote	Busche	Dracher	Kutz
INPUT											
Skills	✓		✓	✓							
Roles											
Members							✓		✓		
Structure					✓		✓				
Cohesion	✓			✓							
Style	✓			✓			✓		✓		
Culture	✓			✓			✓	✓	✓		
PROCESS											
Objectives	✓			✓	✓	✓	✓				
Interaction	✓	✓	✓	✓	✓	✓				✓	✓
Management	✓				✓					✓	

Team Effectiveness Factors - Illustrative Mentions in Literature

Factors	Cheung	Margerison & McCann, 1985	Belbin 1976, 1981	Hastings	Blake et al	Woodcock & Francis, 1981	Woodcock 1989	Phillips 1992	Phillips	Carrington	Lawrence
INPUT											
Skills		✓	✓			✓					
Roles	✓	✓	✓						✓		
Members	✓	✓	✓					✓	✓		✓
Structure		✓	✓				✓				
Cohesion									✓		
Style								✓	✓	✓	
Culture											
PROCESS											
Objectives		✓	✓	✓	✓		✓		✓	✓	✓
Interaction		✓	✓	✓			✓		✓		✓
Management		✓	✓						✓		✓

Team Effectiveness Factors - Illustrative Mentions in Literature

Factors	Parkinson et al	Adair	Blake	Proctor	Senge 1990	Dainty and Kakabadse 1992	Trompenaars & Hampden-Turner	Walters	Fowler	Ghoshal & Bartlett, 1995	Ray & Bronstein, 1995
INPUT											
Skills			✓						✓		✓
Roles	✓		✓						✓		
Members	✓	✓	✓			✓	✓	✓	✓		
Structure		✓				✓			✓		
Cohesion		✓		✓		✓	✓				
Style	✓	✓		✓			✓		✓	✓	✓
Culture		✓			✓			✓			✓
PROCESS											
Objectives		✓	✓			✓		✓	✓	✓	✓
Interaction			✓		✓	✓		✓	✓	✓	✓
Management		✓		✓	✓			✓			✓

Team Effectiveness Factors - Illustrative Mentions in Literature

Factors	Gibb & Gibb	Higgs & Rowland, 1992	B Babbington-Smith	Klein	Handy	Holt	Mullen & Cooper	West, 1994	Hackman, 1990	Wichers	Nixon
INPUT											
Skills		✓	✓	✓					✓		
Roles		✓									
Members		✓			✓						
Structure		✓							✓		
Cohesion	✓						✓				✓
Style	✓	✓			✓						✓
Culture		✓		✓				✓	✓	✓	✓
PROCESS											
Objectives		✓						✓	✓	✓	✓
Interaction	✓	✓		✓				✓		✓	
Management		✓								✓	

Team Effectiveness Factors - Illustrative Mentions in Literature

Factors	Zigon, 1994	Spencer and Pruss, 1992	Borrelli et al, 1995	Anderson et al, 1990	Tjosvold, 1984	Blanchard, 1990	Maxon, 1986	Dulewicz et al, 1995	Larson and LaFasto, 1989	Senior, 1995	Berry, 1995	Higgs, 1996	Hambrick, 1995
INPUT													
Skills		✓	✓						✓	✓	✓	✓	
Roles		✓	✓					✓	✓	✓	✓	✓	
Members		✓		✓		✓	✓		✓		✓	✓	
Structure			✓	✓				✓					
Cohesion				✓		✓			✓				✓
Style	✓			✓				✓					✓
Culture			✓		✓	✓						✓	
PROCESS													
Objectives	✓	✓	✓		✓	✓	✓		✓				
Interaction	✓			✓				✓		✓	✓	✓	✓
Management		✓				✓	✓	✓	✓	✓			✓

Appendix II
Examples of Team Role Models

Belbin Team Role Model

Plant

Individualistic, Serious, Bright, Creative, Imaginative, Unorthodox, Solves Difficult Problems

Resource Investigator

Curious, Contact Others, Extrovert, Enthusiastic, Communicative, Explores opportunities, Develops contacts, Exploit opportunities, respond to challenge

Co-ordinator

Calm, Welcome Contribution, Mature, Confident, Good Chairperson, Clarifies Goals, Promotes Decision-Making, Delegates well, Strong sense of objectives

Shaper

Anxious, Outgoing, Drive, Challenge, Challenging, Dynamic, Thrive on Pressure, Drive, Overcomes obstacles

Monitor Evaluator

Prudent, Discretion, Sober, Strategic, Discerning, Sees all Options, Judges accurately, **Hard headed, Unemotional**

Teamworker

Social, Sensitive, Co-operative, Mild, perceptive, Diplomatic, Listen, Builds, Averts friction, Calms waters, Promote team spirit

Implementer

Disciplined, Reliable, Conservative, Efficient, Efficient, Ideas into Practical Actions, Predictable, Organised, Self-discipline

Completer

Painstaking, Conscientious, Anxious, Identifies errors and omissions and delivers on time, follow through

Specialist (1)

Single minded, Self starting, Dedicated Resource Knowledge and Skills

■ Sources: Belbin et al, 1976; Belbin, 1981; Belbin, 1993.

■ Note ⁽¹⁾ The "Specialist" role was added to the original framework at a later stage (see Belbin, 1993).

Belbin Team Role Model: Detailed Role Descriptions

Type	Symbol	Typical Features	Positive Qualities	Allowable Weaknesses
Company Worker (Implementer 1993)	CW (IM)	Conservative, dutiful, predictable	Organising ability, practical common sense, hard-working, self-discipline	Lack of flexibility, unresponsiveness to unproven ideas
Chairman (Co-ordinator 1993)	CH (CO)	Calm, self-confident controlled	A capacity for treating and welcoming all potential contributors on their merits and without prejudice. A strong sense of objectives	No more than ordinary in terms of intellect or creative ability
Shaper	SH	Highly strung, outgoing, dynamic	Drive and a readiness to challenge inertia, ineffectiveness, complacency or self-deception	Proneness to provocation, irritation and impatience
Plant	PL	Individualistic, serious-minded, unorthodox	Genius, imagination, intellect, knowledge	Up in the clouds, inclined to disregard practical details or protocol
Resource Investigator	RI	Extroverted, enthusiastic, curious, communicative	A capacity for contacting people and exploring anything new. An ability to respond to challenge	Liabile to lose interest once the initial fascination has passed
Monitor-Evaluator	ME	Sober, unemotional, prudent	Judgement, discretion, hard- headedness	Lacks inspiration or the ability to motivate others
Team Worker	TW	Socially orientated, rather mild, sensitive	An ability to respond to people and to situations, and to promote team spirit	Indecisiveness at moments of crisis
Completer-Finisher	CF	Painstaking, orderly, conscientious, anxious	A capacity for follow-through. Perfectionism	A tendency to worry about small things. A reluctance to "let go"

Source: Belbin, 1981; 1993

Benne and Sheats Model

Task Roles

Initiator-Contributor

- Suggests new ideas, new definition of problems, new procedure or processes

Information-Seeker

- Seeks clarification of suggestions - factual accuracy seeks information and facts relevant to problem

Opinion-Seeker

- Asks for clarification of values related to group task

Information-Giver

- Offers facts or generalisation which are "authoritative" or relate to own experience of group problem

Opinion-Giver

- States belief or opinion pertinent to suggestion made or alternatives being discussed

Elaborator

- Spells out suggestions in terms of examples or developed meanings; offers reasons for suggestions and tries to deduce consequences of following them

Co-ordinator

- Shows or clarifies the relationships amongst various ideas or suggestions and try to pull them together; attempts to co-ordinate activities of group

Orienter

- Defines position of group with respect to goals; summarises what has happened; points to departures from agreed directions; raises questions

Evaluator-Critic

- Subjects the accomplishment of the group to standards

Energiser

- Prods group to action or decision; stimulate discussion or arouse group to greater or higher level activity

Procedural Technician

- Expediates group movement by doing things for the group, performing routine tasks

Recorder

- Writes down suggestions, makes record of decisions

Maintenance Roles

Encourager

- Praises, agrees with, accepts contribution often warmth and solidarity. Understanding and acceptance of others roles, views and contributions

Compromiser

- Offer compromise, yield status, admit error, maintain harmony

Gatekeeper-Expliciter

- Keep communication channels open, facilitate participation
- Limits length of contribution

Standard Setter

- Expresses standards or applies standards in evaluating quality of process

Group Observer Commentator

- Records process
- Feedback dates
- Interprets groups process evaluation

Follower

- Goes along with group
- Accepts others ideas
- Audience for discussion and decision

Linking

- Co-ordinate activities
- Promote exchange of ideas and information

Advising

- Gather and disseminate information

Source: Benne and Sheats, 1948

Margerison & McCann Model

Creator-Innovator

- Number of ideas. Challenge status quo, Independent

Explorer-Promoter

- Generate ideas and build enthusiasm. Explore outside world. Make contacts. Identify helpful resources and information. Influential. Build from others' ideas

Assessor-Developer

- Balance, explore and organise. Make ideas work in practice, reality testing

Thruster-Organiser

- Get things done. Set up procedures to make things happen. Organise to meet deadlines. Set objectives, build plans. Push for results

Concluder-Producer

- Deliver what expected when expected. Use set procedures

Controller-Inspectors

- Enjoy detail. Ensure things correct. Careful and meticulous. Critical of errors, pursue in depth

Upholder-Maintainer

- Supportive of others
- Strong convictions of way of working. Defend teams, consolidate

Reporter-Adviser

- Generate information, patient, explore information

Source: Margerison and McCann, 1985

Ray and Bronstein Model

Team Leader

- Establishes process, provides support, external interface management, all outer work

Training Co-ordinator

- Develop team
- Cross-training
- Implement process
- Information sharing

Recorder

- Record decisions
- Record agreements

Scheduler/Timekeeper

- Implementing decisions
- Meet deadlines
- Track time

Morale and recognition

- Celebrate success
- Recognising contribution
- Social organising
- Focus on members as individuals

Team Statistician

- Quality control
- Track measures
- Feedback on progress

Communicator

- Bring information in from outside
- Share information and ideas
- Disseminating information

Source: Ray and Bronstein, 1995

Phillips Model

Creative Roles

- Putting ideas forward
- Generating enthusiasm
- Conveying excitement
- Suggesting adjustments to existing proposals
- Pursuing change

Practical Roles

- Co-ordinating group activity
- Driving the group forward
- Provoking thought
- Delegating tasks
- Summarising activity
- Keeping to agreed goals

Applied Roles

- Monitoring progress
- Being aware of members' individual needs
- Paying attention to and responding to detail
- Keeping to group structures
- Ensuring work is done
- Assessing quality

Source: Phillips, 1992

Appendix III
Belbin Team Role Formulae

16PF Team Roles Formulae

Plant (PL)	$2(11-A) + 2B + E + 2(11-F) + H + 2I + M + (11-N) + Q + 2Q2$
Shaper (SH)	$2F + H + 2L + 2O + 2Q4 - C - G - I$
Co-ordinator (CO)	$Q3 + 2G + F + 2F + C - M - 3L - A$
Resource Investigator (RI)	$C + H + M + Q1 - L$
Team Worker (TW)	$A - E - L - Q2$
Implementer (I)	$2(11-I) + 2(11-M) + (11-Q1) + 2(11-L) + G + Q3$
Completer/Finisher (CF)	$G + O + Q3 - Q4 - C$
Monitor Evaluator (ME)	$B + N - F$ (and only when $B =$ Stens 8 to 10)

Source: Dulewicz, 1995(a)

[Faint, illegible text from the table of contents, likely listing various competency models and their corresponding page numbers.]

Appendix IV

Summary of Competences in Main Competency Models

[Faint, illegible text from the table of contents, likely listing specific competencies and their corresponding page numbers.]

Competencies - Summary

Job Competences Survey (Dulewicz, 1992)

Information Handling

- Information collection
- Problem analysis
- Numerical interpretation
- Judgement
- Creativity
- Risk Taking
- Decisiveness
- Business Sense
- Helicopter
- Organisational awareness
- Extra-organisational awareness

Communication

- Reading
- Written communication
- Perceptive listening
- Oral expression
- Oral presentation

Management

- Planning
- Organising
- Delegation
- Appraisal
- Development of subordinates
- Self-management

Interpersonal

- Impact
- Persuasiveness
- Sensitivity
- Flexibility
- Ascendancy
- Motivating others
- Negotiating
- Leadership

Personality

- Energy
- Achievement orientation
- Initiative
- Tolerance for stress
- Adaptability
- Independence
- Integrity
- Resilience
- Tenacity
- Detail consciousness

Dulewicz and Herbert Supra-Competencies, 1992

Intellectual

- Strategic perspective
- Analysis and judgement
- Planning and organising

Interpersonal

- Managing staff
- Persuasiveness
- Assertiveness and decisiveness
- Interpersonal sensitivity
- Oral communication

Adaptability

- Adaptability and resilience

Results Orientation

- Energy and initiative
- Achievement motivation
- Business Sense

Hay McBer (from Boyatzis, 1982)**Cognitive**

- Technical expertise
- Analytical thinking
- Conceptual thinking

Influence

- Impact and influence
- Organisational awareness
- Communication

Helping/Service

- Interpersonal understanding
- Customer service orientation
- Affiliation

Achievement

- Achievement orientation
- Initiative
- Tenacity

Managerial

- Group management
- Developing others
- Conflict resolution

Morgan, 1988

- Reading the environment
- Proactive management
- Leadership and vision
- Human resource management
- Promoting, creativity, learning and information
- Skills of remote management
- Use of IT as a transformative force
- Managing complexity
- Developing contextual competencies (outside in competence)

Guptra, 1988

- Observation
- Curiosity
- Ability to gather information on people
- Data analysis
- Tolerance

Boyatzis, 1982**Goal and Action Management**

- Concern with impact
- Diagnostic use of concepts
- Efficiency orientation
- Proactivity

Leadership

- Conceptualism
- Self confidence
- Use of oral presentations
- Logical thought

Human Resource

- Managing group process
- Use of socialised power
- Accurate self-assessment
- Positive regard

Directing Subordinates

- Developing others
- Spontaneity
- Use of unilateral power

Focus on Others

- Perceptual objectivity
- Self-control
- Stamina and adaptability

Specialised Knowledge

- Specialised knowledge

Schroder, 1989**Cognitive**

- Information search
- Concept formation
- Conceptual flexibility
- Self-awareness

Motivating

- Interpersonal search
- Managing interaction
- Development orientation

Directing

- Self-confidence presentation
- Impact

Achieving

- Proactive orientation
- Achievement orientation

(n.b. Barham adds sensitivity to external

Cockerill as per Barham)

Klomp and McClelland, 1989**Intellectual**

- Planning/causal linking
- Conceptualising/synthetic thinking

Influence

- Directive influence (personal power)
- Collaborative influence (socialised power)
- Symbolic influence
- Self-confidence

plus

- Diagnostic information seeking
- Concern for influence (need for power)

Kakabadse, 1991**Shaping Skills**

- Shaping the future
- Shaping the team
- Shaping the business

Influencing

- Spreading the message
- Hearing what's said

Overview of Major Competency Models

Cognitive Competencies				
	<u>Conceptual Thinking:</u>	<u>Information:</u>	<u>Application:</u>	<u>Functional:</u>
	conceptualising, diagnostic use of concepts, conceptual flexibility, synthetic thinking, concept formation	collection, search, diagnostic information seeking, reading	problem-analysis, numerical interpretation, data analysis, analytical thinking, judgement, logical thinking	technical expertise, specialised knowledge
Dulewicz and Herbert (1992) (a) - JCS		✓	✓	
Dulewicz and Herbert (1992) (b) - Supra-Competencies			✓	
Dulewicz, MacMillan and Herbert (1995) Director Competencies		✓	✓	
Boyatzis (1982)	✓		✓	✓
Spencer and Spencer (1993)	✓		✓	✓
Klemp (1980 and 1991)	✓	✓		
McClelland (1986)	✓			
Morgan (1988)				
Schroder (1989)	✓	✓		
Barham et al (1988)	✓	✓		
Gupta (1988)			✓	
Kakabadse (1991)				
Cocherill (1989)	✓	✓		

Overview of Major Competency Models

Interpersonal Competencies				
	<u>Communication:</u>	<u>Achieving Change and Action:</u>	<u>Sensitivity to Others:</u>	<u>Motivational Focus:</u>
Dulewicz and Herbert (1992) (a) - JCS	✓	✓	✓	use of socialised power, customer service orientation, use of collaborative power, curiosity
Dulewicz and Herbert (1992) (b) - Supra-Competencies	✓	✓	✓	
Dulewicz, MacMillan and Herbert (1995) Director Competencies	✓	✓	✓	
Boyatzis (1982)	✓		✓	✓
Hay/McBer in Finn (1993)	✓	✓	✓	
Klump (1980 and 1991)				✓
McClelland (1986)	✓			✓
Morgan (1988)		✓		
Schroder (1989)	✓	✓	✓	
Barham et al (1988)	✓	✓	✓	
Gupta (1988)			✓	✓
Kakabadse (1991)	✓		✓	
Cocherill (1989)	✓	✓	✓	

Overview of Major Competency Models

		Personal Competencies						
	Motivational: affiliation, need for power, independence	Self-Perception: self-confidence, positive regard, accurate self-assessment	Resilience: tenacity, stress tolerance, self-control, stamina	Drivers: detail conscious, energy, initiative, integrity	Styles: risk taking, flexibility, adaptability, tolerance, spontaneity	Outcomes: impact, assertiveness, decisiveness, influence, initiative		
Dulewicz and Herbert (1992) (a) - JCS	✓		✓	✓	✓	✓		
Dulewicz and Herbert (1992) (b) - Supra-Competencies			✓	✓	✓	✓		
Dulewicz, MacMillan and Herbert (1995) Director Competencies			✓	✓	✓			
Boyatzis (1982)		✓	✓		✓			
Hay/McBer in Finn (1993)			✓					
Klump (1980 and 1991)								
McClelland (1986)		✓						
Morgan (1988)		✓						
Schroder (1989)		✓				✓		
Barham et al (1988)		✓				✓		
Gupta (1988)			✓		✓			
Kakabadse (1991)	✓							
Cocherill (1989)	✓					✓		

Overview of Major Competency Models

Managerial Competencies	
<u>Task/Activity Focus:</u>	<u>Group/People Focus:</u>
Dulewicz and Herbert (1992) (a) - JCS	✓
Dulewicz and Herbert (1992) (b) - Supra-Competencies	✓
Dulewicz, MacMillan and Herbert (1995) Director Competencies	✓
Boyatzis (1982)	✓
Hay/McBer in Finn (1993)	✓
Klump (1980 and 1991)	✓
McClelland (1986)	✓
Morgan (1988)	✓
Schroder (1989)	✓
Barham et al (1988)	✓
Gupta (1988)	✓
Kakabadse (1991)	✓
Cocherill (1989)	✓

Overview of Major Competency Models

	Environmental Competencies			Achievement Competencies	
	<u>Contextual Awareness:</u> helicopter, business sense, strategic perspective, shaping the business, observation	<u>Internal Awareness:</u> organisational awareness, managing complexity	<u>External Awareness:</u> reading environment, extra-organisational awareness, sensitivity to external change	<u>Achievement Orientation:</u> achievement of results, efficiency orientation	<u>Focus of Achievement:</u> proactivity, use of IT as a transformational force
Dulewicz and Herbert (1992) (a) - JCS	✓	✓	✓	✓	
Dulewicz and Herbert (1992) (b) - Supra-Competencies	✓			✓	
Dulewicz, MacMillan and Herbert (1995) Director Competencies	✓	✓	✓	✓	
Boyatzis (1982)				✓	✓
Hay/McBer in Finn (1993)		✓		✓	
Klemp (1980 and 1991)					
McClelland (1986)					
Morgan (1988)		✓			✓
Schroder (1989)				✓	✓
Barham et al (1988)			✓	✓	✓
Gupta (1988)	✓				
Kakabadse (1991)	✓				
Cocherill (1989)			✓	✓	✓

Factor	Norm	Norm	Norm
1	100	100	100
2	100	100	100
3	100	100	100
4	100	100	100
5	100	100	100
6	100	100	100
7	100	100	100
8	100	100	100
9	100	100	100
10	100	100	100
11	100	100	100
12	100	100	100
13	100	100	100
14	100	100	100
15	100	100	100
16	100	100	100

Appendix V
Alternative Norms for 16PF

Sample Descriptions

Sample	Total	Male	Female
Henley	1052 (100%)	1014 (96.3%)	38 (3.7%)
UK 16PF	2220 (100%)	1107 (49.9%)	1113 (50.1%)
Bartram	1796 (100%)	1441 (80.2%)	355 (19.8%)

Summary of Data for Comparative Samples

16PF Factor	Henley				Bartram				UK									
	Mean Total Pop.	S.D. Total Rep	Mean Male	S.D. Male	Mean Female	S.D. Female	Mean Total Pop.	S.D. Total Pop.	Mean Male	S.D. Male	Mean Female	S.D. Female						
A	10.77	3.32	10.74	3.32	11.45	3.08	11.85	3.30	11.79	3.36	12.08	3.02	10.22	3.06	9.35	3.09	11.09	2.78
B	9.29	1.95	9.32	1.93	8.55	2.18	9.43	1.88	9.54	1.82	8.95	2.06	7.01	2.13	7.17	2.14	6.85	2.10
C	16.33	3.85	16.34	3.87	16.08	3.47	17.88	3.70	18.03	3.67	17.27	3.78	14.64	3.90	15.25	3.88	14.03	3.83
E	15.06	4.25	15.09	4.26	14.11	3.87	15.98	3.87	16.24	3.75	14.90	4.14	10.86	4.38	12.28	4.28	9.45	4.00
F	13.38	4.78	13.31	4.78	15.29	4.37	16.88	4.20	16.79	4.14	17.22	4.40	12.36	4.99	12.39	5.05	12.34	4.93
G	14.01	3.62	14.05	3.60	12.92	3.91	14.09	3.42	14.26	3.36	13.39	3.57	12.26	3.56	12.47	3.73	12.05	3.37
H	15.86	5.45	15.82	5.46	16.74	5.25	19.37	4.93	19.62	4.78	18.37	5.37	12.47	5.46	13.25	5.51	11.70	5.30
I	9.18	4.03	9.01	3.96	13.55	3.53	9.38	4.06	8.58	3.79	12.66	3.41	11.25	3.75	9.16	3.42	13.33	2.79
L	7.48	3.14	7.48	3.15	7.29	2.92	6.84	3.24	6.90	3.23	6.60	3.29	8.25	3.44	8.64	3.43	7.87	3.41
M	14.94	3.39	14.91	3.40	15.74	3.04	14.69	3.30	14.83	3.26	14.11	3.43	12.02	3.55	12.37	3.45	11.65	3.60
N	9.19	3.22	9.15	3.19	10.05	3.90	7.89	2.97	7.75	2.86	8.46	3.34	11.16	3.18	10.52	3.06	11.81	3.18
O	7.81	3.87	7.76	3.89	9.00	3.25	6.78	3.81	6.29	3.56	8.78	4.13	11.44	4.40	10.27	4.27	12.58	4.01
Q ₁	10.27	3.35	10.27	3.35	10.13	3.45	11.31	3.25	11.61	3.13	10.08	3.41	9.11	3.31	10.12	3.23	8.11	3.08
Q ₂	10.24	3.39	10.25	3.37	9.92	3.87	8.99	3.42	8.96	3.36	9.14	3.64	11.50	3.51	11.60	3.48	11.40	3.53
Q ₃	13.00	3.08	13.03	3.05	12.24	3.76	13.88	3.04	13.94	2.96	13.24	3.29	12.36	3.23	12.79	3.30	11.94	3.11
Q ₄	11.45	4.96	11.42	4.97	12.11	4.62	8.16	4.86	7.71	4.59	9.96	5.48	13.16	4.92	11.99	4.99	14.31	4.56

Overall Difference Between Sample Means

Comparison	Significance of Difference (2-tail t) (1)
■ Henley Total Population: UK Total Population	0.007 **
■ Henley Total Population: ■ Bartram Total Population	0.000 ***
■ Bartram Total Population: UK Total Population	0.004 *
■ Henley Male Population: UK Male Population	0.000 ***
■ Henley Male Population: Bartram Male Population	0.000 ***
■ Bartram Male Population: UK Male Population	0.002 **
■ Henley Female Population: UK Female Population	0.001 **
■ Henley Female Population: Bartram Female Population	0.000 ***
■ Bartram Female Population: UK Female Population	0.000***

(1) Significance of differences between means using t-tests for paired samples (Null Hypothesis is of no difference)

*** $p < 0.001$

** $p < 0.01$

* $p < 0.05$

Comparison of 16PF Populations (Total Populations: Male and Female)

		T-SCORES ON DIFFERENCES OF MEANS		
16PF Factor	Henley: Bartram ¹	Henley: UK ²	Bartam: UK	
A. Cool : Warm	-8.41 ***	4.67 ***	16.21 ***	
B. Concrete Thinking : Abstract Thinking	-1.89	29.38 ***	37.72 ***	
C. Affected by Feelings : Emotionally Stable	-10.63 ***	11.63 ***	26.79 ***	
E. Submissive : Dominant	-5.90 ***	25.87 ***	38.79 ***	
F. Sober : Enthusiastic	-20.39 ***	5.54 ***	30.61 ***	
G. Expedient : Conscientious	-0.59	13.06 ***	16.49 ***	
H. Shy : Bold	-17.63 ***	16.60 ***	41.58 ***	
I. Tough-minded : Tender-minded	-1.27	-14.40 ***	-15.14 ***	
L. Trusting : Suspicious	5.15 ***	-6.15	-13.26 ***	
M. Practical : Imaginative	1.93 *	22.30 ***	24.46 ***	
N. Forthright : Shrewd	10.93 ***	-16.49 ***	-33.37 ***	
O. Self-assured : Apprehensive	6.92 ***	-23.28 ***	-35.92 ***	
Q ₁ . Conservative : Experimental	-8.15 ***	9.33 ***	21.12 ***	
Q ₂ . Group-Oriented : Self-Sufficient	9.45 ***	-9.70 ***	-22.79 ***	
Q ₃ . Undisciplined : Controlled	-7.42 ***	5.37 ***	15.22 ***	
Q ₄ . Relaxed : Tense	17.31 ***	-9.26 ***	-32.20***	

* p < 0.05, ** p < 0.01 *** p < 0.001

Notes

A negative t-score indicates that the first sample in the pairing is lower than the second and a positive t-score indicates the opposite

1 Based on means published by Bartram in Joop 1992.

2

Saville 16PF means for UK population.

Comparison of 16PF Populations: Male

16PF Factor	Henley : Bartram	Henley : UK	Bartam : UK
A. Cool : Warm	-7.66 ***	9.08 ***	18.80 ***
B. Concrete Thinking : Abstract Thinking	-2.88 **	24.21 ***	30.16 ***
C. Affected by Feelings : Emotionally Stable	-10.99 ***	6.47 ***	18.48 ***
E. Submissive : Dominant	-7.07 ***	15.13 ***	24.83 ***
F. Sober : Enthusiastic	-19.23 ***	4.30 ***	24.14 ***
G. Expedient : Conscientious	-1.48	9.90 ***	12.70 ***
H. Shy : Bold	-18.28 ***	10.77 ***	31.18 ***
I. Tough-minded : Tender-minded	2.72 **	-0.94	-3.99 ***
L. Trusting : Suspicious	4.43 ***	-8.09 ***	-13.11 ***
M. Practical : Imaginative	0.59	17.05 ***	18.40 ***
N. Forthright : Shrewd	11.38 ***	-10.09 ***	-23.49 ***
O. Self-assured : Apprehensive	9.69 ***	-14.10 ***	-25.63 ***
Q ₁ , Conservative : Experimental	-10.15 ***	1.05	11.74 ***
Q ₂ , Group-Oriented : Self-Sufficient	9.36 ***	-9.06 ***	-19.34 ***
Q ₂ , Undisciplined : Controlled	-7.41 ***	1.73	9.24 ***
Q ₄ , Relaxed : Tense	19.06 ***	-2.63 **	-22.45 ***

* p < 0.05 ** p < 0.01 *** p < 0.001

Comparison of 16PF Populations: Female

16PF Factor	Henley : Bartram	Henley : UK	Bartam : UK
A. Cool : Warm	-1.22	0.78	5.72 ***
B. Concrete Thinking : Abstract Thinking	-1.13	4.90 ***	16.49 ***
C. Affected by Feelings : Emotionally Stable	-1.86	3.26 ***	13.93 ***
E. Submissive : Dominant	-1.13	7.07 ***	22.17 ***
F. Sober : Enthusiastic	-2.57 **	3.64 ***	16.66 ***
G. Expedient : Conscientious	-0.77	1.56	6.43 ***
H. Shy : Bold	-1.79	5.77 ***	20.59 ***
I. Tough-minded : Tender-minded	1.53	0.47	-3.76 ***
L. Trusting : Suspicious	1.24	-1.04	-6.16 ***
M. Practical : Imaginative	2.82 **	6.92 ***	11.34 ***
N. Forthright : Shrewd	2.75 **	-3.33 ***	-17.08 ***
O. Self-assured : Apprehensive	0.32	-5.44 ***	-15.44 ***
Q ₁ . Conservative : Experimental	0.09	3.96 ***	10.22 ***
Q ₂ . Group-Oriented : Self-Sufficient	1.25	-2.53 **	-10.43 ***
Q ₃ . Undisciplined : Controlled	-1.76	0.58	6.76 ***
Q ₄ . Relaxed : Tense	2.33 *	-2.92 **	-14.88 ***

* p < 0.05 ** p < 0.01 *** p < 0.001

Development of 16PF Norms Based on Henley General Management Course Population (n = 1052)

16PF Factors	Mean	SD	½ SD	Stens										
				1	2	3	4	5	5.5	6	7	8	9	10
A	10.77	3.32	1.66	2.47	4.13	5.79	7.45	9.11	40.77	12.43	14.09	15.75	17.41	19.07
B	9.29	1.95	0.98	4.39	5.37	6.35	7.33	8.31	9.29	10.27	11.25	12.23	13.21	14.19
C	16.33	3.85	1.93	6.68	8.61	10.54	12.47	14.4	16.33	18.26	20.19	22.12	24.05	25.98
E	15.06	4.25	2.13	4.41	6.54	8.67	10.8	12.93	15.06	17.19	19.32	21.45	23.58	25.71
F	13.38	4.78	2.35	1.63	3.98	6.33	8.68	11.03	13.38	15.73	18.08	20.43	22.78	25.13
G	14.01	3.62	1.81	4.96	6.77	8.58	10.39	12.2	14.01	15.82	17.63	19.44	21.25	23.06
H	15.86	5.45	2.73	2.21	4.94	7.67	10.40	13.13	15.86	18.59	21.32	24.05	26.78	29.51
I	9.18	4.03	2.02	-0.92	1.1	3.12	5.14	7.16	9.18	11.2	13.22	15.24	17.26	19.28
L	7.48	3.14	1.57	-0.37	1.2	2.77	4.34	5.91	7.48	9.05	10.62	12.19	13.76	15.33
M	14.94	3.39	1.70	6.44	8.14	9.84	11.54	13.24	14.94	16.64	18.34	20.04	21.74	23.44
N	9.19	3.22	1.61	1.14	2.75	4.36	5.97	7.58	9.19	40.8	12.41	14.02	15.63	17.24
O	7.81	3.87	1.94	-1.89	0.05	1.99	3.93	5.87	7.81	9.75	11.69	13.63	15.57	17.51
Q1	10.27	3.35	1.68	1.87	3.55	5.23	6.91	8.59	10.27	11.95	13.63	15.31	16.99	18.67
Q2	10.24	3.39	1.70	1.74	3.44	5.14	6.84	8.54	10.24	11.94	13.64	15.34	17.04	18.74
Q3	13.00	3.08	1.54	5.3	6.84	8.38	9.92	11.46	13.00	14.54	16.08	17.62	19.16	20.70
Q4	11.45	4.96	2.48	-0.95	1.53	4.01	6.49	8.97	11.45	13.93	16.41	18.89	21.37	23.85

16PF Norms Based on Henley General Management Course Population (n=1052)

16PF Factor	Stens									
	1	2	3	4	5	6	7	8	9	10
A	0-3	4	5-6	7-8	9-11	12-13	14	15-16	17-18	19+
B	0-4	5	6	7	8-9	10	11	12	13	14+
C	0-7	8-9	10-11	12-13	14-17	18-19	20-21	22-23	24	25+
E	0-5	6-7	8-9	10-11	12-16	17-18	19-20	21-22	23-24	25+
F	0-2	3-5	6-7	8-10	11-14	15-17	18-19	20-21	22-24	25+
G	0-5	6-7	8-9	10-11	12-14	15-16	17-18	19-20	21-22	23+
H	0-3	4-6	7-9	10-12	13-17	18-20	21-23	24-25	26-28	29+
I	0-1	2	3-4	5-6	7-10	11-12	13-14	15-16	17-18	19+
L	0-1	2	3	4	5-8	9	10-11	12	13-14	15+
M	0-7	8	9-10	11-12	13-15	16-17	18-19	20	21-22	23+
N	0-2	3	4	5-6	7-9	10-11	12-13	14	15-16	17+
O	0	1	2	3-4	5-8	9-10	11-12	13-14	15-16	17+
O1	0-2	3-4	5	6-7	8-10	11-12	13-14	15	16-17	18+
O2	0-2	3-4	5	6-7	8-10	11-12	13-14	15-16	17	18+
O3	0-5	6-7	8	9-10	11-13	14-15	16	17-18	19	20+
O4	0-1	2-3	4-5	6-7	8-12	13-15	16-17	18-20	21-22	23+

Development of 16PF Norms Based on Henley General Management Course Population: Males (n=1014)

16PF Factors	Mean	SD	1/2 SD	Stens										
				1	2	3	4	5	5.5	6	7	8	9	10
A	10.74	3.32	1.66	2.44	4.1	5.76	7.42	9.08	10.74	12.4	14.06	15.72	17.38	19.04
B	9.32	1.93	0.97	4.47	5.44	6.41	7.28	8.35	9.32	10.29	11.26	12.23	13.20	14.17
C	16.24	3.87	1.94	6.64	8.58	10.52	12.46	14.4	16.34	18.28	20.22	22.16	24.1	26.04
E	15.09	4.26	2.13	4.44	6.57	8.7	10.83	12.95	15.09	17.22	19.35	21.48	23.61	25.74
F	13.31	4.78	2.39	1.36	3.75	6.14	8.53	10.92	13.31	15.7	18.09	20.48	22.87	25.26
G	14.05	3.60	1.8	5.05	6.85	8.65	10.45	12.25	14.05	15.85	17.65	19.45	21.25	23.05
H	15.82	5.46	2.73	2.17	4.9	7.63	10.36	13.09	15.82	18.55	21.28	24.01	26.74	29.47
I	9.01	3.96	1.98	-0.89	1.09	3.07	5.05	7.03	9.01	10.99	12.97	14.95	16.93	18.91
L	7.48	3.15	1.58	-0.42	1.16	2.74	4.32	5.9	7.48	9.06	10.64	12.22	13.80	15.38
M	14.91	3.40	1.7	6.41	8.11	9.81	11.51	13.21	14.91	16.61	18.31	20.01	21.71	23.41
N	9.15	3.19	1.6	1.15	2.75	4.35	5.95	7.55	9.15	10.75	12.35	13.95	15.55	17.15
O	7.76	3.89	1.95	-1.99	0.04	1.91	3.86	5.81	7.76	9.71	11.66	13.61	15.56	17.51
Q ₁	10.27	3.35	1.68	1.87	3.55	5.23	6.91	8.59	10.27	11.95	13.63	15.31	16.99	18.67
Q ₂	10.25	3.37	1.69	1.8	3.49	5.18	6.87	8.56	10.25	11.94	13.63	15.32	17.01	18.7
Q ₃	13.03	3.05	1.53	5.38	6.91	8.44	9.97	11.5	13.03	14.56	16.09	17.62	19.15	20.68
Q ₄	11.42	4.97	2.49	-1.05	1.46	3.95	6.44	8.93	11.42	13.91	16.4	18.89	21.38	23.87

16PF Norms Based on Henley General Management Course Population: Males (n=1014)

16PF Factors	Stens									
	1	2	3	4	5	6	7	8	9	10
A	0-3	4-5	5-6	7-8	9-11	12-13	14	15-16	17-18	19+
B	0-4	5	6	7	8-9	10	11	12	13	14+
C	0-7	8-9	10-11	12-13	14-17	18-19	20-21	22-23	24-25	26+
E	0-5	6-7	8-9	10-11	12-16	17-18	19-20	21-22	23-24	25+
F	0-2	3-5	6-7	8-9	10-14	15-17	18-19	20-21	22-24	25+
G	0-5	6-7	8-9	10-11	12-14	15-16	17-18	19-20	21-22	23+
H	0-3	4-6	7-9	10-12	13-17	18-20	21-23	24-25	26-28	29+
I	0-1	2	3-4	5-6	7-9	10-11	12-13	14-15	16-17	18+
L	0-1	2	3	4	5-8	9	10-11	12	13-14	15+
M	0-6	7-8	9-10	11-12	13-15	16-17	18-19	20	21-22	23+
N	0-1	2-3	4	5-6	7-9	10-11	12	13-14	15-16	17+
O	0	1	2	3-4	5-8	9-10	11-12	13-14	15-16	17+
O ₁	0-2	3-4	5	6-7	8-10	11-12	13-14	15	16-17	18+
O ₂	0-2	3-4	5	6-7	8-10	11-12	13-14	15-16	17	18+
O ₃	0-5	6-7	8	9-10	11-13	14-15	16	17-18	19	20+
O ₄	0-1	2	3-5	6-7	8-12	13-15	16-17	18-20	21-22	23+

16PF Norms Based on Henley General Management Course Population: Females (n=38)

16PF Factors	Stens									
	1	2	3	4	5	6	7	8	9	10
A	0-4	5	6-7	8	9-11	12-13	14-15	16	17-18	19+
B	0-3	4	5	6	7-8	9	10	11	12-13	14+
C	0-7	8-9	10-11	12-13	14-16	17-18	19-20	21-22	23	24+
E	0-5	6-7	8-9	10-11	12-15	16	17-18	19-20	21-22	23+
F	0-4	5-7	8-9	10-12	13-16	17-18	19-20	21-23	24-25	26+
G	0-3	4-6	7	8-9	10-13	14-15	16-17	18-19	20-21	22+
H	0-4	5-7	8-10	11-13	14-18	19-21	22-23	24-26	27-28	29+
I	0-5	6-7	8-9	10	11-14	15-16	17	18-19	20-21	22+
L	0	1	2-3	4	5-7	8-9	10	11-12	13	14+
M	0-8	9-10	11	12-13	14-16	17	18-19	20	21-22	23+
N	0-1	2-3	4-5	6-7	8-11	12	13-14	15-16	17-18	19+
O	0-1	2-3	4	5-6	7-9	10-11	12	13-14	15-16	17+
Q ₁	0-2	3	4-5	6-7	8-10	11-12	13-14	15-16	17	19+
Q ₂	0-1	2-3	4-5	6	7-10	11-12	13-14	15-16	17-18	19+
Q ₃	0-3	4-5	6-7	8-9	10-13	14-15	16	17-18	19-20	21+
Q ₄	0-1	2-4	5-6	7-8	9-13	14-15	16-18	19-20	21-22	23+

Development of Norms for 16PF Based on Bartram (1992) Management Population

Stens

16PF Factors	Mean	SD	1/2SD	1	2	3	4	5	5.5	6	7	8	9	10
A	11.85	3.30	1.65	3.6	5.25	6.9	8.55	10.2	11.85	13.5	15.15	16.8	18.45	20.1
B	9.43	1.88	0.94	4.73	5.67	6.61	7.55	8.49	9.43	10.37	11.31	12.25	13.19	14.13
C	17.88	3.70	1.85	8.63	10.48	12.33	14.18	16.03	17.88	19.73	21.58	23.43	25.28	27.67
E	15.98	3.87	1.94	6.28	8.22	10.06	12.1	14.04	15.98	17.92	19.86	21.8	23.74	25.68
F	16.88	4.20	2.1	6.38	8.48	10.58	12.68	14.78	16.88	18.98	21.08	23.18	25.28	27.38
G	14.09	3.42	1.71	5.54	7.25	8.96	10.67	12.38	14.09	15.80	16.51	18.22	19.93	21.64
H	19.37	4.93	2.47	7.02	9.49	11.96	14.43	16.9	19.37	21.84	24.31	26.78	29.25	31.72
I	9.38	4.06	2.03	-0.77	1.26	3.29	5.32	7.35	9.38	11.41	13.44	15.47	17.51	19.53
L	6.84	3.24	1.62	-1.26	0.36	1.98	3.6	5.22	6.84	8.46	10.08	11.70	13.32	14.94
M	14.69	3.30	1.65	6.44	8.09	9.74	11.39	13.04	14.69	16.34	17.99	19.64	21.29	22.94
N	7.89	2.97	1.49	0.44	1.93	3.42	4.91	6.4	7.89	9.38	10.87	12.36	13.85	15.34
O	6.78	3.81	1.91	-2.77	-0.85	1.05	2.93	4.87	6.78	8.69	10.6	12.51	14.42	16.33
Q ₁	11.31	3.25	1.63	3.16	4.79	6.42	8.05	9.68	11.31	12.94	14.57	16.2	17.83	19.46
Q ₂	8.99	3.42	1.71	0.44	2.15	3.86	5.57	7.28	8.99	10.7	12.41	14.12	15.83	17.54
Q ₃	13.80	3.04	1.52	6.2	7.72	9.24	10.75	12.28	13.80	15.32	16.84	18.36	19.88	21.4
Q ₄	8.16	4.86	2.43	-3.99	-1.56	0.87	3.3	5.73	8.16	10.59	13.02	15.45	17.88	20.31

16PF Managerial Norms Based on Bartram 1992

16PF Factors	Stens									
	1	2	3	4	5	6	7	8	9	10
A	0-4	5-6	7-8	9-10	10-12	13-14	15-16	17-18	19-20	20+
B	0-4	5-6	6-7	8	9	10	11	12	13	14+
C	0-9	10	11-12	13-14	15-18	19-20	21-22	23	24-26	27+
E	0-6	7-8	9-10	11-12	13-16	17-18	19-20	20-22	23-24	24+
F	0-6	7-8	9-11	12-13	14-17	18-19	20-21	22-23	24-25	26+
G	0-6	7	8-9	10-11	12-14	15-16	17	18	19-20	21+
H	0-7	8-9	10-12	13-16	17-20	21-22	23-24	25-27	28-29	30+
I	0	1-2	3-4	5-6	7-9	10-11	12-13	14-15	16-18	19+
L	0	1	2	3-4	5-7	8	9-10	11-12	13-14	14+
M	0-6	7-8	9-10	11-12	13-15	16	17-18	19-20	21	22+
N	0	1-2	3	4-5	6-8	9	10-11	12	13-14	15+
O	0	0	1	2-3	4-7	8-9	10-11	12-13	14	15+
Q ₁	0-3	3	4-5	6-7	8-10	11-12	13-14	15-16	17	19+
Q ₂	0	1-2	3-4	5-6	7-9	10-11	12	13-14	15-16	16+
Q ₃	0-6	7-8	9	10-11	12-14	15	16-17	18	19-20	20+
Q ₄	0	0	1	2-3	4-8	9-11	12-13	14-15	16-18	19+

Appendix VI
Job Competences Survey
Definitions of Competences

1 INTELLECTUAL - Information Handling

- | | |
|---|--|
| 1. Information Collection | Seeks possible relevant information for the task systematically. Elicits relevant information from others. |
| 2. Problem Analysis | Identifies problems, then transforms them. Relates data from different sources and identifies possible causes. |
| 3. Numerical Interpretation | Assimilates numerical and statistical information accurately and makes sensible, sound interpretations. |
| 4. Judgement | Develops alternative courses of action and makes decisions based on logical assumptions that reflect factual information. |
| 5. Creativity | Generates and recognises imaginative solutions and innovations in work-related situations which are sound and practical, and not obvious to less perceptive colleagues. |
| 6. Risk Taking | Takes or initiates action that involves a significant risk in order to achieve a recognised benefit or advantage. Seeks new experiences and situations rather than the security afforded by well-established or familiar ones. |
| 7. Decisiveness | Shows a readiness to make decisions, render judgements, take action, or commit oneself, even if information is incomplete and/or of dubious validity. |
| 8. Business Sense | Identifies those opportunities which will increase the organisation's sales or profits; selects and exploits those activities which will result in the largest returns. |
| 9. Helicopter | Rises above the immediate problem or situation and sees the broader issues and wider implications; relates facts and problems to an extremely wide context through an ability to perceive all possible relationships. |
| 10. Organisational | Applies knowledge of changing internal situations and pressures to identify potential organisational problems and opportunities. Is aware of the impact and implications of own decisions on other parts of the organisation. |
| 11. Extra-organisational
Awareness and Sensitivity | Applies knowledge of changing societal and governmental pressures to identify potential problems and opportunities. Is aware of the impact and the implications of decisions relevant to societal and governmental factors. |
| 12. Reading | Shows by the use made of written information that it has been effectively assimilated and retained. |
| 13. Written Communications | Written work is readily intelligible; points and ideas are conveyed clearly and concisely to the reader. |
| 14. Perceptive Listening | Listens dispassionately, is not selective in what has been heard; conveys the clear impression that key points have been recalled and been taken into account. |
| 15. Oral Expression | Is fluent, speaks clearly, audibly and has good dictation. |

16. Oral Presentation In formal presentations, is concise and to the point; does not use jargon without explanation; tailors content to the audience's understanding. Is enthusiastic and lively when speaking.

3. MANAGEMENT

17. Planning Establishes courses of action for self and others to accomplish a specific goal; plans suitable assignments of personnel on appropriate allocation of resources. Establishes priorities, visualises all possible changes required to meet future requirements.
18. Organising Effectively coordinates the activities of own staff and colleagues to achieve common goals. Organises all resources efficiently and effectively.
19. Delegation Allocates decision-making and other responsibilities to the appropriate subordinate. Distinguishes successfully between what should be done by others and what one should do oneself.
20. Appraisal Effectively monitors and evaluates the results of delegated assignments or projects. Provides appropriate feedback.
21. Development Develops the skills and competences of subordinates through training and development activities related to current and future jobs.
22. Self-Management Makes effective use of own time and other resources. Organises paperwork efficiently and tidily, adopts effective filing and retrieval procedures.
23. Impact Makes a strong, positive impression on first meeting. Has authority and credibility, establishes rapport quickly with colleagues and clients.
24. Persuasiveness Influences and persuades others to give their agreement and commitment to a decision or course of action which they initially opposed.
25. Sensitivity Behaviour indicates a consideration for the feelings and needs of others.
26. Flexibility Adopts a flexible (but not compliant) style when interacting with others. Takes their views into account and changes position when appropriate.
27. Ascendancy Is dominant and assertive. Is forceful when dealing with others. Takes charge of a situation and commands the respect of others.
28. Motivating Others Inspires others to achieve goals by showing vision and a clear idea of what needs to be achieved; and by showing commitment and enthusiasm.
29. Negotiating When facing opposition or conflict, uses personal influence to communicate proposals, identify bases for compromise and eventually reaches agreement with others.

30. Leadership Adopts appropriate interpersonal styles and methods in guiding a group of individuals towards task accomplishment. Fosters co-operation and effective team work.
- 3 PERSONAL**
31. Energy Shows energy and vitality. Maintains a very high level of activity. Produces a high output. Works very rapidly every day so that a backlog does not build up.
32. Achievement-Orientation Sets high goals or standard of performance for self and for others, and is dissatisfied with average performance.
33. Initiative Actively attempts to influence events to achieve goals, a self-starter rather than passive acceptor. Takes action to achieve goals beyond those called for and originates action.
34. Tolerance for stress Shows stability of performance under pressure and opposition. Does not appear to become irritable, anxious or to lose composure.
35. Adaptability Maintains effectiveness in very different situations and environments, with various tasks, responsibilities, or people. Adapts behaviour rapidly to the requirements of a new situation.
36. Independence Takes action in which the dominant influence is his/her own convictions rather than the influence of other people's options.
37. Integrity Adheres to prevailing social, ethical and organisational norms and standards on the job.
38. Resilience Handles disappointment and rejection while maintaining effectiveness. Does not react adversely to insults or unfair remarks.
39. Tenacity Stays with a position or plan of action until the desired objective is achieved or is no longer reasonably attainable, irrespective of the setbacks and obstacles encountered.
40. Detail Consciousness Works precisely and accurately with highly detailed factual information. Is methodical and ensure details is not overlooked.

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Appendix VII
Definitions of Supra-Competences

Supra Competences: Short Definitions of 12 Independent Performance Factors

Intellectual

1. **Strategic perspective** Rises above the detail to see the broader issues and implications; takes account of wide-ranging influences and situations both inside and outside the organisation before planning or acting.
2. **Analysis and judgement** Seeks all relevant information; identifies problems, relates relevant data and identifies causes; assimilates numerical data accurately and make sensible interpretatations; work is precise and methodical, and relevant detail is not overlooked. Makes decisions based on logical assumptions that reflect factual information.
3. **Planning and organising** Plans priorities, assignments and the allocation of resources; organises resources efficiently and effectively, delegating work to the appropriate staff.

Interpersonal

4. **Managing Staff** Adopts appropriate styles for achieving group objectives; monitors and evaluates their work; shows vision and inspiration; develops the skills and competences of staff.
5. **Persuasiveness** Influences and persuades others to give their agreement and commitment; in face of conflict, uses personal influence to communicate proposals, to reach bases for compromise and to reach an agreement.
6. **Assertiveness decisiveness** Ascendant, forceful dealing with others, can take charge,; is willing to take risks and seek new experiences; is decisive, ready to take decisions even on limited information.
7. **Interpersonal sensitivity** Shows consideration for the needs and feelings of others; listens dispassionately, is not selective, recalls key points and takes account of them; is flexible when dealing with others, will change own position when others proposals warrant it.
8. **Oral communication** Fluent, speaks clearly and audibly, with good diction; in formal presentations, is enthusiastic and lively, tailors content to audience's level of understanding.

Adaptability

9. **Adaptability and resilience** Adapts behaviour to new situations; resilient, maintains effectiveness in face of adversity or unfairness. Performance remains stable when under pressure or opposition; does not become irritable and anxious, retains composure.

Results-orientation

- 10. Energy and initiative** Makes a strong, positive impression, has authority and credibility; is a self-starter and originator, actively influences events to achieve goals; has energy and vitality, maintains high level of activity and produces a high level of output.
- 11. Achievement-motivation** Sets demanding goals for self and for others, and is dissatisfied with average performance; makes full use of own time and resources; sees a task through to completion, irrespective of obstacles and setbacks.
- 12. Business Sense** Identifies opportunities which will increase sales or profits; selects and exploits those activities which will result in the largest returns.

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Appendix VIII

Formulae for Calculating Supra-Competences from JCS

Calculation of Supra-Competences from JCS

Supra-Competencies = Average of ratings of primary competencies

Supra-Competencies: Formula from JCS

$$1 = \frac{C9+C10+C11}{3}$$

$$2 = \frac{C1+C2+C3+C4}{4}$$

$$3 = \frac{C17+C18}{2}$$

$$4 = \frac{C20+C21+C28+C30}{4}$$

$$5 = \frac{C24+C29+C35}{3}$$

$$6 = \frac{C6+C7+C27}{3}$$

$$7 = \frac{C26+C25+C14}{3}$$

$$8 = \frac{C15+C16}{2}$$

$$9 = \frac{C38+C35+C34}{3}$$

$$10 = \frac{C33+C31+C23}{3}$$

$$11 = \frac{C39+C22+C32}{3}$$

$$12 = C8$$

Source: Dulewicz, 1995(a)

Appendix IX
Assessment Scales for NatWest Life Assessment Centres

**Assessment framework used for NatWest Life Core
Senior Management Competencies**

Competencies	Assessment				
<u>COGNITIVE</u>					
A Decision Making	1	2	3	4	5
B Business Acumen	1	2	3	4	5
C Breadth of Thinking	1	2	3	4	5
D Analytical Thinking	1	2	3	4	5
E Strategic Thinking	1	2	3	4	5
F Innovating	1	2	3	4	5
<u>ACHIEVEMENT</u>					
G Maintaining Service	1	2	3	4	5
H Results Management	1	2	3	4	5
I Resourcing & Organising	1	2	3	4	5
J Co-ordinating	1	2	3	4	5
K Planning & Forecasting	1	2	3	4	5
<u>INTERPERSONAL</u>					
L Directing	1	2	3	4	5
M Team Working	1	2	3	4	5
N Communication	1	2	3	4	5
O Personal Input	1	2	3	4	5
P Conflict Management	1	2	3	4	5
<u>MANAGING PEOPLE</u>					
Q Networking & Representation	1	2	3	4	5
R Motivating	1	2	3	4	5
S Team Building	1	2	3	4	5
T Developing Performance	1	2	3	4	5
<u>Scale</u> Low 1 = no evidence of competency displayed High 5 = very strong evidence of competency displayed					

Appendix X
NatWest Life Competences Definitions

NatWest Life Competencies - Overall Definitions

1. COGNITIVE COMPETENCIES

- Decision-Making:** Recognises the need for timely decisions; makes decisions based on a combination of analysis and judgement; willing to adhere to and defend decisions. Takes timely decisions to resolve an issue or move a situation forward.
- Business Acumen:** Awareness of strategies, tactics and players in the market place; identifies and exploits commercial opportunities.
- Breadth of Thinking:** Takes an overview of a problem/situation to consider broader implications. Looks beyond the immediately obvious.
- Analytical Thinking:** Interprets quantitative and qualitative information to achieve a business-related objectives, logical and objective analysis of data to explore and resolve problems/situations.
- Strategic Thinking:** Able to think and plan within a strategic orientation; is future oriented and can create credible visions of future scenarios and possibilities.

2. ACHIEVEMENT COMPETENCIES

- Maintaining Service:** Identifies and builds relationships with internal/external customers and seeking to understand and meet their service requirements.
- Results Management:** Establishes goals and performance targets and monitors progress towards achievement. Consistently focuses self and others on results; bottom-line and achievement orientated.
- Resourcing and Organising:** Allocates areas of responsibility and overall resourcing levels to meet performance goals within organisational constraints.
- Co-ordinating:** Identifies inter-dependencies to organise tasks and people in the most efficient/effective way.
- Planning and Forecasting:** Anticipates and addresses key issues which could affect the achievement of a number of potentially conflicting business goals. Establishes action to accomplish goals and identifies resource requirements and allocation.

3. INTERPERSONAL COMPETENCIES

- Directing:** Determines and offers a supporting rationales for plan of action; maintains resolve and integrity when these are challenged.
- Team working:** Contributes to the team and seeks the ideas and efforts of team members and other teams to achieve optimum performance.
- Communications:** Communicates facts or concepts in an appropriate format so that they can be easily understood and interpreted by others.
- Conflict Management:** Identifies areas of conflict and helps others to identify mutually acceptable solutions which optimise outcomes of differences.
- Personal Impact/Influence:** Develops and implements plans to influence others and align their needs with business goals.

4. MANAGING PEOPLE

- Networking and Representation:** Establishes relationships with key individuals within the organisation and within external bodies to support the achievement of business goals and strategies.
- Motivating:** Creates and maintains enthusiasm, energy and co-operations of others through integrating their needs into projects and/or work planning.
- Team Building:** Creates teams through selection and encouraging others to consider themselves of a team and to work co-operatively to achieve common goals.
- Developing Performance:** Provides opportunities for successful personal development by setting challenging performance goals for others and provides guidance on the means of meeting them.

Appendix XI

Dimensions of Board Effectiveness Questionnaire

(Dulewicz and Herbert, 1995)

Dimensions of Board Effectiveness

(Dulewicz and Herbert 1995)

Name:

Company: Position:

This questionnaire is designed to measure your perceptions of how your Board currently operates, or should operate on a number of different dimensions relating to the relationships between its members, the climate, its predispositions and its approach to decision-making.

In order to complete this form:

- a) Work through all the items and circle the number on the scale which represents your view of the Board's *current* position on each continuum. A '1' means that the left hand description applies exactly to your Board and a '6' that the right hand description applies exactly, whereas the number in between signify that on balance on description or the other applies to some extent.
- b) Having given your views of the current situation, please repeat the process, but put a (X) through the number which reflects the position you think your Board should adopt in order to maximise its effectiveness.

PREDISPOSITIONS

1	Operational tasks dominate	1 - 2 - 3 - 4 - 5 - 6	Strategic or long-term issues dominate
2	Highly risk averse attitude prevails	1 - 2 - 3 - 4 - 5 - 6	Willing to take significant risks
3	Personal and company values coincide	1 - 2 - 3 - 4 - 5 - 6	Personal or company values conflict
4	Non-Executive Directors' views are highly valued	1 - 2 - 3 - 4 - 5 - 6	Non-Executive Directors' views are usually ignored
5	Emphasis of discussions is on past performance (diagnosis)	1 - 2 - 3 - 4 - 5 - 6	Emphasis is on future performance (prognosis)
6	Emphasis on discussion is on successes	1 - 2 - 3 - 4 - 5 - 6	Emphasis is on failures
7	Board is keen to appraise its own performance and learn	1 - 2 - 3 - 4 - 5 - 6	Board is unwilling to appraise its own performance
8	The board sets itself ambitious targets	1 - 2 - 3 - 4 - 5 - 6	The board sets itself easily attainable targets
9	The "real" business is done inside the boardroom	1 - 2 - 3 - 4 - 5 - 6	The "real" business is done outside the boardroom
10	The board never makes mistakes	1 - 2 - 3 - 4 - 5 - 6	The board learns from its mistakes

11	Bad news is confronted readily	1 - 2 - 3 - 4 - 5 - 6	Bad news is suppressed or shelved
12	Boardwork evinces shared ownership of company's vision, mission and values	1 - 2 - 3 - 4 - 5 - 6	Boardwork does <i>not</i> evince shared ownership of company's vision, etc.
13	The Board is reluctant to deal with and respond to change	1 - 2 - 3 - 4 - 5 - 6	The Board is enthusiastic about change and its possibilities
14	The Board is fully responsive to prevailing ethical standards pertaining to its conduct	1 - 2 - 3 - 4 - 5 - 6	The Board could be much more responsive to prevailing ethical standards pertaining to its conduct

CLIMATE

15	The Board's performance does not vary according to circumstances	1 - 2 - 3 - 4 - 5 - 6	The Board's performance varies <i>noticeably</i> according to circumstances
16	Directors are keen and free to ask questions	1 - 2 - 3 - 4 - 5 - 6	Directors are reluctant to ask questions unless invited
17	Creative ideas discouraged	1 - 2 - 3 - 4 - 5 - 6	Creative ideas encouraged
18	High level of candor and openness	1 - 2 - 3 - 4 - 5 - 6	High level of inhibition or secrecy
19	Highly formal atmosphere	1 - 2 - 3 - 4 - 5 - 6	Highly informal atmosphere
20	Humour and enjoyment are redundant	1 - 2 - 3 - 4 - 5 - 6	Humour and enjoyment are encouraged as essential
21	Climate is normally co-operative	1 - 2 - 3 - 4 - 5 - 6	Climate is normally antagonistic
22	The Board is unclear about how/whether it adds value to the business	1 - 2 - 3 - 4 - 5 - 6	The Board knows <i>exactly</i> how it adds value to the business
23	Positive atmosphere prevails	1 - 2 - 3 - 4 - 5 - 6	Negative atmosphere prevails

RELATIONSHIPS

24	Contributions dominated by Executive Directors	1 - 2 - 3 - 4 - 5 - 6	Contributions dominated by Non-Executive Directors
25	The Board operates as a cohesive team	1 - 2 - 3 - 4 - 5 - 6	The Board operates as competing individuals
26	Personal relationships are harmonious	1 - 2 - 3 - 4 - 5 - 6	Personal relationships are conflict-ridden
27	Professional relationships are highly competitive	1 - 2 - 3 - 4 - 5 - 6	Professional relationships are complementary
28	Contributions dominated by a few (overpowering) individuals	1 - 2 - 3 - 4 - 5 - 6	Contributions evenly distributed among most or all members
29	High level of trust and loyalty between colleagues	1 - 2 - 3 - 4 - 5 - 6	Clear lack of trust and loyalty between colleagues
30	Genuine listening is consistently achieved	1 - 2 - 3 - 4 - 5 - 6	Listening is more apparent than real

31	Social contact between Board members is considered to be important	1 - 2 - 3 - 4 - 5 - 6	Social contact between Board members is considered irrelevant
DECISION MAKING			
32	Debate is conducted in a highly autocratic and directive fashion	1 - 2 - 3 - 4 - 5 - 6	Debate is conducted in a highly democratic and Participative fashion
33	Decisions are made largely on hard data (eg, financials)	1 - 2 - 3 - 4 - 5 - 6	Decisions are made largely on soft data (eg opinion)
34	Good time-management	1 - 2 - 3 - 4 - 5 - 6	Poor time-management
35	Unclear dialogue and communication between colleagues	1 - 2 - 3 - 4 - 5 - 6	Clear dialogue and communications
36	Thorough preparation is evident in all members	1 - 2 - 3 - 4 - 5 - 6	Lack of preparation impairs debate and decisions
37	Style of debate is rigid and predictable	1 - 2 - 3 - 4 - 5 - 6	Style of debate is flexible and adapts to the agenda
38	Quality of debate is superficial or trivial	1 - 2 - 3 - 4 - 5 - 6	Debate is incisive and adds value
39	Chairman's style is unobtrusive	1 - 2 - 3 - 4 - 5 - 6	Chairman's style is extremely forceful
40	High level of commitment to decisions and actions	1 - 2 - 3 - 4 - 5 - 6	Low level of commitment to decisions and actions
41	Willingness to bring in experts	1 - 2 - 3 - 4 - 5 - 6	complacency with own membership
42	Decisions are always taken by voting	1 - 2 - 3 - 4 - 5 - 6	Decisions are never taken by voting
43	Voting results in full commitment of all directors to decisions	1 - 2 - 3 - 4 - 5 - 6	Voting conceals significant differences in commitment
44	Chairman's style invites initiative(s) from Board colleagues	1 - 2 - 3 - 4 - 5 - 6	Chairman's style discourages initiative(s) from colleagues
AND FINALLY ...			
45	The Board is accustomed to analysing itself in this fashion	1 - 2 - 3 - 4 - 5 - 6	The Board has not previously analysed itself in this fashion

Appendix XII

Relationships of Data Analysis Steps to Research Hypotheses

Research Format to Examine Hypotheses

Hypothesis	References	Instrumentation	Data Analysis
<p>H1. Input:Outcome Relationships</p> <p>H1.1 Management teams with an "Optimum" balance of Belbin Team Roles will be rated as higher performing teams in terms of both "hard" and "soft" outcomes.</p>	<ul style="list-style-type: none"> ■ Belbin, 1976; 1981; 1993; Senior, 1995; Dulewicz and Herbert, 1993; Dulewicz, 1995(a); Furnham et al, 1993; Fowler, 1995; Proctor, 1995; Fisher et al, 1994; West and Slater, 1995; Berry, 1995; Higgs, 1996; Berry, 1995; Parkinson, 1995; Life, 1987. 	<ul style="list-style-type: none"> ■ Belbin Team Roles calculated from 16PF using formula reported by Dulewicz (1995(a)). ■ "Balance" calculation for team using Team Role Index (Berry, 1995) with an 7 step cut-off for the inclusion of "talents". ■ Team Outcomes measured by "boss" rating on outcome questionnaire adapted from Higgs and Rowland (1992). 	<ul style="list-style-type: none"> ■ Factor analysis of Team Outcome questionnaire to identify outcome factors. ■ Calculation of Cronbach Alphas for Outcome factors. ■ Multiple correlation analysis of BTR Index and Outcome factors to identify significant relationships. ■ T-test analysis to explore differences between high and low performing teams followed by analysis of relationships between average "talent" scores (using an 8 step cut-off) and outcome measures using multiple correlations.
<p>H.1.2 Management teams with a "balanced" mix of competencies will be rated as higher performing teams in terms of both "hard" and soft" outcomes.</p>	<ul style="list-style-type: none"> ■ Benne & Sheats, 1948; Hackman & Schein, 1990; Woodcock and Francis, 1986; Hackman, 1990; Higgs & Rowland, 1993; Belbin, 1981; 1976; 1993; Margerison & McCann, 1985; Adair, 1986; Ray & Bronstein, 1995; Katzenbach & Smith, 1993; Fowler, 1995; Proctor, 1985; Klein, 1956; Blake et al, 1987; Phillips, 1992; Senior, 1995; Tjosvold, 1991; Davidson, 1994; Proctor, 1995; Finn, 1993; Boyatzis, 1986; Spencer & Spencer, 1994; Dulewicz & Herbert, 1992; Dulewicz, 1989; Cook, 1993; Parker, 1990; Dulewicz, 1994; Klomp, 1980; Kakabadse, 1991. 	<ul style="list-style-type: none"> ■ Individual competence assessment using JCS (boss plus individual assessment) (Dulewicz, 1995(a); Sarawano, 1995). ■ Calculation of Supra-Competencies at individual level using formula reported by Dulewicz (1995(a)). ■ 'Balance' calculated for Team Competence using adapted version of Team Role Index (Berry 1995) using a score of 4 (on 1-5 scale) as cut off for inclusion. ■ Team outcomes measured by "boss" rating on outcome questionnaire adapted from Higgs and Rowland (1992). 	<ul style="list-style-type: none"> ■ Conversion of NatWest Life competences to Supra-competences through regression analysis for sub-sample who have complete JCS. ■ Factor analysis of team outcome questionnaire and calculation of Cronbach Alphas as per H1 above ■ Multiple correlation analysis of Team competence index and outcome factors to identify significant relationships. ■ T-test analysis to explore differences between high and low performing teams followed by correlational analysis of average SC scores and outcome factors.

Research Format to Examine Hypotheses

Hypothesis	References	Instrumentation	Data Analysis
<p>H.1.3 Management teams with higher average levels of Critical Reasoning Ability (using CTA as a measure) will be rated as higher performing teams in terms of "hard" outcomes.</p> <p>H1.4 Management teams with higher average levels of divergent thinking will be rated as higher performing teams in terms of both "hard" and "soft" outcomes.</p>	<ul style="list-style-type: none"> ■ Belbin, 1976; 1981; Likert, 1961; Eynsenk, 1977; Majier and Solem, 1952; Dulewicz, 1989; Dulewicz, 1995; Dulewicz and Herbert, 1992; Balin, 1979; Guildford, 1959; Wallach, 1988; Higgs and Dulewicz, 1997; Watson and Glaser, 1964; 1991; Follman et al, 1969; West and Anderson, 1996; Thornton and Byham, 1992; Smith, 1995. 	<ul style="list-style-type: none"> ■ Critical Reasoning Ability measured using the Watson-Glaser Critical Thinking Appraisal Form C. ■ Productive (Divergent) thinking measured using the PTT (Dulewicz and Fletcher 1989). ■ Team scores on both CTA and PTT taken as mean of team member scores. ■ Team outcomes measured by "boss" rating on outcomes questionnaire adapted from Higgs and Rowland (1992). 	<ul style="list-style-type: none"> ■ Factor analysis and calculation of Cronbach Alphas on outcome questionnaire as per H1 ■ Use of CTA sten scores ■ Standardise PTT range and volume scale scores. ■ Calculate overall PTT score through addition of standardised scale scores. ■ Multiple correlational analysis of mean CTA and PTT scores with Outcome factors to identify significant relationships. ■ T-test analysis to explore differences between high and low performing teams followed by correlational analysis of average CTA and PTT scores and outcome factors
<p>H.2 Relationship between Input Factors and Team Processes</p> <p>H.2.1 Management teams with an 'optimum' balance of Belbin team roles will have higher ratings on team process factors than other teams.</p> <p>H.2.2 Management teams with an 'optimum' balance of competences will have higher ratings on team process factors than other teams.</p> <p>H.2.3 Management teams with higher average levels of Critical Reasoning ability (measured using the CTA) will have lower ratings on team process factors than other teams.</p> <p>H.2.4 Management teams with higher average levels of divergent thinking ability will have higher ratings than other teams on team process factors.</p>	<ul style="list-style-type: none"> ■ Belbin, 1976; 1981; Berry, 1995; Higgs and Dulewicz, 1997; West and Anderson, 1996; Katzenbach and Smith, 1993; Hackman, 1990; Senior, 1995; Spencer and Spencer, 1994; Ray and Bronstein, 1995; Finn, 1993; Kakabadse, 1991; West and Slater, 1995; Fisher et al, 1994; Tjosvold, 1984; 1991; Margerison and McCann, 1989; Guildford, 1959; Wallach, 1988; Smith, 1995; Woodcock, 1989; Spencer and Pruss, 1992; Davis et al, 1992; Mumma, 1992; Stewart, 1963; Higgs, 1996; Maier, 1963; Hoffman et al, 1962. 	<ul style="list-style-type: none"> ■ Belbin team roles calculated from 16PF and converted to a team role index (as per H1 above). ■ Competences calculated from JCS, converted to supra-competences and aggregated into a competence index (as per H2 above). ■ Critical reasoning measured through the CTA; calculation of team score as mean of individual CTAs. ■ Productive thinking measured through PTT; two scales standardised and added to produce overall PTT score; calculation of team score as mean individual overall PTT score. ■ Team processes measured using individual scores on team process questionnaire (adapted from Dulewicz and Herber, 1992). Team score aggregated from individual scores. 	<ul style="list-style-type: none"> ■ Check process questionnaire for validity of aggregation using formula reported by James et al (1984). ■ Factor analysis of team process questionnaire to identify process factors. ■ Calculation of Cronbach Alphas for process factors. ■ Multiple correlation of CTA, BTR Index Team competence index and PTT with process factors to identify significant relationships. ■ T-test analysis to explore differences between high and low performing teams followed by correlational analysis of average scores on input variables with process factors (using averaging basis described in H1 to H3 above).

Research Format to Examine Hypotheses

Hypothesis	References	Instrumentation	Data Analysis
<p>H.3 Relationship between Team Processes and Team Performance</p> <p>H.3.1 Management teams with higher ratings on team process factors will be rated as higher performing teams in terms of both "hard" and "soft" outcomes.</p>	<ul style="list-style-type: none"> ■ Tjosvold, 1991; Blake et al, 1987; Adair, 1986; Woodcock, 1979; Everard & Morris, 1988; Hackman & Morris, 1975; Ray & Bronstein, 1995; Nixon, 1990; Fowler, 1995; Robinson, 1991; Seddon, 1992; Higgs & Rowland, 1992; Senge, 1990; Guzzo & Shea, 1992; Demming, 1982; Belbin, 1993; Margerison & McCann, 1985; Woodcock and Francis, 1986; Carrington, 1994; Wickens, 1995; Walters, 1995; Proctor, 1995; Hastings et al, 1986; Woodcock, 1989; Moss-Kanter, 1993; Katzenbach and Smith, 1993; Guzzo & Shea, 1992; Emmett, 1967; McGrath, 1984; Locke & Latham, 1990; Tannebaum et al, 1992; Mullen & Cooper, 1994; Seashore, 1954; Babbington-Smith, 1979; Blake et al, 1987; Deutch, 1985; West & Slater, 1994; West, 1994; Holt, 1987; Berkowicz, 1954; O'Leary et al, 1994; Hackman, 1990; Higgs & Dulewicz, 1997; 	<ul style="list-style-type: none"> ■ Team outcomes measured by 'boss' ratings on outcome questionnaire adapted from Higgs and Rowland (1992). ■ Team process measured by scores on team process questionnaire (adapted from Dulewicz and Herbert, (1992). Individual scores aggregated to obtain team score. 	<ul style="list-style-type: none"> ■ Check process questionnaire for aggregation validity as per H4. ■ Factor analysis and Cronbach Alphas on outcome questionnaire, as per H1. ■ Factor analysis and Cronbach Alphas on process questionnaire, as per H4 ■ Multiple correlational analysis of process and outcome factors to determine significant relationships. ■ T-test analysis to explore differences between high and low performing teams followed by correlational analysis of process and outcome factors.
<p>H.4 Relationship between Input, Process and Outcome Measures</p> <p>H.4.1 A model which accounts for interactions between Input and Process factors will account for more variance in Team Outcomes than a one-stage model</p> <p>H.4.2 A model which accounts for interactions between Input and Process factors will provide evidence to show that Team Processes act as a mediator variable between Input and Outcome variables.</p>	<ul style="list-style-type: none"> ■ Hackman & Morris, 1975; Greenbaum et al, 1988; Gladstein, 1980; Hambrick & Mason, 1984; Smith et al, 1994; Pinto et al, 1993; Porras & Berg, 1978; Rogers et al, 1995; Stott and Walker, 1995; Schein, 1965; Hackman, 1990; West & Anderson, 1996; Larson & Lafasto, 1989; Abel, 1976; Buller, 1986; McGrath, 1984; Pfeffer, 1983; Eisenhardt, 1990; Keck, 1991; Goodstein & O'Reilly, 1988; Katz, 1982; Berkowitz, 1978; 	<ul style="list-style-type: none"> ■ Measures employed will be those described for Input, Process and Outcome factors in HR to H4 above. ■ All measures used at team level (this is the unit of analysis) 	<ul style="list-style-type: none"> ■ Screening of data for normality, homoscedasticity and multi-collinearity to check for breaches of assumptions underpinning multivariate analysis. ■ Review sample size to determine number of variables which can be used in multiple regression analysis (Hair et al, 1995). ■ Review results from correlational analyses together with literature to determine which variables and interactions to include in multiple regression analysis. ■ Conduct multiple regression on identified outcome factors for one stage model. Initially use enter method, but consider subsequent stepwise for parsimony and collinearity reasons. ■ Conduct multiple regressions for interaction model. (as above). ■ Compare R² and standardised Betas for the two models.

Appendix XIII
Distribution of Sample Population

Distribution of Sample Population

(n = 196)

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Minimum	Maximum
LEVEL	2.12	.70	-.92	.35	-.16	.17	1.00	3.00
AGE	38.42	6.06	-.83	.35	.46	.17	28.00	53.00
TEAM NO.	3.63	1.61	4.48	.64	1.80	.32	2.00	10.00
TENURE	1.31	0.96	-.44	.64	.88	.32	3.32	.27

Notes:

1. Level describes reporting level below CEO. Thus, for example, a level 1-0 equates with a direct report to the CEO.
2. Team No. refers to the number of team members.
3. Tenure relates to the length of time the participant has been a member of the team.

Appendix XIV

**Comparison of NatWest Life Interview and
Focus Group Data with Dulewicz and Herbert Questionnaire Items**

Factors from Literature Review in Research Model Derived from Hackman-Morris Group Interaction Model	Form Analysis of NatWest Life Interviews - Focus Groups	Items from Dulewicz & Herbert Dimensions of Board Effectiveness
A. Input		
A1. Individual Level Personal Characteristics		
■ Flexibility	✓	
■ Previous Experience	✓	
■ Sense of Contribution	✓	
■ Self-insight and understanding		
■ Mix of personal styles	✓	
	<ul style="list-style-type: none"> ■ Willing to accept challenge from others ■ Achievement orientation ■ Breadth of perspective 	
Competencies		
■ Mix of skills	✓	
■ Potential as well as actual skills		
■ Complementarity of skills	✓	
	<ul style="list-style-type: none"> ■ All understand required competencies ■ Mix of 'hard' and 'soft' skills ■ All need technical excellence 	
Roles		
■ Balance of functional and team roles	✓	
■ Role structure allocation	✓	
■ Balance of differing team roles	✓	
	<ul style="list-style-type: none"> ■ Roles understood by all ■ Explicit identification of contributions required ■ Clarity of roles 	
A2. Group Level		
■ Team size	✓	
■ Nature and extent of hierarchy	✓	
■ Functional or cross-functional	✓	
	<ul style="list-style-type: none"> ■ Selected rather than inherited members ■ Leader also a member of team 	

Factors from Literature Review in Research Model Derived from Hackman-Morris Group Interaction Model	Form Analysis of NatWest Life Interviews - Focus Groups	Items from Dulewicz & Herbert Dimensions of Board Effectiveness
A3. Environmental Level		
■ Task		
— nature of tasks	✓	1
— complexity of tasks	✓	1
— ambiguity of outcome	✓	
	■ Handle unstructured problems and decisions	1
■ Reward		
— recognition and reward structure	✓	
— recognition of success	✓	
— HR infrastructure	✓	
	■ Reward appropriate behaviour	
■ Organisation Culture		
— performance culture	✓	5
— encourage new thinking and challenge	✓	17
— degree of empowerment	✓	
— example from top	✓	
— provision of support		41
— valuing diversity	✓	28
	■ Demonstration of business need for teams	12
B. Process Factors		
B1. Direction Setting		
■ Nature of goals and purpose	✓	8, 5, 3, 22
■ Involvement in establishing goals	✓	8, 5
■ Clarity of timescales	✓	
■ Measurable and achievable goals	✓	
■ Clarity of standards developed by team	✓	8, 5
	■ Clarity of vision and purpose	12, 22
	■ Process for regular monitoring of performance	7
	■ Balanced range of objectives	12,33

Factors from Literature Review in Research Model Derived from Hackman-Morris Group Interaction Model	Form Analysis of NatWest Life Interviews - Focus Groups	Items from Dulewicz & Herbert Dimensions of Board Effectiveness
B2. Interaction		
■ Levels of openness	✓	11,18
■ Confrontation of issues	✓	11
■ Challenge processes	✓	16
■ Co-operation	✓	21
■ Trust	✓	29
■ Mutual respect and support	✓	26, 28, 30
■ Levels of information sharing	✓	11
■ Checking assumptions		16
■ Communication patterns	✓	35, 37, 30
■ Decision processes	✓	16
■ Levels of involvement and participation	✓	28
■ Identifying and exploring issues	✓	16
■ Building on and combining ideas		
■ Managing and disseminating information	✓	17
■ Cross-training of members		
■ Idea generation and sharing	✓	11
■ Regular feedback and reflection	✓	17
	■ regular meetings	9
	■ 360° feedback	
	■ avoidance blame	6, 10
	■ Review of learning	7, 10
	■ Decision-making to be non-judgemental	
	■ Focus on results and actions	40
	■ Balance consensus & action	42
	■ Agreed standards of behaviour	
	■ Mutual clarification of expectations	
	■ Understanding each others' skills and contribution	
	■ Reflect on processes as well as content	45
	■ Social as well as business contact	31

Factors from Literature Review in Research Model Derived from Hackman-Morris Group Interaction Model	Form Analysis of NatWest Life Interviews - Focus Groups	Items from Dulewicz & Herbert Dimensions of Board Effectiveness	
B3. Management/Leadership			
■ Leader role and style	✓	24, 32, 39, 44	
■ Nature of power			
■ Exercise of authority			
■ Interface management	✓		
■ Removing barriers to performance	✓		
■ Structuring roles and contribution of members	✓		
■ Building commitment			
	■ Rotation of leadership		
	■ Leader sets example		
	■ Commitment of leader to continuous improvement		40
	■ Provision of clear direction		
	■ Willing to receive and confront feedback		11
	■ Leader acts as coach to team members		

Appendix XV

Regressions of NatWest Life Competences on JCS Competences

Regression of NWL Competencies on JCS Competences

(n=32)

JCS Competency	NWL Competencies		
	R ² ①	R ² ②	R ² ③
1	.42	.25	.58
2	.39	.13	.48
3	.12	.43	.64
4	.17	.37	.60
5	.42	.47	.65
6	.38	.25	.52
7	.10	.10	.34
8	.17	.29	.47
9	.12	.45	.59
10	.29	.29	.42
11	-.@	.17	.41
12	-.@	-.@	.37
13	-.@	.16	.33
14	-.@	-.@	.42
15	.43	.22	.48
16	.41	.47	.61
17	.40	.64	.69
18	.34	.45	.55
19	-.@	.31	.60
20	.36	.08	.58
21	.34	.48	.67
22	.18	.09	.31
23	.58	.57	.67
24	.27	.13	.52
25	-.@	.49	.65
26	.39	.41	.61
27	.49	.16	.42
28	.34	.61	.73
29	.15	.25	.40
30	.19	.36	.59
31	.24	.25	.45

JCS Competency	NWL Competencies		
	R ² ①	R ² ②	R ² ③
32	.79	.59	.63
33	.16	.26	.46
34	-@	.08	.54
35	.48	.43	.72
36	-@	.22	.52
37	-@	.22	.51
38	.50	.53	.63
39	.65	-@	.30
40	-@	.22	.63

Notes:

- ① Analysis based on development centre evaluations.
- ② Based on development centre and self-assessment ratings.
- ③ Based on development centre and appraisal ratings.
- @ No variables entered.

Appendix XVI

Correlations Between Supra-Competences and Belbin Team Roles

Appendix XVI

Correlations between Supra-competences and Belbin Team Roles (16PF and OPO) (from Dulewicz, 1995)

Team roles	Supra-Competences												Multiple Correlation
	1	2	3	4	5	6	7	8	9	10	11	12	
Plant 16PF OPO	04 01	-13 01	-11 -00	-11 00	-12 03	02 01	-12 -13	15 02	-23 04	-09 23**	03 19	07 00	37*** 32***
Shaper 16PF OPO	-11 -09	-17* 04	15 00	-02 -03	00 00	17* 18*	-21* -21*	-04 -01	-13 -14	19* 10	16* 12	17* 12	50*** 36***
Coordinator 16PF OPO	-01 00	04 -02	-00 02	18* 13	-08 17*	11 02	-16* -05	09 13	-09 11	11 14	03 -03	-25** -09	40*** 33***
Resource Investigator 16PF OPO	06 -12	00 -03	-05 04	03 09	05 22*	-01 08	06 -03	21* 20*	00 08	06 19*	-02 -13	-15 -05	32*** 41***
Team worker 16PF OPO	18* 18*	17* -11	-08 24***	09 24***	14 18*	-16* -09	31*** 20*	-03 -07	36** 16	03 13	-05 -09	-08 -02	50*** 49***
Implementer 16PF OPO	-13 -00	17* 30***	09 -03	15 -04	-16 -05	08 -06	-19* -12	-09 -07	02 11	04 05	00 20*	-09 -17*	44*** 42***
Completer finisher 16PF OPO	-00 07	07 37***	00 -02	-01 -08	-10 -06	-04 -04	-11 -10	-16* -13	-08 05	01 07	20* 26**	07 -02	30*** 44***
Monitor Evaluator 16PF OPO	-08 05	-08 33***	-08 -02	02 -09	-11 -16*	10 -07	05 -21*	-05 -12	04 -10	-15 02	01 -21*	13 02	38*** 44***

(nb. Decimal Points omitted)

*: p<0.05; **: p<0.01; ***: p<0.001

Appendix XVII
Productive Thinking Test

**Fletcher Dulewicz & Associates
Assessment and Development Consultants**

PRODUCTIVE THINKING

Surname & Initials

INSTRUCTIONS

On the following pages are descriptions of imaginary situations. These situations are all highly improbable. If they did occur, however, they would have important consequences in business, government, social science and other field of human activity.

Your task is to see how many different consequences or results you can think of in the time allowed. The idea is to be as productive as you can in the few minutes allowed for each situation.

Don't fight the situations. Even if they are impossible, just think of all the consequences you can.

You will have eight minutes for each question. Please keep working on the problem until time is called.

Any good ideas count, but of course, some ideas show more imagination than others. Write down as many ideas as you can. Be specific.

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Appendix XVIII
Team Process Instrument:
Dimensions of Management Team Processes

Dimensions of Management Team Processes

(Adapted from Dulewicz and Herbert Dimensions of Board Effectiveness)

Introduction

This questionnaire is designed to measure your perceptions of how the management team of which you are a member currently operates on a number of different dimensions relating to the relationships between its members, the climate, its predispositions and its approach to decision making. In completing this questionnaire you should have in mind the management team of which you are a member. For example if you and, say, four other managers of your level report to the same executive then you and the other managers would comprise the management team for the purposes of this questionnaire. It is likely that the questionnaire will take between 30 and 40 minutes to complete.

Section I: Background Information

In order to complete Sections II work through all the items and **circle the number** on the scale which represents your view of the team's **current** position on each continuum. A "1" means that the left hand description applies exactly to your team and a "6" that the right hand description applies exactly, whereas the numbers in between signify that on balance one description or the other applies to some extent.

Section II: Team Processes

1*	Operational tasks dominate	1	2	3	4	5	6	Strategic or long-term issues dominate
2	Highly risk averse attitude prevails	1	2	3	4	5	6	Willing to take significant risks
3	Personal and company values coincide	1	2	3	4	5	6	Personal and company values conflict
4	Emphasis of discussions is on past performance (diagnosis)	1	2	3	4	5	6	Emphasis is on future performance (prognosis)
5	Emphasis of discussion is on success	1	2	3	4	5	6	Emphasis is on failures
6	The team is keen to appraise its own performance and learn	1	2	3	4	5	6	The team is unwilling to appraise its own performance
7	The team sets itself ambitious targets	1	2	3	4	5	6	The team sets itself easily attainable targets
8*	The "real" business is done within team meetings	1	2	3	4	5	6	The "real" business is done outside of team meetings
9	The team learns from its mistakes	1	2	3	4	5	6	The team does not learn from its mistakes
10	Bad news is confronted readily	1	2	3	4	5	6	Bad news is suppressed or shelved
11	Teamwork evidences shared ownership of company's vision, mission and values	1	2	3	4	5	6	Teamwork does not evidence shared ownership of company's vision, etc.

12	The team is reluctant to deal with and respond to change	1	2	3	4	5	6	The team is enthusiastic about change and its possibilities
13	The team has measurable goals and objectives	1	2	3	4	5	6	There are no measurable goals and objectives for the team
14	Tasks and goals have realistic time scale targets	1	2	3	4	5	6	Tasks and goals have unrealistic time scale targets
15	Feedback on team performance only comes from the team manager	1	2	3	4	5	6	Feedback on team performance comes from a diverse range of sources
16	Team goals are established by the team leader	1	2	3	4	5	6	Team members are involved in establishing and agreeing team goals
17*	The team's performance does not vary according to circumstances	1	2	3	4	5	6	The team's performance varies noticeably according to circumstances
18	Members of the team are keen and free to ask questions	1	2	3	4	5	6	Members of the team are reluctant to ask questions unless invited
19	Creative ideas discouraged	1	2	3	4	5	6	Creative ideas encouraged
20	High level of candor and openness	1	2	3	4	5	6	High level of inhibition or secrecy
21	Highly formal atmosphere	1	2	3	4	5	6	Highly informal atmosphere
22	Humour and enjoyment are redundant	1	2	3	4	5	6	Humour and enjoyment are encouraged as essential
23	Climate is normally co-operative	1	2	3	4	5	6	Climate is normally antagonistic
24	The team is unclear about how/whether it adds value to the business	1	2	3	4	5	6	The team knows exactly how it adds value to the business
25	Positive atmosphere prevails	1	2	3	4	5	6	Negative atmosphere prevails
26	The team performs effectively irrespective of the company's reward and recognition policies	1	2	3	4	5	6	Effective team performance is dependent on the company's reward and recognition policies
27	Team performance depends on recognition of the success of the team	1	2	3	4	5	6	Team performance requires no supporting recognition
28	The success of team does not depend on selection of team members	1	2	3	4	5	6	Team success is critically dependent on the selection of team members
29	All members of the team have clearly understood roles	1	2	3	4	5	6	The specific roles of team members are not clearly understood
30	Team members do not understand the roles of other members of the team	1	2	3	4	5	6	Team members have a clear understanding of the roles of other members
31	The mix of skills of members is important to performance	1	2	3	4	5	6	The mix of skills of members is not important to performance
32	It is not important to identify the explicit contribution required from each team member	1	2	3	4	5	6	Explicit identification of the required contribution of each team member is important

33	Team performance is not dependent on differences in the personality/styles of individual members	1	2	3	4	5	6	Team performance is dependent on the differences in personality/styles of individual members
34	The members operate as a cohesive team	1	2	3	4	5	6	The members operate as competing individuals
35	Personal relationships are harmonious	1	2	3	4	5	6	Personal relationships are conflict ridden
36	Professional relationships are highly competitive	1	2	3	4	5	6	Professional relationships are complementary
37	Contributions dominated by a few (overpowering) individuals	1	2	3	4	5	6	Contributions evenly distributed among most or all members
38	High level of trust and loyalty between colleagues	1	2	3	4	5	6	Clear lack of trust and loyalty between colleagues
39	Genuine listening is consistently achieved	1	2	3	4	5	6	Listening is more apparent than real
40	Social contact between team members is considered to be important	1	2	3	4	5	6	Social contact between team members is considered irrelevant
41	Team members do not clarify the expectations of each team member	1	2	3	4	5	6	Team members clarify the expectations of each team member
42	Team members do not discuss standards of behaviour	1	2	3	4	5	6	Team members discuss and agree standards of behaviour for all team members
43	Team members have a clear view of each others' contribution	1	2	3	4	5	6	Team members do not have an understanding of the contribution of each team member
44	Debate is conducted in a highly autocratic and directive fashion	1	2	3	4	5	6	Debate is conducted in a highly democratic and participative fashion
45	Good time-management	1	2	3	4	5	6	Poor time-management
46	Unclear dialogue and communication between colleagues	1	2	3	4	5	6	Clear dialogue and communications
47	Thorough preparation is evident in all members	1	2	3	4	5	6	Lack of preparation impairs debate and decisions
48	Style of debate is rigid and predictable	1	2	3	4	5	6	Style of debate is flexible and adapts to the agenda
49	Quality of debate is superficial or trivial	1	2	3	4	5	6	Debate is incisive and adds value
50	High level of commitment to decisions and actions	1	2	3	4	5	6	Low level of commitment to decisions and actions
51	Willingness to bring in experts	1	2	3	4	5	6	Complacency with own membership
52*	Decisions are always taken by voting	1	2	3	4	5	6	Decisions are never taken by voting
53*	Voting results in full commitment of all team members to decisions	1	2	3	4	5	6	Voting conceals significant differences in commitment

54*	Team leader's style is unobtrusive	1	2	3	4	5	6	Team leader's style is extremely forceful
55	Team leader's style invites initiative(s) from team members	1	2	3	4	5	6	Team leader's style discourages initiative(s) from team members
56	The team leader is able to participate as a team member	1	2	3	4	5	6	The team leader remains distant from team members and executes a different role
57	The team leader manages the relationships between the team and other parts of the Organisation	1	2	3	4	5	6	The team leader does not take responsibility for relationships between the team members & other parts of the Organisation
58	Barriers to team performance are not considered by the team leader	1	2	3	4	5	6	The team leader eliminates barriers to performance of the team
59	The team leader discusses and agrees the role and contribution expected from each team member	1	2	3	4	5	6	The team leader does not discuss the roles and contributions of each team member
60	Behaviour of the team leader does not provide an example for the team	1	2	3	4	5	6	The behaviour of the team leader provides an example to the team
61	The team leader acts as a coach to the members of the team	1	2	3	4	5	6	The team leader expects team members to work out their own development and needs
62	The team is accustomed to analysing itself in this fashion	1	2	3	4	5	6	The team has not previously analysed itself in this fashion

CAN YOU PLEASE CHECK THAT YOU HAVE ANSWERED ALL OF THE QUESTIONS FROM 1 - 62.

Thank you for the time you have taken in completing this questionnaire. Will you please follow the instructions for its return which are outlined in the covering letter.

NB. Questions marked with an asterisk were not marked thus in the issued questionnaire. These items were included in the data gathering for research purposes separate to the current research.

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Appendix XIX

James et al (1984) Consensus/Interater Reliability Formula

James et al (1984) Consensus/Interater Reliability Calculation

Overall Formula:

$$WG(J) = \frac{J[1-(Sxj^2/\alpha EU^2)]}{J[1-(Sxj^2/\alpha EU^2)] + (Sxj^2/\alpha EU^2)}$$

Where:

J = number of items

Sxj = Standard Deviation of Team Score

$\alpha EU^2 = (A^2-1)/12$

Where A = Scale range

**Appendix XX Regression Equations based on
Combination of Development Centre and Appraisal Ratings**

(n=32)

Supracompetency	Regression Equation	R ²
SC1	$-2.01 - 3.9G + 0.85B + 0.86A$	.50
SC2	$2.72 - 0.51D + 0.7K$	.54
SC3	$3.76 + 0.49T + 1.39K - 0.86I - 1.06D$	.69
SC4	$-1.97 + 0.33R + 0.83Q - 0.29I + 0.51B$	.65
SC5	$4.21 + 0.25T - 0.35M + 0.46G - 0.6D$	.66
SC6	$-0.05 + 1.26Q - 0.46H$	.50
SC7	$2.63 + 0.36R - 0.56O + 0.46B$	.59
SC8	$2.86 + 0.77N - 0.67J - 0.55G + 0.56B$	.58
SC9	$4.87 - 0.38N$	.51
SC10	$2.23 + 0.64Q + 0.33K - 0.66D$	.58
SC11	$3.21 - 0.51D + 0.56C$	.38
SC12	$2.97 - 0.39R + 0.90P - 0.46M$	.47

Appendix XXI
Team Outcome Instrument

Team Outcomes

(n.b. This questionnaire should only be used after a briefing has been given to the managers/executives to whom the team reports)

Introduction

This questionnaire is designed to obtain your assessment of the current performance and the required dimensions of performance of the team(s) for which you are responsible.

In completing this questionnaire you should have in mind the management team of which your reports are members. In the briefing session the nature of the team was discussed. It was highlighted that in reviewing the team you should consider the direct reports who work together in relation to business problems and issues. Individuals who report to you, but play no part (due to the nature of their role) in team working should not be included in your thinking. That is to say we are looking at the "real" team for which you are responsible rather than all direct reports (as a matter of course).

You only need to complete the questionnaire for the team as a whole. So, for example, if you have three reports on the programme who are in the same team you only need complete one questionnaire (however, you do need to put the names of all participants covered on the questionnaire). This questionnaire should take between 15 and 20 minutes to complete.

Section I: Background

■ Name:	
■ Team	(Brief description of the team to which this assessment relates and names of Relevant Team Members)
■ How long has the team been formed?:	
■ How long have you been a responsible for this team?:	

Section II:

In order to complete Section II work through all the items and circle the number on the scale which represents your assessment of the team's current performance on each continuum. A "1" means that the left hand description applies exactly to the performance of the team and a "6" that the right hand description applies exactly, whereas the numbers in between signify that on balance one description or the other applies to some extent.

1	The team consistently achieves its goals and objectives`	1	2	3	4	5	6	The team does not achieve its goals and objectives
2	All members of the team do not consistently achieve their individual goals and objectives	1	2	3	4	5	6	All members of the team consistently achieve their individual goals and objectives
3	Team's customers are consistently satisfied by the performance of the team	1	2	3	4	5	6	Team's customers are consistently dissatisfied with the performance of the team
4	The team focuses on maintaining the 'status quo'	1	2	3	4	5	6	The team focuses on change and improvement
5	The team are unable to implement change	1	2	3	4	5	6	The team are able to make change happen
6	The team generates a high volume of new ideas and innovations	1	2	3	4	5	6	The team focuses on working within established guidelines and policies
7	The team does not demonstrate team learning and development of skills and knowledge	1	2	3	4	5	6	The team demonstrates team learning and development of skills and knowledge
8	Individual team members do not demonstrate personal growth and development	1	2	3	4	5	6	Individual team members demonstrate personal growth and development
9	The team discusses differences and manages conflict constructively	1	2	3	4	5	6	The team encounters difficulty in discussing and managing conflict
10	All team members are highly motivated to perform	1	2	3	4	5	6	Motivation to perform is low amongst team members
11	The team has problems in responding to crises	1	2	3	4	5	6	The team is able to cope effectively with crises
12	Team decisions result in positive and specific actions	1	2	3	4	5	6	Team decisions do not result in specific actions
13	The team is proactive in addressing issues and problems	1	2	3	4	5	6	The team reacts to the problems and issues they are presented with
14	Team members are unsupportive and antagonistic in their dealings with each other	1	2	3	4	5	6	Team members are mutually supportive and co-operate actively in their dealings with each other
15	The climate in team interactions could be described as generally positive	1	2	3	4	5	6	The climate in team member interactions could be described as generally negative

16	The members operate cohesively with a shared and accepted agenda and priorities	1	2	3	4	5	6	The members operate as a group of individuals competing for resource and priorities
----	---	---	---	---	---	---	---	---

- CAN YOU PLEASE CHECK THAT YOU HAVE ANSWERED ALL OF THE QUESTIONS FROM 1 TO 16.
- Thank you for the time you have taken in completing this questionnaire. Will you please follow the instructions for its return which are outlined in the covering letter.

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Appendix XXII

**Factor Calculation Equations
for Team Process and Team Outcome Questionnaires**

Calculation of Team Outcome and Process Factors

1. Using manager ratings to calculate outcome factors. Scores unweighted. Using Varimax rotation.

Factor	No. Items	Alpha	Calculation (questions)
1. Team Cohesion	7	0.85	$\frac{16+14+15+10+7+9+8}{7}$
2. Improvement Orientation	4	0.74	$\frac{4+5+13+6}{4}$
3. Achievements	3	0.75	$\frac{2+1+3}{3}$

2. Using average team member ratings to calculate Team Process Factors. Unweighted. Varimax rotation. Factor loading cut-off 0.40.

Factor	No. Items	Alpha	Calculation (questions)
1. Atmosphere	10	0.95	$\frac{11+20+23+25+34+35+36+38+39+49}{10}$
2. Communication/ Interaction	5	0.79	$\frac{21+22+18+46+48}{5}$
3. Performance Orientation	5	0.76	$\frac{7+5+6+10+12}{5}$
4. Involvement/ Participation	5	0.87	$\frac{16+44+55+56+60}{5}$
5. Confidence and Comfort	3	0.65	$\frac{19+50+51}{3}$
6. Learning and Improvement	5	0.70	$\frac{58+9+4+40+47}{5}$
7. Roles	2	0.76	$\frac{29+30}{2}$
8. Composition and Contribution	4	0.69	$\frac{31+32+41+43}{4}$
9. Process Orientation	4	0.75	$\frac{2+15+42+62}{4}$
10. Realistic Focus	2	0.60	$\frac{14+24}{2}$
11. Alignment	2	0.48	$\frac{45+3}{2}$
12. Enabling Leadership	3	0.77	$\frac{13+59+61}{3}$
13. Interface Management	1	-	57
14. Distribution of Contribution	1	-	37

Appendix XXIII

Correlation Tables for Main Variables in the Study

Intercorrelations Between Variables Included in the Study (n =54)

	TEQ1	TEQ 2	TEQ 3	TEQ 4	TEQ 5	TEQ 6	TEQ 7	TEQ 8	TEQ 9	TEQ 10	TEQ 11	TEQ 12	TEQ 13	TEQ 14	TPM 1	TPM 2	TPM 3	BTR Index	Comp. Index	CTA	PTT
TEQ 1	1.00																				
TEQ 2	*** 0.701	1.00																			
TEQ 3	*** 0.716	***0.60	1.00																		
TEQ 4	*** 0.787	*** 0.823	*** 0.607	1.00																	
TEQ 5	*** 0.761	*** 0.539	*** 0.543	*** 0.73	1.00																
TEQ 6	*** 0.760	***0.55	*** 0.582	*** 0.624	***0.58	1.00															
TEQ 7	**0.40	**0.397	**0.442	** 0.339	**0.44	**0.39	1.00														
TEQ 8	*** 0.522	*** 0.543	*** 0.528	*** 0.529	*** 0.495	**0.31	**0.408	1.00													
TEQ 9	*** 0.602	***0.59	*** 0.596	*** 0.545	** 0.427	*** 0.573	0.17	**0.415	1.00												
TEQ 10	** 0.436	***0.56	**0.298	*** 0.513	** 0.419	**0.431	0.201	**0.431	*** 0.591	1.00											
TEQ 11	*** 0.693	*** 0.520	**0.406	*** 0.589	*** 0.485	*** 0.533	0.025	**0.33	*** 0.483	**0.355	1.00										
TEQ 12	*** 0.530	**0.432	*** 0.479	*** 0.566	*** 0.569	**0.48	**0.43	**0.451	**0.438	*** 0.585	**0.393	1.00									
TEQ 13	0.082	0.132	0.096	0.195	0.061	0.076	0.166	0.116	**0.34	0.184	0.227	0.228	1.00								
TEQ 14	*** 0.480	**0.454	**0.295	** 0.374	** 0.278	**0.36	0.066	**0.451	0.21	*0.260	*** 0.459	0.085	-0.104	1.00							
TPM 1	** 0.275	**0.310	**0.27	** 0.284	** 0.365	0.075	**0.301	**0.497	0.25*	**0.29	0.122	0.24*	0.036	0.154	1.00						
TPM 2	0.228	**0.273	0.02	0.165	0.227	0.15	0.24*	**0.340	0.09	**0.301	0.248*	0.069	-0.116	0.24*	***0.49	1.00					
TPM 3	0.026	0.102	0.02	-0.025	0.135	0.048	0.23*	**0.276	0.15	**0.340	0.096	0.022	-0.018	0.069	***0.571	***0.51	1.00				
BTR Index	0.153	0.007	0.12	0.08	0.026	0.23	-0.097	0.42	**0.37	-0.162	0.232*	0.008	0.28*	0.031	0.30*	**0.34	0.197	1.00			
Comp. Index	0.16	0.197	0.08	0.136	0.166	0.045	0.22*	*0.23	-0.20	0.223*	-0.011	0.106	-0.192	0.111	0.032	**0.33	0.029	**0.39	1.00		
CTA	0.18	-0.014	-0.095	0.022	0.153	0.077	0.006	0.07	0.036	0.072	0.04	0.135	-0.093	0.116	0.122	0.09	0.18	-0.17	-0.163	1.00	
PTT	0.20	-0.067	-0.22	-0.078	0.03	0.108	0.025	0.026	0.06	-0.167	0.101	-0.036	0.088	-0.114	0.083	0.011	-0.041	-0.041	0.135	-0.146	1.00

***: P < 0.001, **: P < 0.01, *: P < 0.05

For Key see next page

Key to Intercorrelation Table

TEQ1	Team Process Factor:	Team Atmosphere
TEQ2	Team Process Factor:	Communication/Interaction Style
TEQ3	Team Process Factor:	Performance Orientation
TEQ4	Team Process Factor:	Involvement and Participation
TEQ5	Team Process Factor:	Confidence and Comfort
TEQ6	Team Process Factor:	Learning and Improvement
TEQ7	Team Process Factor:	Roles
TEQ8	Team Process Factor:	Composition and Contribution
TEQ9	Team Process Factor:	Process Orientation
TEQ10	Team Process Factor:	Realistic Focus
TEQ11	Team Process Factor:	Alignment
TEQ12	Team Process Factor:	Enabling Leadership
TEQ13	Team Process Factor:	Interface Management
TEQ14	Team Process Factor:	Distribution of Contribution
TPM1	Team Outcome Factor:	Team Cohesion
TPM2	Team Outcome Factor:	Improvement Orientation
TPM3	Team Outcome Factor:	Achievements
BTR Index	Belbin Team Role Index	
Comp Index	Supra-Competences Index	
CTA:	Average Team CTA score	
PTT:	Average Team PTT score	

NatWest Life Competencies v's JCS (n = 32)

JCS	NWL Competencies																			
	A	B	C	D	E	G	I	J	K	L	M	N	O	P	Q	R	S	T		
XC1	-.0551	.2148	-.0316	-.2414	.1331	-.0156	.1797	-.4196	.0990	.2387	.1148	.0037	-.0176	.1446	-.1188	.0812	.0636	.0873		
(P)	.765	.238	.864	.183	.468	.932	.325	.017	.590	.188	.532	.984	.924	.430	.517	.659	.730	.635		
C2	.2043	.2044	-.2399	-.0718	.1901	.1531	.3199	.2237	.2085	-.2357	.3210	.1346	.2572	.3493	.0280	.2464	.2083	.3163		
(P)	.262	.262	.186	.696	.297	.403	.074	.218	.252	.194	.073	.463	.155	.050	.879	.174	.253	.078		
XC3	.0310	-.2897	.0000	-.0249	-.1714	-.2462	-.0103	-.1761	.0059	-.0342	.0627	-.1255	-.0853	-.1115	-.3398	.1032	.0587	.0437		
(P)	.866	.108	1.000	.892	.348	.174	.955	.335	.974	.852	.733	.494	.643	.544	0.57	.574	.749	.812		
XC4	.2622	.1523	-.2889	.0284	.2606	.2101	.1948	-.0402	.3452	.1998	.4305	.3485	.3231	.3013	.2771	.0924	.4174	.1932		
(P)	.147	.405	.109	.877	.150	.249	.295	.827	.050	.273	.014	.050	.071	.094	.125	.615	.000	.289		
XC5	.2147	.1961	.3825	.4810	.3604	.4085	.2023	-.0592	.2452	.1652	.0793	.1957	.0561	.2932	.1922	-.1002	-.0134	.1656		
(P)	.238	.282	.031	.005	.043	.020	.267	.748	.176	.366	.666	.283	.760	.103	.471	.585	.942	.365		
XC6	-.1826	-.0793	-.2236	-.2466	-.1657	-.0358	0.0969	-.1829	.0307	-.0236	-.2969	-.1777	-.2042	-.1904	.2127	-.3945	-.2019	-.1943		
(P)	.317	.666	.219	.174	.365	.846	.598	.316	.867	.898	.099	.331	.262	.297	.242	.025	.268	.287		
XC7	.1908	.1160	.0186	.2450	.1445	.1197	.1493	.0452	.0640	.1072	-.0162	.1939	-.0749	.0542	.1981	.0614	-.0406	.1376		
(P)	.295	.527	.920	.177	.430	.514	.415	.806	.728	.559	.930	.288	.684	.768	.277	.739	.825	.453		
XC8	-.0251	-.0033	.2795	.0543	.2265	.2361	-.0225	.0403	.2195	.0665	.0220	.0615	-.0207	.2581	.0454	-.2269	.0026	-.0790		
(P)	.891	.986	.121	.768	.213	.193	.903	.827	.227	.718	.905	.738	.911	.154	.805	.212	.989	.668		
XC9	.2338	.3976	.2118	.2181	.3402	.1980	.3032	.2546	.2776	.2296	.1915	.3336	.3133	.4799	.2591	.1566	.1476	.3414		
(P)	.198	.024	.244	.230	.057	.277	.092	.160	.124	.206	.294	.062	.081	.005	.152	.392	.420	.050		
XC10	.4670	.3207	.2705	.2308	.3843	.0781	.3441	.1412	.2990	.2145	.4036	.1663	.1661	.3119	.4218	.1754	.3521	.2509		
(P)	.007	.074	.134	.204	.030	.671	.050	.441	.096	.238	.022	.363	.364	.082	.006	.337	.048	.166		

NatWest Life Competencies v's JCS (n = 32) (Continued)

JCS	NWL Competencies																			
	A	B	C	D	E	G	I	J	K	L	M	N	O	P	Q	R	S	T		
XC11 (P)	.0456	-.0990	.0146	-.1231	.0346	-.1317	-.1256	.0822	.0340	-.1194	-.0115	-.1079	-.0646	.0085	.1493	-.1197	.0710	-.1921		
	.804	.590	.937	.502	.851	.473	.493	.655	.853	.515	.950	.557	.725	.963	.415	.514	.699	.292		
XC12 (P)	.0408	.0199	.1658	.0461	.0949	.0638	.0551	.1141	.0588	.0697	-.0251	-.0151	.0463	.0107	-.1671	-.1433	-.1722	.0103		
	.825	.914	.365	.802	.605	.729	.765	.534	.749	.705	.892	.935	.801	.954	.361	.434	.346	.955		
XC13 (P)	.2675	.1390	.4269	.0914	.2393	.1318	.2069	.0401	.0950	.1655	.1892	.1767	.1557	.1354	.0335	.1073	.0971	.0678		
	.139	.448	.010	.619	.187	.472	.256	.827	.605	.365	.300	.333	.395	.460	.856	.559	.597	.712		
XC14 (P)	-.1776	.0889	-.0171	-.1673	-.0132	.1066	-.1803	.0606	-.0102	-.0713	.1703	-.0757	-.1141	.0498	-.0358	.0982	.1989	.1122		
	.331	.628	.926	.360	.943	.561	.323	.742	.956	.698	.352	.680	.534	.787	.846	.593	.275	.541		
XC15 (P)	-.1427	.2916	.1372	.0520	.2257	-.0792	.2662	-.1610	.2434	.1854	.0382	.1624	.0859	.1776	.0822	.0914	-.0175	-.0200		
	.436	.105	.454	.777	.214	.667	.141	.379	.179	.310	.836	.374	.640	.331	.655	.619	.924	.913		
XC 16 (P)	-.0248	.0104	.1959	.0789	.1121	-.0731	-.0479	-.2929	.0579	-.1448	-.0507	.1754	-.1450	.0614	-.1329	-.2049	-.0649	-.1505		
	.893	.955	.283	.668	.541	.691	.795	.104	.753	.429	.783	.337	.429	.738	.469	.261	.724	.411		
XC17 (P)	.0844	.1251	-.0425	-.1693	-.0476	-.1288	-.0602	.0228	.1496	-.0870	.1598	.0174	.1289	.2166	-.0135	.0054	.1654	.2450		
	.646	.495	.817	.354	.796	.482	.743	.901	.414	.636	.382	.925	.482	.234	.942	.977	.366	.177		
XC18 (P)	.0933	.2129	-.1710	-.0738	.1064	-.1595	.0021	-.0447	.1602	.0174	.1366	.1833	.2451	.1724	.0292	.1493	.0959	.2514		
	.611	.242	.349	.684	.562	.383	.991	.808	.381	.925	.456	.315	.176	.345	.874	.415	.602	.165		
XC19 (P)	.1285	.2103	-.1630	.0206	.0263	.1255	.0181	0.789	-.0016	.0647	-.0411	.1139	-.1020	-.0352	.2700	.1255	.0473	.1258		
	.483	.248	.373	.911	.886	.494	.922	.668	.993	.725	.823	.535	.578	.848	.135	.494	.797	.493		
XC20 (P)	.2388	.2359	-.0601	.0342	-.0598	.0000	-.0378	.3013	.1627	.0290	.0753	.3203	.2344	.1094	.2669	.1687	.0725	.1852		
	.188	.194	.744	.853	.745	1.000	.837	.094	.374	.875	.682	.074	.197	.551	.140	.356	.693	.310		
XC21 (P)	.0529	.1968	-.1737	-.0036	-.0114	-.1641	.1208	.0955	.0539	.0947	.0102	.1217	-.0096	-.0092	.4457	.2462	.0469	.0917		
	.774	.280	.342	.984	.951	.369	.510	.603	.770	.606	.956	.507	.958	.960	.010	.174	.799	.618		

NatWest Life Competencies v's JCS (n = 32) (Continued)

JCS	NWL Competencies																			
	A	B	C	D	E	G	I	J	K	L	M	N	O	P	Q	R	S	T		
XC22	.3203	.1825	.2023	.0965	.0820	.0452	.1530	.1670	-.0689	.0747	.1659	.2407	.2234	.1520	-.1097	.0974	.1634	.2126		
(P)	.074	.318	.267	.599	.655	.806	.403	.361	.708	.685	.364	.185	.219	.406	.550	.596	.371	.243		
XC23	-.2491	.2787	-.2238	-.1893	-.0007	-.0397	.2302	.1284	-.0078	.2743	-.1952	-.0988	-.0273	-.0167	.1474	.0110	-.1072	.0684		
(P)	.169	.122	.218	.299	.997	.829	.205	.484	.966	.129	.284	.591	.882	.928	.421	.952	.559	.710		
XC24	.1648	.3884	.0528	-.0257	.1698	.3134	.2907	.1930	.3122	.3478	.0837	.3029	.3104	.2416	.2176	.1125	.1369	.3146		
(P)	.367	.028	.774	.889	.953	.081	.107	.290	.082	.050	.649	.092	.084	.183	.232	.540	.458	.080		
XC25	-.0785	.1393	-.2234	.2197	-.0155	.0656	.0089	.1064	-.0215	-.0087	.0285	-.1645	-.1362	-.1213	-.1141	.1850	-.0388	.1523		
(P)	.670	.447	.219	.227	.933	.721	.961	.562	.907	.962	.877	.368	.457	.508	.534	.311	.833	.405		
XC26	.2128	.2675	.1022	.3878	.2460	.1771	.3325	.0610	.0184	.1888	.1709	-.0838	-.0295	.1241	.2378	.4086	.2055	.3540		
(P)	.242	.139	.578	.028	.175	.332	.063	.740	.920	.301	.350	.648	.873	.499	.190	.020	.259	.047		
XC27	.1018	.1448	.0095	-.1264	-.0217	.0110	.0445	.0881	.0249	.0776	.1034	.1171	.1252	.2311	.4097	.1203	.1637	.2850		
(P)	.579	.429	.959	.491	.906	.952	.809	.632	.892	.673	.573	.523	.495	.203	.020	.512	.371	.143		
XC28	.3095	.3405	.2391	.1792	.2460	.2020	.1937	.3435	.4025	.2536	.3029	.3586	.4676	.3228	.4680	.3117	.2912	.4570		
(P)	.085	.050	.187	.326	.175	.267	.288	.050	.022	.161	.092	.044	.007	.072	.007	.082	.106	.009		
XC29	.2250	.2216	.2558	.0539	.2150	.3829	.2639	.1136	.2453	.1921	.1369	.3703	.2751	.2852	.0290	.2848	.1189	.3398		
(P)	.216	.223	.158	.770	.237	.031	.144	.536	.176	.292	.455	.037	.128	.114	.875	.114	.517	.047		
XC30	.2241	.3810	.3061	.2090	.3902	.4353	.2094	.2809	.3776	.3194	.2666	.3197	.3226	.3472	.3791	.2026	.2432	.4095		
(P)	.218	.031	.088	.251	.027	.010	.250	.119	.033	.075	.140	.075	.072	.052	.032	.266	.180	.020		
XC31	.1670	.2258	.2033	-.1583	.1052	.1483	.2812	.1015	.2172	.2127	.1418	.3071	.2643	.0623	.3020	.0969	.1238	.0788		
(P)	.361	.214	.264	.387	.567	.418	.119	.580	.232	.243	.439	.087	.144	.735	.093	.598	.500	.668		
XC32	.1995	.1405	.1301	-.2666	-.0810	.0225	-.2007	.2656	-.1198	-.0470	-.0746	.2347	.1692	-.0190	.4045	-.1361	.0157	.0074		
(P)	.274	.443	.478	.140	.660	.903	.271	.142	.514	.798	.685	.196	.355	.918	.022	.458	.932	.968		

NatWest Life Competencies v's JCS (n = 32) (Continued)

JCS	NWL Competencies																			
	A	B	C	D	E	G	I	J	K	L	M	N	O	P	Q	R	S	T		
XC33 (P)	-.1185	.1264	.0267	-.0708	-.0077	-.1231	-.0322	.0938	.1082	-.0225	.1495	-.0801	-.0501	.0518	.0648	-.0442	.0297	-.0695		
	.518	.491	.885	.700	.966	.502	.861	.610	.556	.903	.414	.663	.786	.778	.725	.810	.872	.706		
XC34 (P)	-.1890	.0577	.0512	-.1406	.0041	.0522	.1494	-.0513	.0318	.2036	.0183	-.1408	-.0833	-.1317	-.1329	-.1434	-.0068	.0531		
	.300	.754	.781	.443	.982	.777	.414	.781	.863	.264	.921	.442	.654	.473	.469	.434	.971	.773		
XC35 (P)	.0235	-.0333	.0980	-.0086	.0629	.0000	-.1863	-.2686	-.1000	-.0645	-.2241	-.1545	-.3627	-.1976	-.0072	-.1664	-.1260	.0839		
	.888	.856	.584	.963	.732	1.000	.307	.137	.586	.726	.218	.398	.041	.278	.969	.363	.492	.648		
XC36 (P)	-.2885	.0123	-.1106	-.0365	-.1087	.1112	-.0387	.0824	.2230	.0760	-.2544	-.0731	-.0974	-.2389	.1685	.0778	-.2207	-.0153		
	.109	.947	.547	.843	.554	.545	.833	.654	.220	.679	.144	.691	.596	.188	.356	.672	.225	.934		
XC37 (P)	-.3090	-.1124	-.1374	-.0361	-.1039	-.0366	.0017	-.0246	-.1993	-.1591	-.1501	-.3495	-.2550	-.1129	-.2715	.0085	-.1979	.0553		
	.085	.540	.453	.845	.571	.842	.993	.894	.274	.384	.412	.050	.159	.539	.133	.963	.278	.764		
XC38 (P)	-.2129	-.1248	.1240	-.0520	.0430	-.2034	-.1756	-.2254	-.0689	-.2145	-.0584	-.4867	-.2742	-.1140	-.1759	-.0891	-.1169	-.1031		
	.242	.496	.499	.778	.815	.264	.336	.215	.708	.238	.751	.005	.129	.534	.336	.628	.524	.574		
XC39 (P)	.0225	.0309	.2161	-.3205	.0180	-.0663	.0022	.0465	.0422	-.0372	.2654	.1457	.1505	.1354	.0373	.0408	.3803	.0666		
	.903	.867	.235	.074	.922	.718	.991	.800	.819	.840	.142	.426	.411	.460	.839	.824	.032	.717		
XC40 (P)	.1888	-.0200	.1928	-.0958	.0476	-.0846	-.0013	-.2610	.1771	-.0762	.1313	.1981	.1212	.0237	-.1490	.0599	.1906	.0624		
	.301	.914	.291	.602	.796	.645	.994	.149	.332	.679	.474	.277	.509	.897	.416	.745	.296	.734		

**Correlation of Average Team Supra-Competence Scores
With Team Outcome Factors (n = 54)**

Supra-Competences	Team Outcome Factors		
	TPMIB	TPM2B	TPM3B
AVSC1	.1133	.1953	.1854
(P)	.415	.157	.180
AVSC2	-.1280	-.2238	.0600
(P)	.356	.104	.667
AVSC3	.0874	.1557	.0165
(P)	.530	.261	.906
AVSC4	.1009	.1043	.0558
(P)	.468	.453	.689
AVSC5	.2919	.1740	.2700
(P)	.032	.208	.048
AVSC6	-.0617	.2093	.0460
(P)	.658	.129	.741
AVSC7	.2340	.2151	.3711
(P)	.089	.118	.006
AVSC8	.1778	.1226	.2756
(P)	.198	.377	.044
AVSC9	.0421	-.2488	.1150
(P)	.762	.070	.408
AVSC10	.0461	-.0629	.1005
(P)	.741	.652	.470
AVSC11	.0199	.2143	.0673
(P)	.886	.120	.629
AVSC12	-.0121	.2796	-.0357
(P)	.931	.041	.798

Supra Competences V's Team Process Factors (n=54)

Team Effectiveness Factors	Supra-Competences											
	AVSC1	AVSC2	AVSC3	AVSC4	AVSC5	AVSC6	AVSC7	AVSC8	AVSC9	AVSC10	AVSC11	AVSC12
TEQ1 (P)	.0239 .914	.0264 .905	-.1112 .614	-.0742 .737	-.1110 .614	-.2464 .257	.1788 .414	-.0029 .989	-.0944 .668	-.1010 .647	.1307 .552	.6148 .002
TEQ2 (P)	.0701 .751	.1196 .590	.1000 .383	.1271 .563	.0070 .727	.2054 .171	.2204 .312	.1050 .631	.0404 .823	.0001 .993	.1004 .619	-.1231 .576
TEQ3 (P)	.1322 .548	.1420 .518	.1294 .556	.0043 .984	.1031 .640	-.3029 .160	.0625 .777	-.1864 .395	.1231 .576	.2625 .226	.3134 .145	.3167 .141
TEQ4 (P)	.0842 .703	-.0821 .710	-.1541 .483	-.1320 .548	-.2305 .290	-.2191 .315	.1011 .646	.0768 .727	-.0708 .748	-.1192 .588	.0121 .956	.0353 .873
TEQ5 (P)	.1045 .635	.1300 .554	.0398 .857	.0302 .891	.1108 .615	.2549 .240	.1156 .599	.0366 .868	.0127 .954	.0131 .953	.1523 .488	.0801 .716
TEQ6 (P)	-.3161 .142	.1286 .559	-.0038 .986	.2073 .342	-.1154 .600	-.1264 .565	.1669 .447	-.0255 .908	.2167 .321	-.1143 .603	-.3969 .061	.6114 .002
TEQ7 (P)	-.3274 .127	-.0212 .924	.2153 .324	.2198 .314	.1990 .363	-.2782 .199	.2671 .218	.2159 .323	.1787 .415	.1209 .585	.2864 .185	-.2162 .322
TEQ8 (P)	.0974 .659	.1668 .447	-.0756 .732	-.2121 .331	-.0506 .819	-.2742 .205	-.0043 .984	-.3385 .114	-.0081 .971	-.1702 .438	.1684 .442	-.1085 .622
TEQ9 (P)	-.1627 .458	.0728 .741	.0587 .790	.0860 .696	-.0302 .891	-.1336 .543	.0403 .855	-.1179 .592	.1655 .450	-.0550 .803	.1381 .530	-.3702 .082

Supra Competences V's Team Process Factors (n=54) (Continued)

Team Effectiveness Factors	Supra-Competences											
	AVSC1	AVSC2	AVSC3	AVSC4	AVSC5	AVSC6	AVSC7	AVSC8	AVSC9	AVSC10	AVSC11	AVSC12
TEQ10 (P)	-.3150	.1445	-.1192	.0716	-.1480	-.2270	.0886	-.0918	-.0686	-.2303	.0164	-.2795
	.143	.511	.588	.745	.500	.298	.688	.677	.791	.290	.941	.196
TEQ11 (P)	.0416	.1226	-.2234	-.1114	-.0880	-.1601	.1856	-.0352	-.1250	-.0724	-.0493	.0388
	.850	.577	.306	.613	.690	.465	.397	.873	.570	.743	.823	.860
TEQ12 (P)	-.2464	.1095	-.1309	-.0962	.4321	.4858	-.2814	-.3122	.0198	-.2977	.0203	.3041
	.257	.619	.551	.662	.039	.019	.193	.147	.929	.168	.927	.156
TEQ13 (P)	-.3564	.1812	.1314	.1151	-.1028	.4076	-.0931	-.1846	.1672	-.1075	.2121	.2636
	.095	.408	.550	.601	.641	.054	.673	.399	.446	.625	.331	.306
TEQ14 (P)	.1561	.1972	-.0791	.1749	-.0328	-.0174	.2137	.0919	-.1155	-.0862	-.0068	.1592
	.477	.367	.720	.425	.882	.937	.327	.677	.600	.696	.975	.461

Belbin Team Roles Correlated with Team Process Factors (n=54)

Team Process Factors	Belbin Team Roles									
	AVCO	AVSH	AVIM	AVME	AVTW	AVRI	AVCF	AVPL		
TEQ1	.1079	.0505	.1885	-.2922	-.0973	.0537	-.3036	-.1256		
(P)	.437	.717	.172	.032	.484	.700	.026	.366		
TEQ2	.1274	.0298	.1660	-.1543	.0630	-.1001	-.1466	-.2096		
(P)	.359	.831	.230	.265	.651	.471	.290	.128		
TEQ3	.1498	.0379	.1532	-.1952	-.0788	.0838	-.1979	-.0481		
(P)	.280	.785	.269	.157	.571	.547	.152	.730		
TEQ4	.0332	.0126	.0594	-.2410	-.0016	.0391	-.0716	-.1303		
(P)	.811	.928	.670	.079	.933	.779	.574	.348		
TEQ5	.0906	.1361	.1045	-.2069	-.0570	.0145	-.2469	-.1710		
(P)	.515	.327	.452	.133	.682	.917	.072	.216		
TEQ6	.2391	.0369	.1092	-.2839	-.2313	.3038	-.1717	.0885		
(P)	.082	.791	.432	.037	.092	.048	.214	.524		
TEQ7	.1902	.0957	.1545	.0515	-.0018	-.0405	-.0474	-.1410		
(P)	.168	.491	.265	.712	.990	.771	.733	.309		
TEQ8	-.0310	.0280	-.0441	.0576	.0594	.0329	-.2879	-.1016		
(P)	.824	.841	.752	.679	.670	.813	.035	.465		
TEQ9	.1229	-.0032	.0851	-.1759	-.1810	.1277	-.1414	.0742		
(P)	.376	.982	.541	.203	.190	.358	.308	.594		

Belbin Team Roles Correlated with Team Process Factors (n=54) (Continued)

Team Process Factors	Belbin Team Roles										
	AVCO	AVSH	AVIM	AVME	AVTW	AVRI	AVCF	AVPL			
TEQ10	.1286	-.0489	.1050	.0577	-.0296	.1257	-.2034	-.0210			
(P)	.354	.725	.450	.678	.832	.365	.140	.880			
TEQ11	.0790	-.0545	.1493	-.1421	-.0071	.1304	-.2523	-.1303			
(P)	.570	.695	.281	.305	.959	.347	.066	.348			
TEQ12	.1806	-.0989	.1609	.0491	.0761	.2102	-.3907	-.1907			
(P)	.191	.477	.245	.724	.584	.127	.003	.167			
TEQ13	.0572	-.1476	.1210	.0529	.0162	.1328	-.0527	-.0387			
(P)	.681	.287	.383	.704	.908	.338	.705	.781			
TEQ14	-.1130	-.0088	.0541	-.0323	.1027	-.0152	-.1442	-.0540			
(P)	.416	.950	.698	.817	.460	.913	.298	.698			

Supra-Competences V's BTRS (n=196)

SUPRA COMPETENCIES	AVCO	AVSH	AVIM	AVME	AVTW	AVRI	AVCF	AVPL
AVSC1	.2343	-.1332	.0401	-.2327	-.1446	.1531	-.0671	.3170
(P)	.088	.337	.773	.090	.297	.269	.630	.020
AVSC2	.1318	.0799	-.1998	.0069	-.2425	-.1985	.2054	.0686
(P)	.342	.566	.147	.960	.077	.150	.136	.622
AVSC3	.0390	-.0123	.1950	-.0599	-.0343	.0072	-.2802	.1852
(P)	.780	.930	.158	.667	.805	.959	.040	.180
AVSC4	.1571	-.0854	.0567	-.3567	-.2673	.0009	.1111	.2305
(P)	.257	.539	.684	.008	.050	.995	.424	.094
AVSC5	.1089	.1130	-.0814	-.3574	-.2550	.0275	-.1559	.0540
(P)	.433	.416	.558	.008	.063	.844	.260	.698
AVSC6	.0662	-.1296	.1597	-.2547	.0688	-.0311	-.2959	.1461
(P)	.635	.350	.249	.063	.621	.823	.030	.292
AVSC7	-.1047	.0566	-.1991	-.0344	-.3765	.0204	.1169	.0527
(P)	.451	.685	.149	.805	.005	.884	.400	.705
AVSC8	-.1511	.0369	-.2077	-.0587	.4582	.1215	.0636	.1069
(P)	.275	.791	.132	.673	.000	.381	.648	.442
AVSC9	-.3284	.0992	-.0010	.0884	-.0460	-.1058	-.2267	-.1248
(P)	.015	.476	.994	.525	.741	.447	.099	.369
AVSC10	.0939	.0264	-.0596	.0828	-.1692	.1307	-.1445	.1560
(P)	.499	.850	.668	.552	.221	.346	.297	.260

Supra-Competences V's BTRS (n = 196) (Continued)

SUPRA COMPETENCIES	AVCO	AVSH	AVIM	AVME	AVTW	AVRI	AVCF	AVPL
AVSC11	.0716	.0762	-.0603	.0664	-.0974	.0272	-.1280	.1587
(P)	.607	.584	.665	.633	.483	.845	.356	.252
AVSC12	-.0404	.1526	.0164	-.2225	-.2143	-.1730	-.0821	.0903
(P)	.772	.271	.906	.106	.120	.211	.555	.516

Correlations Between Productive Thinking Test and Belbin Team Roles (n = 196)

	Volume PTT	Breadth PTT	PTT	BNCO	BNSH	BNI	BNME	BNTW	BNRI	BNCF	PLANT
Volume PTT	1.0000 P= .										
Breadth PTT	.4056 P= .004	1.0000 P= .									
PTT Overall	.8383 P= .000	.8383 P= .000	1.0000 P= .								
BNCO	-.0052 P= .956	.2668 P= .008	.1279 P= .171	1.0000 P= .							
BNSH	.0138 P= .883	.1916 P= .036	.1093 P= .243	-.2066 P= .016	1.0000 P= .						
BNI	.4206 P= .000	.0361 P= .616	-.0057 P= .937	.6538 P= .000	.3753 P= .000	1.0000 P= .					
BNME	.1138 P= .224	.0311 P= .740	.0865 P= .356	.0019 P= .984	-.0202 P= .829	.1674 P= .042	1.0000 P= .				
BNTW	-.0859 P= .359	.0422 P= .653	-.0261 P= .781	.1756 P= .059	-.4483 P= .000	.3453 P= .000	.0304 P= .746	1.0000 P= .			
BNRI	-.0186 P= .843	.0080 P= .932	-.0063 P= .947	.1407 P= .132	-.4222 P= .000	-.4068 P= .000	-.1976 P= .033	.2058 P= .017	1.0000 P= .		
BNCF	.0201 P= .830	.0853 P= .363	.0629 P= .503	.0625 P= .505	.5617 P= .000	.2335 P= .012	.3721 P= .000	-.1958 P= .035	-.5935 P= .000	1.0000 P= .	
PLANT	.1676 P= .044	-.1499 P= .088	.0098 P= .917	-.2196 P= .014	-.1004 P= .284	.5833 P= .000	.2014 P= .021	-.4622 P= .000	.3726 P= .000	-.0647 P= .490	1.0000 P= .

Correlations Between Thinking Style Measures and Selected 16PF Scales: (n=196)

	CTA	VOLUME PTT	BREADTH PTT	PTT OVERALL	CTA PTT	16PF B	16PF E	16PF H	16PF Q1	16PF TOUGH POISE
CTA	1.000 P= .									
VOLUME PTT	.1487 P= .111	1.0000 P= .								
BREADTH PTT	.0664 P= .479	.4056 P= .000	1.0000 P= .							
PTT OVERALL	.1283 P= .170	.8383 P= .000	.8383 P= .000	1.0000 P= .						
CTA PTT	.7323 P= .000	.6404 P= .000	.6051 P= .000	.7429 P= .000	1.0000 P= .					
16PF: B	.1769 P= .057	.0402 P= .668	.0260 P= .782	.0395 P= .674	.1784 P= .035	1.0000 P= .				
16PF: E	-.0174 P= .853	.0084 P= .929	.2752 P= .006	.1796 P= .038	.1161 P= .214	.0890 P= .342	1.0000 P= .			
16PF: H	-.0265 P= .778	.0408 P= .664	.1904 P= .041	.1379 P= .140	.1013 P= .279	.1080 P= .249	.2070 P= .026	1.0000 P= .		
16PF: Q1	-.2213 P= .017	-.1689 P= .046	-.471 P= .065	-.1288 P= .168	-.2191 P= .009	-.0542 P= .564	.0732 P= .435	.2016 P= .030	1.0000 P= .	
16PF: TOUGH POISE	-.1195 P= .201	.1836 P= .032	.1641 P= .041	.0682 P= .467	-.0406 P= .665	-.1594 P= .069	.1599 P= .076	-.0801 P= .393	-.0961 P= .305	1.0000 P= .

Inter-Correlations of Supra-Competences (n = 196)

	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11	SC12
SC1	1.0000 196 P = .											
SC2	.2031 196 P = .004	1.0000 196 P = .										
SC3	-.0144 196 P = .841	-.1263 196 P = .078	1.0000 196 P = .									
SC4	.4832 196 P = .000	.2052 196 P = .004	.0226 196 P = .753	1.0000 196 P = .								
SC5	.2442 196 P = .001	.2126 196 P = .003	-.0847 196 P = .238	.4770 196 P = .	1.0000 196 P = .							
SC6	.4206 196 P = .000	.0361 196 P = .616	-.0057 196 P = .937	.6538 196 P = .000	.3753 196 P = .000	1.0000 196 P = .						
SC7	-.0593 196 P = .409	.0129 196 P = .858	.0037 196 P = .639	.1333 196 P = .063	.3902 196 P = .000	.0553 196 P = .441	1.0000 196 P = .					
SC8	.2544 196 P = .000	.0775 196 P = .280	.0401 196 P = .577	.1875 196 P = .008	.4239 196 P = .000	.1241 196 P = .083	.4552 196 P = .000	1.0000 196 P = .				
SC9	-.1421 196 P = .0476	-.0165 196 P = .819	.1389 196 P = .052	-.0569 196 P = .428	.0435 196 P = .545	-.0419 196 P = .560	.1784 196 P = .012	.1060 196 P = .139	1.0000 196 P = .			
SC10	.1324 196 P = .064	.0776 196 P = .280	.0446 196 P = .535	.2644 196 P = .000	.4022 196 P = .000	.1440 196 P = .044	.2099 196 P = .003	.2638 196 P = .000	.0292 196 P = .685	1.0000 196 P = .		

Inter-Correlations of Supra-Competences (n=196) (Continued)

	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11	SC12
SC11	.0642 196 P = .371	.0772 196 P = .282	.1909 196 P = .007	.0814 196 P = .257	.0321 196 P = .655	-.0258 196 P = .720	-.0294 196 P = .683	.1204 196 P = .093	.1571 196 P = .028	.3993 196 P = .000	1.0000 196 P = .	
SC12	.4557 196 P = .000	.1884 196 P = .008	.1076 196 P = .133	.2215 196 P = .002	.2372 196 P = .001	.3341 196 P = .000	.0749 196 P = .297	.2334 196 P = .001	.1583 196 P = .027	.0369 196 P = .608	.1532 196 P = .032	1.0000 196 P = .

Inter-Correlations of Supra-Competences with Thinking Measures (n=196)

	Volume PTT	Breadth PTT	PPT Overall	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11	SC12	CTA	LTA.PTT
Volume PTT	1.0000 P = .																
Breadth PTT	.4056 P = .000	1.000 P = .															
PTT Overall	.8383 P = .000	.8383 P = .000	1.0000 P = .														
SC1	.1629 P = .179	.0132 P = .889	.0839 P = .373	1.0000 P = .													
SC2	.1629 P = .082	.0198 P = .833	.1100 P = .242	.2221 P = .017	1.0000 P = .												
SC3	.1179 P = .209	-.0652 P = .489	-.1098 P = .243	.1338 P = .154	.0715 P = .447	1.0000 P = .											
SC4	.0972 P = .302	.0122 P = .897	.0658 P = .485	.0233 P = .805	.1256 P = .181	.6605 P = .000	1.0000 P = .										
SC5	.1153 P = .220	.1082 P = .250	.0053 P = .955	.2487 P = .007	.1552 P = .098	.3403 P = .000	.3523 P = .000	1.0000 P = .									
SC6	-.2210 P = .008	-.3163 P = .000	-.3211 P = .000	.1455 P = .121	.0403 P = .669	.2795 P = .002	.3517 P = .001	.3288 P = .000	1.0000 P = .								
SC7	.0546 P = .562	-.0629 P = .504	-.0044 P = .963	-.0681 P = .349	-.0164 P = .862	-.0121 P = .898	.1996 P = .032	.3601 P = .000	-.0306 P = .746	1.0000 P = .							
SC8	.1696 P = .046	.0091 P = .923	.1077 P = .252	.1794 P = .055	.0644 P = .494	.1217 P = .195	.1825 P = .051	.4176 P = .000	.1206 P = .199	.4459 P = .000	1.0000 P = .						
SC9	-.1940 P = .038	-.2397 P = .010	-.2593 P = .005	-.0041 P = .966	.0513 P = .586	-.0328 P = .728	-.0789 P = .402	.2564 P = .006	-.1029 P = .274	.3570 P = .000	.2444 P = .008	1.0000 P = .					
SC10	.1502 P = .109	.0320 P = .734	.1095 P = .244	.0013 P = .989	-.0648 P = .492	.2749 P = .003	.3072 P = .001	.4982 P = .000	.0807 P = .391	.1339 P = .154	.1838 P = .049	.0573 P = .543	1.0000 P = .				
SC11	-.2386 P = .010	-.1183 P = .208	-.2141 P = .022	-.0068 P = .943	.0221 P = .815	.4422 P = .000	.1925 P = .039	-.0608 P = .518	-.0285 P = .779	-.0394 P = .876	-.0905 P = .336	.0019 P = .984	.2071 P = .026	1.0000 P = .			
SC12	-.0208 P = .825	-.0405 P = .667	-.0366 P = .698	.4875 P = .000	.1885 P = .044	.1093 P = .245	.0596 P = .527	.2281 P = .014	.4328 P = .000	.0611 P = .516	.1583 P = .091	-.1039 P = .269	-.0553 P = .557	1.0000 P = .	1.0000 P = .		
CTA	.1487 P = .111	.0664 P = .479	.1283 P = .170	-.0020 P = .983	.2427 P = .009	.1817 P = .048	-.2354 P = .010	-.0682 P = .469	-.1247 P = .184	-.1178 P = .210	.0908 P = .334	-.1810 P = .053	.0255 P = .787	-.0908 P = .391	1.0000 P = .	1.0000 P = .	
CTA.PTT	.6404 P = .000	.6051 P = .000	.7429 P = .000	.0561 P = .552	.2342 P = .013	.1972 P = .035	-.1334 P = .155	-.0407 P = .666	-.2754 P = .003	-.0707 P = .453	.1338 P = .154	-.2603 P = .005	.0585 P = .535	-.1191 P = .205	-.2012 P = .031	.7323 P = .000	1.0000 P = .

Appendix XXIV
Distributions of Key Variables

Distribution of Key Variables at Team Level (n=54)

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Range	Minimum	Maximum
TEQ1	2.69	.65	-.52	.64	.17	.32	2.71	1.45	4.16
TEQ2	2.44	.54	.07	.64	.81	.32	2.29	1.61	3.90
TEQ3	2.87	.57	-.58	.64	.18	.32	2.26	1.93	4.19
TEQ4	2.62	.72	.15	.64	.83	.32	3.11	1.40	4.51
TEQ5	2.44	.49	.27	.64	.28	.32	2.42	1.42	3.83
TEQ6	2.96	.58	.27	.64	.22	.32	2.88	1.70	4.58
TEQ7	2.61	.70	-.51	.64	.41	.32	3.03	1.35	4.38
TEQ8	2.80	.49	0.65	.64	.11	.32	1.97	1.87	3.85
TEQ9	3.65	.67	-.47	.64	-.39	.32	2.73	2.14	4.88
TEQ10	2.62	.60	-.46	.64	-.35	.32	2.50	1.25	3.75
TEQ11	2.86	.57	-.27	.64	.05	.32	2.69	1.56	4.25
TEQ12	2.95	.66	-.60	.64	.37	.32	2.50	1.83	4.33
TEQ13	2.94	.69	.54	.64	.03	.32	3.50	1.00	4.50
TEQ14	2.72	.69	1.41	.64	.70	.32	3.50	1.50	5.00
TPM1	2.59	.51	-.49	.64	.22	.32	2.11	1.63	3.74
TPM2	2.67	.51	1.03	.64	.96	.32	2.47	1.83	4.30
TPM3	2.55	.57	-.19	.64	.59	.32	2.46	1.67	4.13
TPM1B	2.49	.66	1.33	.64	.85	.32	3.29	1.43	4.71
TPM2B	2.67	.67	1.76	.64	1.02	.32	3.50	1.50	5.00
TPM3B	2.53	.75	1.42	.64	.93	.32	3.67	1.33	5.00
AVCO	.31	.30	-.09	.64	.76	.32	1.00	.00	1.00
AVSH	.05	.13	5.39	.64	2.51	.32	.50	.00	.50
AVIM	.05	.16	24.41	.64	4.57	.32	1.00	.00	1.00
AVME	.73	.29	-.28	.64	-.75	.32	1.00	.00	1.00
AVTW	.25	.31	.67	.64	1.22	.32	1.00	.00	1.00
AVRI	.41	.30	-.38	.64	.40	.32	1.00	.00	1.00
AVCF	.18	.21	-.72	.64	.78	.32	.67	.00	.67
AVPL	.01	.05	12.70	.64	3.67	.32	.25	.00	.25
AVPL2	.01	.04	16.68	.64	4.19	.32	.20	.00	.20
AVME2	.49	.27	-.29	.64	-.03	.32	1.00	.00	1.00
COMPANY	1.50	.64	-.18	.64	.91	.32	2.00	1.00	3.00
BTRINDX1	.06	.02	-.55	.64	-.11	.32	.09	.01	.10
BTRINDX2	.06	.02	-.38	.64	-.12	.32	.10	.01	.11
COMPINX1	.05	.02	-.20	.64	.34	.32	.08	.01	.09
COMPINX2	.06	.02	-.45	.64	.20	.32	.01	.01	.12
AVGECTA	5.24	1.18	-.01	.64	-.01	.32	5.50	2.50	8.00
AVGEPTT	.06	1.08	-.27	.64	-.08	.32	4.84	-2.68	2.16

Distribution of Team Process Factors (n=54)

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Range	Minimum	Maximum
TEQ1	2.69	.65	-.52	.64	.17	.32	2.71	1.45	4.16
TEQ2	2.44	.54	.07	.64	.81	.32	2.29	1.61	3.90
TEQ3	2.87	.57	-.58	.64	.18	.32	2.26	1.93	4.19
TEQ4	2.62	.72	.15	.64	.83	.32	3.11	1.40	4.51
TEQ5	2.44	.49	.27	.64	.28	.32	2.42	1.42	3.83
TEQ6	2.96	.58	.27	.64	.22	.32	2.88	1.70	4.58
TEQ7	2.61	.70	-.51	.64	.41	.32	3.03	1.35	4.38
TEQ8	2.80	.49	-.65	.64	.11	.32	1.97	1.87	3.85
TEQ9	3.65	.67	-.47	.64	-.39	.32	2.73	2.14	4.88
TEQ10	2.62	.60	-.46	.64	-.35	.32	2.50	1.25	3.75
TEQ11	2.86	.57	-.27	.64	.05	.32	2.69	1.56	4.25
TEQ12	2.95	.66	-.60	.64	.37	.32	2.50	1.83	4.33
TEQ13	2.94	.69	.54	.64	.03	.32	3.50	1.00	4.50
TEQ14	2.72	.69	1.41	.64	.70	.32	3.50	1.50	5.00
TEQ2AND4	2.53	.61	-.04	.64	.81	.32	2.45	1.54	3.99

Distribution of BTR's (n=196)

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Range	Minimum	Maximum
BNCO	6.52	1.55	-.22	.35	-.22	.17	8.00	2.00	10.00
BNSH	4.83	1.79	-.28	.35	-.03	.17	9.00	1.00	10.00
BNI	4.69	1.71	-.50	.35	-.07	.17	8.00	1.00	9.00
BNME	8.68	1.75	-.33	.35	-1.01	.17	6.00	4.00	10.00
BNTW	5.60	2.17	-.86	.35	.19	.17	9.00	1.00	10.00
BNRI	6.41	2.37	-.54	.35	-.47	.17	9.00	1.00	10.00
BNCF	5.16	2.42	-.66	.35	.13	.17	9.00	1.00	10.00
BNPL	1.08	1.72	-.48	.35	.15	.17	8.00	1.00	9.00

Distribution of Supra-Competences (n=196)

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Range	Minimum	Maximum
SC1	2.90	.51	-.13	.35	-.01	.17	2.76	1.57	4.33
SC2	3.41	.29	3.15	.35	-.62	.17	1.88	2.25	4.13
SC3	3.30	.68	.04	.35	-.36	.17	3.74	1.19	4.93
SC4	3.22	.49	.70	.35	-.55	.17	3.02	1.15	4.17
SC5	3.19	.29	1.40	.35	0.79	.17	1.67	2.17	3.83
SC6	3.01	.40	1.59	.35	-.57	.17	2.85	1.21	4.06
SC7	3.37	.38	.42	.35	.31	.17	2.33	2.33	4.67
SC8	3.13	.57	.90	.35	-.42	.17	3.08	1.25	4.33
SC9	3.33	.48	.54	.35	.30	.17	2.87	2.17	5.05
SC10	3.25	.32	.59	.35	.39	.17	1.83	2.50	4.33
SC11	3.39	.54	1.14	.35	-.15	.17	3.61	1.28	4.89
SC12	2.83	.61	.87	.35	-.31	.17	3.50	1.00	4.50

Distribution of Cognitive Measures (n=196)

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Range	Minimum	Maximum
WGSTEN	5.45	2.10	-.55	.45	-.01	.22	9.00	1.00	10.00
VOLSTD	.00	1.00	.90	.45	.29	.22	5.64	-3.13096	2.50429
BTHSTD	.00	1.00	-.31	.45	-.03	.22	4.46	-2.11913	2.33680
PTTSCORE	.00	1.68	-.14	.45	.05	.22	7.58	-3.76	3.82
CTAS.PTS	.00	1.49	1.69	.45	-.22	.22	8.93	-4.88	4.05

Distribution of Team Process Scores (n=196)

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Range	Minimum	Maximum
TEF1A	3.99	1.54	-.61	.35	-.58	.17	5.00	1.00	6.00
TEF2A	3.58	1.18	-.58	.35	.16	.17	5.00	1.00	6.00
TEF3A	2.92	1.17	-.66	.35	.44	.17	5.00	1.00	6.00
TEF4A	3.01	1.18	-.34	.35	.45	.17	5.00	1.00	6.00
TEF5A	2.90	1.21	-.21	.35	.47	.17	5.00	1.00	6.00
TEF6A	2.90	1.31	-.37	.35	.47	.17	5.00	1.00	6.00
TEF7A	2.63	1.12	.28	.35	.64	.17	5.00	1.00	6.00
TEF8A	4.57	1.16	.98	.35	-1.09	.19	5.00	1.00	6.00
TEF9A	2.71	1.06	1.45	.35	1.02	.17	5.00	1.00	6.00
TEF10A	2.57	1.16	.24	.35	.75	.17	5.00	1.00	6.00
TEF11A	2.88	1.37	-.48	.35	.62	.17	5.00	1.00	6.00
TEF12A	2.55	1.17	.36	.35	.83	.17	5.00	1.00	6.00
TEF13A	2.77	1.29	-.01	.35	.68	.17	5.00	1.00	6.00
TEF14A	2.84	1.23	-.37	.35	.52	.17	5.00	1.00	6.00
TEF15A	3.17	1.40	-.73	.35	.29	.17	5.00	1.00	6.00
TEF16A	2.82	1.42	-.23	.35	.75	.17	5.00	1.00	6.00
TEF17A	3.57	1.26	-.90	.35	-0.8	.17	5.00	1.00	6.00
TEF18A	2.08	1.25	.84	.35	1.23	.17	5.00	1.00	6.00
TEF19A	2.11	1.14	1.59	.35	1.24	.17	5.00	1.00	6.00
TEF20A	2.59	1.33	.08	.35	.86	.17	5.00	1.00	6.00
TEF21A	2.44	1.06	.34	.35	.76	.17	5.00	1.00	6.00
TEF22A	2.58	1.13	.09	.35	.46	.17	5.00	1.00	6.00
TEF23A	2.20	1.05	.50	.35	.83	.17	5.00	1.00	6.00
TEF24A	2.51	1.16	.75	.35	.82	.17	5.00	1.00	6.00
TEF25A	2.57	1.22	-.01	.35	.62	.17	5.00	1.00	6.00
TEF26A	2.43	1.20	1.00	.35	1.05	.17	5.00	1.00	6.00
TEF27A	3.18	1.23	-.19	.35	.28	.17	5.00	1.00	6.00
TEF28A	2.63	1.31	.14	.35	.91	.17	5.00	1.00	6.00
TEF29A	2.44	1.39	.01	.35	.89	.17	5.00	1.00	6.00
TEF30A	2.58	1.24	-.13	.35	.69	.17	5.00	1.00	6.00
TEF31A	2.19	1.04	2.02	.35	1.31	.17	5.00	1.00	6.00
TEF32A	3.56	1.36	-.92	.35	.02	.17	5.00	1.00	6.00
TEF33A	3.03	1.25	-.55	.35	.3	.17	5.00	1.00	6.00
TEF34A	3.02	1.40	-.56	.35	.64	.17	5.00	1.00	6.00
TEF35A	2.94	1.31	-.18	.35	.60	.17	5.00	1.00	6.00
TEF36A	2.51	1.09	.32	.35	.66	.17	5.00	1.00	6.00

Distribution of Team Process Scores (n=196)

Variable	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Range	Minimum	Maximum
TEF37A	2.69	1.12	.05	.35	.47	.17	5.00	1.00	6.00
TEF38A	2.70	1.23	-.71	.35	.41	.17	5.00	1.00	6.00
TEF39A	2.65	1.27	.06	.35	.66	.17	5.00	1.00	6.00
TEF40A	3.01	1.29	-.24	.35	.57	.17	5.00	1.00	6.00
TEF41A	3.67	1.40	-.82	.35	.05	.17	5.00	1.00	6.00
TEF42A	3.44	1.22	-.36	.35	.26	.17	5.00	1.00	6.00
TEF43A	3.64	1.37	-.87	.35	-.06	.17	5.00	1.00	6.00
TEF44A	2.76	1.06	-.23	.35	.58	.17	5.00	1.00	6.00
TEF45A	2.53	1.27	.45	.35	.92	.17	5.00	1.00	6.00
TEF46A	3.66	1.20	-.63	.35	.08	.17	5.00	1.00	6.00
TEF47A	2.95	1.22	-.20	.35	.56	.17	5.00	1.00	6.00
TEF48A	2.61	1.05	-.04	.35	.58	.17	5.00	1.00	6.00
TEF49A	3.18	1.15	-.65	.35	.21	.17	5.00	1.00	6.00
TEF50A	2.32	.95	.42	.35	.68	.17	5.00	1.00	6.00
TEF51A	2.68	1.05	.16	.35	.53	.17	5.00	1.00	6.00
TEF52A	2.52	1.11	.37	.35	.66	.17	5.00	1.00	6.00
TEF53A	2.66	1.20	-.34	.35	.53	.17	5.00	1.00	6.00
TEF54A	4.56	1.54	-.75	.35	-.72	.17	5.00	1.00	6.00
TEF55A	3.65	1.61	-1.12	.35	-.03	.17	5.00	1.00	6.00
TEF56A	3.45	1.27	-1.08	.35	-.14	.17	5.00	1.00	6.00
TEF57A	3.44	1.51	-1.00	.35	.13	.17	5.00	1.00	6.00
TEF58A	2.35	1.26	.77	.35	1.09	.17	5.00	1.00	6.00
TEF59A	2.57	1.45	-.14	.35	.88	.17	5.00	1.00	6.00
TEF60A	3.05	1.43	-.62	.35	.50	.17	5.00	1.00	6.00
TEF61A	3.16	1.18	-.08	.35	.52	.17	5.00	1.00	6.00
TEF62A	2.80	1.33	-.33	.35	.58	.17	5.00	1.00	6.00
TEF63A	4.84	1.57	.08	.35	-1.16	.17	5.00	1.00	6.00
TEF64A	2.76	1.45	-.36	.35	.73	.17	5.00	1.00	6.00
TEF65A	3.35	1.50	-.92	.35	.29	.17	5.00	1.00	6.00
TEF66A	4.15	1.72	-1.44	.35	-.24	.17	5.00	1.00	6.00

Appendix XXV
Homoscedasticity Test Data

Testing for Homoscedasticity Using the Levene Test

Performance Factor 1: Team Cohesion

(n=54)

Variable	Levine Statistic	df1	df2	Significance
TEQ 12	.5977	3	50	.619
TEQ 2	1.9653	2	51	.151
TEQ 3	1.1439	3	50	.340
TEQ 4	1.0560	3	50	.376
TEQ 2&4	1.4078	2	51	.254
Comp Index	.8477	3	50	.523
Avge CTA	1.1634	3	32	.339
Avge PTT	1.1283	2	51	.333
CTA.PTT	1.1398	3	50	.329
BTR Index	1.2204	2	51	.302
CTA x Ldr	1.8837	17	36	0.054
x Comm	1.1008	15	38	.388
x Perf	1.0002	17	36	.480
x Inv	1.8846	15	38	.055
x Coin	1.4278	17	36	.226
PTT x Ldr	.7811	13	40	.675
x Comm	1.1808	11	42	.329
x Perf	1.2177	13	40	.303
x Inv	1.0146	12	41	.454
x Coin	1.1418	12	41	.355
CTA.PTT				
x Ldr	1.9477	14	39	.051
x Comm	1.8245	10	43	.062
x Perf	1.3347	12	41	.146
x Inv	1.9636	12	41	.056
x Coin	1.8153	12	41	.053
BTR Index				
x Ldr	1.6387	17	36	.192
x Comm	1.0102	17	36	.441
x Perf	1.2107	15	38	.386
x Inv	1.4782	15	38	.262
x Coin	1.7846	17	36	.074
SC Index				
x Ldr	1.8742	14	39	.378
x Comm	1.0043	17	36	.476
x Perf	1.7135	15	38	.066
x Inv	1.4278	17	36	.214
x Coin	1.8142	15	38	.072

Performance Factor 2: Improvement Orientation

(n=54)

Variable	Levine Statistic	df1	df2	Significance
TEQ 2	2.0820	2	51	.135
TEQ 3	1.8037	3	50	.159
TEQ 4	1.1968	3	50	.321
TEQ 12	1.2519	3	50	.301
TEQ 2&4	2.0063	2	51	.145
Avge CTA	1.5797	3	50	.213
Avge PTT	2.7905	1	52	.102
CTA.PTT	2.8698	2	51	.094
CTA x Ldr	2.6913	17	36	.192
x Comm	1.0269	15	38	.451
x Perf	1.9654	17	36	.054
x Inv	1.9509	16	37	.059
x Coin	.9363	17	36	.542
PTT x Ldr	2.4689	10	43	.049
x Comm	1.7178	11	42	.104
x Perf	1.7931	13	40	.086
x Inv	1.5093	12	41	.160
x Coin	1.6741	12	41	.109
CTA.PTT				
x Ldr	1.8860	14	39	.060
x Comm	2.0030	10	43	.052
x Perf	1.8834	12	41	.066
x Inv	1.6471	12	41	.114
x Coin	1.1828	12	41	.327
Supra-Comp Index				
BTR Index	1.4604	5	45	.222
BTR Index	1.3751	4	49	.324
x Ldr				
x Comm	1.0629	17	36	.428
x Perf	1.9546	17	36	.061
x Inv	.9234	17	36	.518
x Coin	1.3178	16	37	.286
SC Index	1.1431	17	36	.309
x Ldr				
x Comm	1.5471	14	39	.223
x Perf	1.6043	13	40	.302
x Inv	1.1013	15	38	.382
x Coin	1.4428	14	39	.341
	1.5417	15	38	.096

Performance Factor 3: Team Achievements

(n=54)

Variable	Levine Statistic	df1	df2	Significance
TEQ 2	1.9060	2	51	.159
TEQ 3	2.2753	3	50	.091
TEQ 4	.5139	3	50	.675
TEQ 12	1.1433	3	50	.341
TEQ 2&4	.4870	2	51	.617
Avge CTA	2.5287	3	50	.086
Avge PTT	2.6494	2	51	.111
CTA.PTT	1.6470	2	51	.203
CTA x Ldr	1.9906	17	36	.146
x Comm	1.4126	15	38	.191
x Perf	.9249	17	36	.554
x Inv	1.2337	17	36	.292
x Coin	1.0832	17	36	.405
PTT x Ldr	.8824	13	40	.577
x Comm	.9010	11	42	.547
x Perf	.8957	13	40	.564
x Inv	1.0020	12	41	.464
x Coin	1.0408	12	41	.432
CTA.PTT				
x Ldr	1.1601	14	39	.342
x Comm	1.1241	10	43	.367
x Perf	.8570	12	41	.594
x Inv	.8693	12	41	.583
x Coin	1.9603	12	41	.055
Supra-Comp Index				
BTR Index	.7135	5	45	.617
BTR Index	1.0431	3	50	.543
x Ldr				
x Comm	1.3924	15	38	.196
x Perf	1.2737	17	36	.294
x Inv	1.4470	15	38	.146
x Coin	1.1238	17	36	.324
SC Index	1.4017	17	36	.116
x Ldr				
x Comm	.8741	12	41	.513
x Perf	1.0112	6	48	.213
x Inv	1.4729	10	43	.187
x Coin	1.2478	12	41	.205
	1.3630	10	43	.221

Appendix XXVI

Collinearity Statistics for `Enter' Multiple Regression Analysis

Collinearity for "Enter" on Multiple Regression Analysis (n=54)

Variable	Outcome Factor 1		Outcome Factor 2		Outcome Factor 3	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
PTT x Average TPF 2 + 4	0.014	71.12	6.0141	71.116	0.014	71.12
BTR Index	0.011	90.21	0.011	90.21	0.110	90.21
TPF 12	0.0122	81.669	0.0122	81.67	0.112	81.669
CTA	0.21	48.06	0.0208	48.059	0.021	48.06
SC x TPF3	0.0072	122.48	0.00716	122.48	0.0072	122.48
Average TPF 2 + 4	0.0071	141.127	0.0070	141.13	0.0071	141.127
TPF3	0.004	231.42	0.004	231.42	0.0043	231.417
CTA x TPF 12	0.0127	79.01	0.0126	79.006	0.013	79.01
SC x Average TPF 2 + 4	0.012	84.29	0.0118	84.294	0.0118	84.30
PTT	0.15	65.54	0.0152	65.53	0.0153	65.538
SC Index	0.016	61.56	0.016	61.564	0.016	61.56
CTA x Average TAF 2 + 4	0.0071	140.53	0.0072	140.52	0.007	140.53
BTR Index x TPF 12	0.0063	159.51	0.0062	159.508	0.0063	159.51
PTT x TPF12	0.0114	87.67	0.0114	87.674	0.011	87.67
BTR x Average TPF 2 + 4	0.0077	113.01	0.0084	113.08	0.0088	113.008
BTR x TPF 3	0.0043	232.92	0.0042	232.91	0.0043	232.91
SC Index x TPF 12	0.0058	172.196	0.0058	172.196	0.0058	172.20
CTA x TPF 3	0.0038	266.37	0.0037	266.36	0.0038	266.37

